

**SUBMITTAL TO THE BOARD OF SUPERVISORS
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA**

806



FROM: EDA/Facilities Management

SUBMITTAL DATE:
November 3, 2011

SUBJECT: Indio Milestones Mental Health Adult Residential Facility Improvement Project – Plans and Specifications

RECOMMENDED MOTION: That the Board of Supervisors:

1. Approve the plans and specifications for the Indio Milestones Mental Health Adult Residential Facility Improvement Project and authorize the Clerk of the Board to advertise for bids; and
2. Delegate project management authority for the project to the Assistant County Executive Officer/EDA in accordance with Board policies.

BACKGROUND: On August 16, 2011, Agenda Item 3.28, the Riverside County Board of Supervisors approved, in-principle, the project to correct and improve facility conditions for the continued operational censng and ongoing patient care at the Indio Milestones Mental Health Adult Residential Facility.

(Continued)

Robert Field

Robert Field
Assistant County Executive Officer/EDA

FINANCIAL DATA

Current F.Y. Total Cost:	\$ 0	In Current Year Budget:	Yes
Current F.Y. Net County Cost:	\$ 0	Budget Adjustment:	No
Annual Net County Cost:	\$ 0	For Fiscal Year:	2011/12

COMPANION ITEM ON BOARD OF DIRECTORS AGENDA: No

SOURCE OF FUNDS: 100% State Funds

Positions To Be Deleted Per A-30	<input type="checkbox"/>
Requires 4/5 Vote	<input type="checkbox"/>

C.E.O. RECOMMENDATION:

APPROVE

County Executive Office Signature

Jennifer L. Sargent
Jennifer L. Sargent

MINUTES OF THE BOARD OF SUPERVISORS

On motion of Supervisor Buster, seconded by Supervisor Stone and duly carried, IT WAS ORDERED that the above matter is approved as recommended.

Ayes: Buster, Stone, Benoit and Ashley
Nays: None
Absent: Tavaglione
Date: November 15, 2011
xc: EDA, CIP, DMH, COB

Kecia Harper-Ihem
Clerk of the Board
By: *Kecia Harper-Ihem*
Deputy

Prev. Agn. Ref.: 3.28 of 08/16/11

District: 4

Agenda Number **3.5**

FORM APPROVED COUNTY COUNSEL
REVIEWED BY CIP BY: *AP Kessler*
MARSHAL VICTOR
10/26/11
MARIA T. MAREY ASST DIRECTOR
RIVERSIDE COUNTY DMH Departmental Concurrence
Christina Harris

Dept's Recomm.: Consent Policy Policy
Per Exec. Ofc.: Consent Policy

BACKGROUND: (Continued)

The bid documents are now complete and Economic Development Agency requests approval to solicit bids for construction of this project.

The scope of work for this project includes improvements to the facility in the following areas; roof system, electrical infrastructure, kitchen, dining area, and resident rooms. All costs associated with this project will be 100% state funds.

PROJECT MANUAL

FOR THE CONSTRUCTION OF

**Indio Mental Health
Milestones Building Renovation
82 485 Miles Avenue
Indio, CA 92201-01
Phase I & II
FM08410000039**



October 19 2011

**Economic Development Agency
3403 10th Street, Suite 500
Riverside, CA 92507**

**Miller Architecture, Interiors & Planning
1177 Idaho Street, Suite 200
Redlands, CA 92374
PHONE (909) 335-7400 - FAX 909 335-7299**

MAN. NO.

FORM APPROVED COUNTY COUNSEL
BY: MA Victor 10/26/11
MARSHA L. VICTOR DATE

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GENERAL CONDITIONS OF THE CONTRACT

ARTICLE 1 GENERAL PROVISIONS

1.1 DEFINITIONS

THE CONTRACT DOCUMENTS - The Contract Documents consist of the Contract, the Performance Bond and Payment Bond and any other bond required by the Contract, the drawings, the specifications, addenda issued prior to execution of the Contract, and all modifications thereto.

THE CONTRACT - The Contract Documents form the Contract. The Contract represents the entire and integrated agreement between the parties hereto, and supersedes all prior negotiation, representations, or agreements, either written or oral, including the bidding documents.

ACT OF GOD - An Act of God is an earthquake of magnitude 4.5 or greater on the Richter scale, flood, tornado, or other cataclysmic phenomenon of nature, or rain, snowstorm, windstorm, high water, or other natural phenomenon in excess of the normal as established by National Oceanic and Atmospheric Administration weather data.

ACCEPTANCE - Acceptance is when the County determines all of the Contract requirements have been completed. Execution of the Notice of Completion will signify acceptance. A copy of the Notice of Completion will be sent to the Contractor after execution by the County. Upon receipt of the Notice of Completion, the Contractor will be relieved of the duty of protecting the work, and the County will initiate final settlement and payment.

ARCHITECT - The use of the term Architect shall mean the individual, partnership, corporation, association or joint venture contracted by the County for the design of this Work, as designated on the title sheet of these specifications and Contract Documents.

BENEFICIAL OCCUPANCY - The right of the County to occupy all or any portion of the project prior to final Acceptance of the Work. Such occupancy does not constitute acceptance or completion by the Contractor of the Work or any portion thereof, nor will it relieve the Contractor of the responsibility for correcting defective work or materials found at any time before Acceptance of the Work.

COUNTY - The term County when used herein shall mean the Board of Supervisors of the County of Riverside, a political subdivision of the State of California.

CHANGE ORDER - A Change Order is the document issued by the County authorizing any change or adjustment to the Contract Documents in accordance with Article 19 of this Contract.

CONTRACT DRAWINGS - "Contract drawings" or "drawings" means and includes (a) all drawings which have been prepared on behalf of the County and are included in the Contract Documents and all clarification drawings issued by notice to the bidders thereto; (b) all drawings submitted pursuant to the terms of the Contract by the Contractor to the County during the progress of the Work, which are accepted by the County.

CONTRACTOR'S AGENT - The representative of the Contractor, approved by the County, who shall be present at the Work and be authorized to receive and act upon instructions from the County and to execute and direct the Work on behalf of the Contractor.

CONTRACTOR - When used herein, Contractor means the prime or principal Contractor licensed to perform work in the State of California, including all joint ventures. References to subcontractor or others are only for convenience and all such references shall be considered to refer to the Contractor. The prime or principal Contractor shall be responsible for all subcontractors, and all subcontractors shall require their subcontractors to comply with the relevant provisions of the prime or principal contract.

CRITICAL PATH METHOD(CPM) - "Critical Path Method" is a schedule technique.

DAY - The use of "day" herein means calendar day and shall include every day including Saturdays, Sundays, and legal holidays.

DIRECTOR - The use of "Director" shall mean the Assistant County Executive Officer/EDA of the County or his designated representative.

INSTALL - When used herein, "install" shall mean the complete installation, in place, of any item, equipment or material.

MATERIAL - Material shall be construed to include machinery, equipment, manufactured articles, or construction such as form work, fasteners, etc., and any other classes of material to be furnished in connection with the Contract. All materials shall be new.

NOTICE OF COMPLETION - The Notice of Completion ("NOC") shall be issued at that point in the Contract when the Contractor has completed all Work required in the Contract Documents. The time for issuance shall be determined by the County through a final inspection. The NOC shall be issued by the Board of Supervisors.

NOTICE TO PROCEED - The Notice to Proceed is the written notification from the County giving the Contractor notice to commence with the Work. The Notice to Proceed will specify the start date for the Work and the completion date.

REQUEST FOR INFORMATION - (RFI) The form and procedure established for communication between the Contractor and the County to clarify or interpret the Contract Documents.

REQUEST FOR QUOTATION - (RFQ) A document consisting of supplemental details, instruction, or information issued by the Architect, through the County, for the purpose of obtaining price quotations for possible changes in the Work.

SHALL - When used herein, "shall" means anything, which is mandatory to be performed by the Contractor.

SPECIFICATIONS - The term "Specifications" means that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work.

SUBCONTRACTOR - The term "Subcontractor" means a person or firm that has a contract with Contractor or with another subcontractor to perform a portion of the Work. Unless otherwise specifically provided, the term Subcontractor includes Subcontractors of any tier, suppliers, manufacturers, and distributors. The term Subcontractor is referred to throughout the Contract Documents as if singular in number.

WORK - The term "Work" comprises the services and materials required by the Contract Documents, as may be amended, and includes all labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in such construction.

1.2 AUTHORITIES AND LIMITATIONS

1.2.1 The Board of Supervisors alone have the power to bind the County and to exercise the rights, responsibilities, authorities, and functions vested therein by the Contract Documents, except that they shall have the right to designate authorized representatives to act for them.

1.2.2 Neither the Contract, nor any part thereof, nor moneys due or to become due there under may be assigned by the Contractor without the prior written approval of the County, with the exception of the assignments to County which may be required under the terms of this Contract.

1.3 LEGAL REQUIREMENTS

1.3.1 Contractor shall keep informed of, and comply with, all federal, state and county laws, ordinances, rules, and regulations applicable to the Work or to those engaged or employed in the Work of this Contract, especially (but not limited to) those laws relating to hours of employment, prevailing wages, payment of wages, sanitary and safety conditions for workers, workers' compensation insurance, type and kind of materials that can be used, non-discrimination in employment and affirmative action programs. Failure to identify a specific provision in these Contract Documents shall not excuse the Contractor from complying with such applicable statutory requirements.

1.3.2 If conflict arises between provisions of the Contract Documents and any such laws, rules, or regulations, the Contractor shall notify the County at once in writing. If, before receiving clarification, Contractor performs any portion of the Work affected by such apparent conflict, such performance shall be at Contractor's own risk. Contractor shall not be entitled to any additional compensation or time by reason of the conflict or its later correction.

1.3.3 All work and materials shall be in full accordance with the latest applicable (or otherwise noted) codes, rules, and regulations including, but not limited to, the following:

- .Uniform Building Code
- .Uniform Plumbing Code
- .Uniform Mechanical Code
- .Uniform Fire Code
- .State Fire Marshal
- .State Industrial Accident Commission's Safety Orders
- .Rules of Local Utilities

1.3.4 Nothing in the specifications is to be construed to permit work not conforming to the above, and expense incurred complying with the above shall be borne by the Contractor. Whenever the specifications and working details require higher standards than those required by the ordinances, codes and statutes, the specifications and working details shall take priority over the ordinances, codes and statutes.

1.3.5 In submitting a bid on this public works projects, or any subcontractor agreeing to supply goods, services, or materials, and entering a contract pursuant thereto, the contractor and/or subcontractor do offer and agree to assign the County all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700)

of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final acknowledgement by the parties.

1.4 STANDARD REFERENCES

1.4.1 All documents and publications (such as, but not limited to, manuals, handbooks, codes, standards, and specifications) which are cited in this Contract for the purpose of establishing technical (non-administrative) requirements applicable to equipment, materials, or workmanship under this Contract, shall be deemed to be incorporated herein as though fully set forth.

1.4.2 Whenever reference is made to any particular document or publication, the Contractor shall comply with the requirements set out in the edition specified in this Contract, or if not specified, the latest edition or revision thereof, in effect on the date of the solicitation of bid on this project, except as modified by, as otherwise provided in, or as limited to type, class, or grade, in the specifications of this Contract.

1.5 PERMITS, LICENSES, FEES & TAXES

1.5.1 COUNTY RESPONSIBILITIES

- a. The County will apply for all plan checks and will apply for and obtain the Building Permit(s), the Grading Permit and Construction Permits required by the County of Riverside, paying all fees in connection therewith.
- b. The County will furnish, at no expense to the Contractor, all on-site inspection of the Work and will arrange and pay for off-site inspection only as noted in the Contract Documents.

1.5.2 CONTRACTOR'S RESPONSIBILITIES

- a. The Contractor shall obtain and pay for all other permits and licenses required for the Work, including excavation permit and for plumbing, mechanical and electrical work and for operations in or over public streets or right of way under jurisdiction of public agencies other than the County.
- b. Exclusive of off-site inspection specified herein to be the County's responsibility, the Contractor shall arrange and pay for all off-site inspection of the Work, including certification, required by the specifications, drawings, or by governing authorities.
- c. Before Acceptance of the project by the County, the Contractor shall submit all licenses, permits, and certificates of inspection to the County.

1.6 SEPARATE CONTRACTS

1.6.1 The County reserves the right to perform work related to this project with its own forces, and to award separate contracts in connection with other portions of the project or other work on the site. The Contractor shall cooperate with others in the prosecution of all work and shall not interfere with material, appliances or workmen of the County or any other contractor engaged by the County at the site of the Work. In case of disagreement regarding such use, the matter shall be referred to the County whose decision relative to said use shall govern.

1.6.2 The Contractor shall afford the County and separate contractors reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work, and shall properly connect and coordinate Contractor's Work with theirs.

1.6.3 If any part of the Contractor's Work depends for proper execution or results upon the work of the County or any separate contractor, the Contractor shall inspect and promptly report to the County any discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor to so inspect and report shall constitute an acceptance of the County's or the separate contractor's work as fit and proper to receive the Work, except as to defects which may develop in the other separate contractor's work after the execution of the Contractor's Work.

1.6.4 Should the Contractor cause damage to the work or property of any separate contractor on the Project, the Contractor shall, upon due notice, settle with such other contractor by agreement, if both will so settle. If such separate contractor sues the County because of any damage alleged to have been so sustained, the Contractor agrees to indemnify and defend the County in such proceedings with the County retaining the right to select and hire independent counsel for the County paid by the Contractor.

1.6.5 Any cost caused by defective or ill-timed work shall be borne by the party responsible therefore.

1.7 COUNTY'S AUTHORIZED REPRESENTATIVE, INSPECTOR(S), & ARCHITECT

1.7.1 AUTHORIZED REPRESENTATIVE

The County shall designate a representative during the Work, who shall have the right to be present at the job site during construction and shall supervise any additional representatives appointed by the County.

1.7.2 INSPECTOR(S)

The Inspector(s) shall have the right to observe the installation of all materials and equipment to be incorporated into the Work and the placing of such material and equipment to determine in general if the Work is proceeding in accordance with the Contract Documents. The Inspector(s) is not authorized to make changes in the Contract Documents. On the basis of his observations, he shall keep the County informed as to the progress of the Work. The Inspector shall not be responsible for means, methods, techniques, sequences, or procedures of construction nor for safety precautions and programs in connection with the Work. Nor will the inspector be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.

1.7.3 ARCHITECT

- a. The County has retained an Architect for this project. The Architect will advise and consult with the County, and the County will issue instructions to the Contractor. The Architect will be requested to interpret the requirements of the Contract. When requested by the County, the Architect will, within a reasonable time, render such interpretations as he may deem necessary for the proper execution of the Work.
- b. The Architect will make periodic visits to the job site to familiarize himself generally with the progress and quality of the Work and to determine in general whether the work is proceeding in accordance with the Contract Documents. Based on such observations he will recommend approval of applications for progress payments made by Contractor. The Architect shall not be responsible for means, methods, techniques, sequences, or procedures of construction nor for safety precautions and programs in connection with the Work. Nor

will the Architect be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.

ARTICLE 2 BONDS AND INSURANCE

2.1 BIDS OF \$25,000 OR LESS

2.1.1 If the total amount bid on the Work is \$25,000 or less, the payment bond and performance bond are not required, provided that one payment of all compensation shall be made following Acceptance of all work.

2.2 BONDS

2.2.1 GENERAL REQUIREMENTS

a. Before commencing any Work under this Contract, the Contractor shall file four of each bond with the County. These bonds shall be in the amounts and for the purposes specified below. They shall be surety bonds issued by:

- (1) Either a California Admitted Surety OR a current Treasury Listed Surety (Federal Register).

And

- (2) Either a current A.M. Best A VIII rated Surety OR an admitted surety insurer which complies with the provisions of the Code of Civil Procedure, § 995.660.

b. Should any surety or sureties upon said bonds or any of them become insufficient, Contractor shall renew said bond or bonds with good and sufficient sureties within ten (10) calendar days after receiving notice from the County that the surety or sureties are insufficient. Cost of bonds shall be included in the bid price.

2.2.2 PERFORMANCE BOND

The successful bidder shall deliver to the County an executed Performance Bond on the attached form in an amount equal to 100% of the accepted bid as security for the faithful performance of the Contract.

2.2.3 PAYMENT BOND

The successful bidder shall deliver to the County an executed Payment Bond on the attached form in an amount equal to 100% of the accepted bid as security for the payment of all persons performing labor and furnishing materials in connection with the Work.

2.3 INSURANCE

2.3.1 GENERAL REQUIREMENTS

Before commencing this Work under the Contract, and without limiting or diminishing CONTRACTOR'S obligation to indemnify and hold the COUNTY harmless, the Contractor shall procure and maintain, or cause to be maintained at its sole cost and expense, the following insurance coverages during the term of this Contract.

2.3.2 WORKERS' COMPENSATION INSURANCE

Contractor shall secure Workers' Compensation Insurance (Coverage A) as prescribed by the laws of the State of California. Policy shall include Employers' Liability (Coverage B) including Occupational Disease with limits not less than \$1,000,000 per person per accident. Policy shall be endorsed, if applicable, to provide a Borrowed Servant/Alternate Employer Endorsement, and contain a Waiver of Subrogation in favor of the County of *Riverside*. Pursuant to Section 3700 of the Labor Code of the State of California, Contractor shall file with the County before commencing the Work the following signed certification:

"I am aware of the provisions of Section 3700 of the Labor Code, which requires every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that Code, and I shall comply with such provisions before commencing the performance of the Work of this Contract."

2.3.3 COMMERCIAL GENERAL LIABILITY:

Commercial General Liability insurance coverage, including but not limited to, premises liability, contractual liability, products/completed operations if applicable, personal and advertising injury – which may arise from or out of CONTRACTOR'S operations, use, and management of the premises, or the performance of its obligations hereunder. Policy shall name the County of Riverside—its Director's, Officers, special Districts, Board of Supervisors, employees, agents or representatives as Additional Insured, and contain a Waiver of Subrogation in favor of the County of Riverside. Policy limits shall not be less than \$1,000,000 per occurrence combined single limits. If such insurance contains a general aggregate limit, it shall apply separately to this agreement or be no less than two (2) times the occurrence limit. Policy shall also contain coverage for \$5,000 Medical Payments coverage per accident, per person, and Fire Legal Liability in an amount not less than \$50,000.

2.3.4 VEHICLE LIABILITY:

If CONTRACTOR'S vehicles or licensed mobile equipment are used on County property, or used in any manner on behalf of the County, CONTRACTOR shall maintain auto liability insurance for all owned, non-owned and hired automobiles in an amount not less than \$1,000,000 per occurrence combined single limit, \$2,000,000 in the aggregate. Policy shall name the County of Riverside, its Director's Officers, Special Districts, Board of Supervisors, employees, agents, or representatives as Additional Insured, and provide a Waiver of Subrogation in favor of the County of Riverside.

2.3.5 PROPERTY (PHYSICAL DAMAGE):

All-Risk property insurance coverage for the full replacement value of all CONTRACTOR'S equipment, improvements/alterations, temporary structures, and systems (Care, Custody, and Control of CONTRACTOR) used on COUNTY property, or used in any way connected with the accomplishment of the Work performed in this contract.

2.3.6 COURSE OF CONSTRUCTION INSURANCE

CONTRACTOR shall provide All Risk Builder's Risk (Course of Construction) insurance, including earthquake and flood if in an earthquake or flood zone (required on financed or bond financing arrangements), covering the COUNTY, the CONTRACTOR and every subcontractor of every tier for the entire project including property to be used in the construction of the project while such property is at off site storage locations or while in transit. Policy shall include coverage for collapse, faulty workmanship, debris removal, expediting expense, Fire Department Service charges, valuable papers and records, trees, grass, shrubbery and

plants. If scaffolding, falsework and temporary buildings are insured separately by the CONTRACTOR or others, evidence of such separate coverage shall be provided to COUNTY prior to the start of the work. Policy shall be written on a completed value form. Policy shall also provide coverage for temporary structures (onsite offices, etc.), fixtures, machinery and equipment being installed as part of the construction project. (The Base Bid including course of construction insurance shall be used for determination of lowest bid, unless otherwise stated in the bid form.)

CONTRACTOR shall provide a bid price with Course of Construction insurance as outlined herein, and shall also separately provide the cost of the Course of Construction insurance and deductible; and shall declare all terms, conditions, coverages and limits upon request of COUNTY. COUNTY RETAINS THE RIGHT TO CHOOSE TO USE ITS OWN COURSE OF CONSTRUCTION PROGRAM. If the COUNTY program is chosen, CONTRACTOR shall assume the cost of any and all applicable policy deductibles (currently \$50,000 per occurrence), and shall insure its own machinery, equipment, tools, etc., from any loss of any nature whatever. If COUNTY elects the CONTRACTOR's All Risk Builder's Risk Program, CONTRACTOR shall be responsible for any and all policy deductibles.

2.3.7 GENERAL INSURANCE PROVISION – ALL LINES:

- a. Any insurance carrier providing insurance coverage hereunder shall be admitted to the State of California unless waived, in writing, by the County Risk Manager. Carrier(s) shall have an A.M. BEST rating of not less than an A:VIII. Insurance deductibles or self-insured retentions must be declared by the carrier(s), and such deductibles and retentions shall have the prior written consent from the County Risk Manager. At the election of the Risk Manager, carriers shall provide written notification, and shall either 1) reduce or eliminate such deductibles or self-insured retentions, or 2) procure a bond which guarantees payment of losses and related investigations, claims administration, and defense costs and expenses. If no written notice is received from the County Risk Manager within ten (10) days of the acceptance of agreement, then such deductibles or self-insured retentions shall be deemed acceptable.
- b. Cause its insurance carrier(s) to furnish the County of Riverside with either 1) a properly executed original Certificate(s) of Insurance and certified original copies of Endorsements effecting coverage as required herein, or 2) if requested to do so in writing by the County Risk Manager, provide original Certified copies of policies including all Endorsements and all attachments thereto, showing such insurance is in full force and effect. The County of Riverside, its Director's and Officers, Special Districts, Board of Supervisors, elected officials, employees, agents or representatives are named as Additional Insureds. Further, said Certificate(s) and policies of insurance shall contain the covenant of the insurance carrier(s) that shall provide no less than thirty (30) days written notice be given to the County of Riverside prior to any material modification or cancellation of such insurance. In the event of a material modification or cancellation of coverage, this Agreement shall terminate forthwith, unless the County of Riverside receives, prior to such effective date, another properly executed original Certificate of Insurance and original copies of endorsements or certified original policies, including all endorsements and attachments thereto evidencing coverages set forth herein and the insurance required herein is in full force and effect. **CONTRACTOR shall not take possession, or use the Premises, or commence operations under this Agreement until the County of Riverside has been furnished original Certificate(s) of Insurance and certified original copies of Endorsements or policies of insurance including all Endorsements and any and all other attachments as required in this Section. The original Endorsements for each policy and the Certificate of Insurance shall be signed by an individual authorized by the insurance carrier to do so on its behalf.**
- c. It is understood and agreed to by the parties hereto and the insurance company(s), that the

Certificate(s) of Insurance and policies shall so covenant and shall be construed as primary, and the COUNTY'S insurance and/or deductibles and/or self-insured retentions or self-insured programs shall not be construed as contributory.

The County of Riverside's Reserved Rights-Insurance. The County of Riverside reserves the right to adjust the monetary limits of insurance coverage's during the term of this agreement or any extension thereof-if in the County Risk Manager's reasonable judgment, the amount or type of insurance carried by the CONTRACTOR becomes inadequate.

- d. CONTRACTOR shall pass down the insurance obligations contained herein to all tiers of sub-consultants working under this Agreement.

2.4 INDEMNITY AND HOLD HARMLESS

- 2.4.1 CONTRACTOR agrees to and shall indemnify and hold the COUNTY-its officers, employees and agents free and harmless from any and all claims, actions, damages and liabilities of whatsoever kind and nature arising from death, personal injury, property damage or other cause asserted or, based upon any negligent act or omission of CONTRACTOR, its employees, agents, invitees, or any subcontractor of CONTRACTOR relating to or in any way connected with the accomplishment of the work or performance of services under this Agreement, regardless of the existence or degree of fault or negligence on the part of the COUNTY or any officer or employee of said COUNTY, other than the sole active negligence or willful misconduct of COUNTY-its Directors and Officers, Special Districts, Board of Supervisors, elected officials, employees, agents or representatives. As part hereto of the foregoing indemnity CONTRACTOR agrees to protect and defend at its own expense, including attorneys' fees the COUNTY-its Directors and Officers, Special Districts, Board of Supervisors, elected officials, employees, agents or representatives from any and all legal action based upon any acts or omissions, as stated hereinabove, by any person or persons.
- 2.4.2 If any such claim, action, or proceeding is brought against County or County's officers, agents, employees, or independent contractors, Contractor, upon notice from County, shall defend the same at Contractor's expense by counsel satisfactory to County.
- 2.4.3 County shall promptly notify Contractor of any claim, action, or proceeding against County or County's officers, agents employees, independent contractors, and consultants relating to the performance, or omission to perform, any term or condition of this Contract. County shall cooperate fully in the defense of such claim, action, or proceeding.
- 2.4.4 County shall not be liable or responsible for any accident, loss or damage occurring to the Work prior to the completion and Acceptance of same, unless otherwise specifically agreed to at the time of occupancy by the County.

ARTICLE 3 SITE CONDITIONS

3.1 DIFFERING SITE CONDITIONS

- 3.1.1 The Contractor shall have reviewed and ascertained pertinent local conditions such as location, accessibility, and general character of the site and satisfy himself as to the conditions under which the Work is to be performed. No claim for allowances shall be made because of Contractor's error or negligence in acquainting himself with the conditions at the site.
- 3.1.2 The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by County. The Contractor shall promptly report in writing to County any errors,

inconsistencies, or omissions in the Contract Documents or inconsistencies with applicable code requirements observed by Contractor.

- 3.1.3 If Contractor performs any construction activity which it knows or should know involves an error, inconsistency, or omission without notifying and obtaining the written consent of County, Contractor shall be responsible for the resultant losses, including, without limitation, the costs of correcting defective work.
- 3.1.4 The County will furnish surveys necessary to properly locate the property and establish the boundaries thereof with general reference points as well as to enable the Contractor to proceed with the Work.
- 3.1.5 The Contractor shall provide competent engineering services to lay out the Work and all parts thereof and to establish all grades and elevations in accordance with the Contract requirements. He shall verify the figures shown on the survey and approach drawings before undertaking any construction work and shall be responsible for the accuracy of the finished work.
- 3.1.6 The Contractor shall protect and preserve established bench marks and monuments and shall make no changes in locations without the written approval of the County. Any bench marks or monuments that are lost or destroyed shall be replaced by the Contractor subsequent to notification and approval from County.

3.2 SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK

- 3.2.1 The Contractor acknowledges by submission of his/her bid that he has satisfied himself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including any exploratory work deemed necessary by the Contractor. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating the difficulty and cost of successfully performing the Work, or for proceeding to successfully perform the Work without additional expense to the County.

3.3 DIMENSIONS AND MEASUREMENTS

- 3.3.1 All dimensions shown for existing conditions and all dimensions required for work that is to connect with work now in place, shall be verified and calculated by the Contractor by actual measurement of the existing work. Any discrepancies between the Contract Documents and the existing conditions shall be referred to the authorized representative of the County before any work affected thereby has been performed. Failure to notify the County before starting work will be considered acceptance by the Contractor. Where doubts as to dimensions exist, County shall determine the correct dimensions.

ARTICLE 4 SPECIFICATIONS AND DRAWINGS

4.1 GENERAL PROVISIONS

4.1.1 SUBDIVISIONS

For convenience, the specifications are arranged into several sections, but such separation shall not be considered as the limits of the work required of any separate trade. The terms and conditions of such limitations are wholly between the Contractor and his subcontractors. Requirements contained in any section are required as if contained in all sections and are the responsibility of the Contractor. The Contractor, prior to awarding subcontracts, will assure the Work required as a whole has been coordinated among the subcontracts.

4.1.2 RECORD DOCUMENTS

- a. The Contractor shall keep on the Work site a copy of the awarded construction documents (drawings and specifications) and shall at all times give the County and Architect access thereto.
- b. The Contractor will be given one set of drawings and specifications which shall be kept at the site of the Work at all times and updated weekly. Payment may be withheld if drawings are not kept current. Exact locations of all pipes and conduits and all changes in construction and details shall be indicated and dimensions provided upon these drawings, and all changes in materials and equipment installed shall be indicated in these specifications. Upon completion and prior to Acceptance of the Work, a final reproducible (transparencies) set of project record documents and specifications shall be submitted to the County by the Contractor. County will furnish a set of reproducibles.
- c. The working details will indicate dimensions, position, and kind of construction, and the specifications, qualities, and methods. Any Work indicated on the working details and not mentioned in the specifications, or vice versa, shall be furnished as though fully set forth in both. Work not particularly detailed, marked, or specified shall be the same as similar work that is detailed, marked, or specified.
- d. In case of discrepancy in the documents, the matter shall be promptly submitted to the County, who shall make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The County shall furnish from time to time such detailed information as considered necessary to clarify the Work.
- e. Where the word "similar" occurs on the drawings, it shall have a general meaning and not be interpreted as meaning identical, and all details shall be worked out in relation to their location and their connection with other parts of the work.
- f. Standard details or specification drawings are applicable when listed, bound with specifications, noted on the drawings or referenced elsewhere in the specifications. Where the notes on the drawings indicate modifications, such modifications shall govern.
- g. All drawings, specifications and copies thereof furnished to the Contractor are the property of the County and shall not be used on other work without its consent. Upon completion of this project, all copies of the drawings and specifications shall be returned to the County.

4.2 SUMMARY OF THE ORDER OF THE PROCEDURE

4.2.1 In case of conflicts between the Contract Documents, the order of precedence shall be as follows:

- 1) Modifications or changes last in time are first in precedence.
- 2) Addenda.
- 3) County-Contractor agreement.
- 4) General Conditions except for specific modifications thereto stated in the Supplementary Conditions.
- 5) Supplementary Conditions.
- 6) Division One Specifications.
- 7) Division Two through Sixteen Specifications.
- 8) Drawings - as between figured dimensions given on drawings and the scaled measurements, the figured dimension shall govern; as between large-scale drawings and small-scale drawings, the larger scale shall govern.

- 9) Structural drawings
- 10) Architectural drawings.
- 11) As between detailed drawings and typical details bound within the specifications, the detailed drawings govern.
- 12) In the event provisions of codes, safety orders, contract documents, referenced manufacturer's specifications or industry standards are in conflict, the more restrictive and higher quality shall govern.
- 13) Schedules shown on the drawings take precedence over conflicting information given on other drawings.
- 14) Mechanical drawings.
- 15) Electrical drawings.

4.3 CLARIFICATIONS/REQUEST FOR INFORMATION AND ADDITIONAL INSTRUCTIONS

4.3.1 NOTIFICATION BY CONTRACTOR

- a. Should Contractor discover what he perceives to be conflicts, omissions, or errors in the Contract Documents, or have any question concerning interpretation or clarification of the Contract Documents, or if it appears that the work to be done or any matters relative thereto are not sufficiently detailed or explained in the Contract Documents, then, before proceeding with the work affected, Contractor shall notify County's authorized representative in writing, and request interpretation, clarification, or additional detailed information concerning the work. The Contractor shall ask for the clarification (Request for Information) immediately upon discovery but no less than 14 calendar days prior to the start date of the activities related to the clarification, based on the latest updated version of the accepted Progress Schedule. County, whose decision shall be final and conclusive, shall resolve such questions and issue instructions to Contractor. Should Contractor proceed with work affected before receipt of instructions from County, Contractor shall remove and replace or adjust work which is not in accordance with the instructions from County and shall be responsible for resultant damage, defect or added cost. In event of failure to agree as to scope of Contract requirements, Contractor shall follow the procedure set forth in the DISPUTES article.
- b. The Contractor shall not be entitled to any compensation for delays, disruptions, inefficiencies or additional administrative effort caused by the Contractor's untimely review of the Contract Documents for potential conflicts, omissions, discrepancies or ambiguities.
- c. County may charge back to the Contractor, time and expense associated with RFI's, as may be reasonably determined by the County to be unnecessary.

4.3.2 ADDITIONAL DETAILED INSTRUCTIONS

- a. The County may furnish additional detailed written instructions on any Request for Information to further explain the Work. If in the opinion of Contractor, the additional detailed instructions constitute work in excess of the scope of the Contract, he must submit written notice thereof immediately to the County, but no later than seven (7) calendar days following receipt of such instruction(s), and in any event prior to commencement of work thereon. The Contractor shall not be entitled to additional compensation due to any additional instructions unless the Contractor shall have given the appropriate written notice. County will then consider such notice and, if in its judgment it is justified, the County instructions will be revised or extra work shall be authorized by Change Order. In the event of a dispute hereunder, attention is directed to the DISPUTES article.

ARTICLE 5 SHOP DRAWINGS AND SUBMITTALS

5.1 SHOP DRAWINGS, PRODUCT DATA, COORDINATION DRAWINGS AND SCHEDULES

- 5.1.1 Shop drawings are drawings submitted to the County by the Contractor showing detail of the proposed fabrication and assembly of structural elements and the installation (i.e., form, fit, and attachment details) of materials or equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, fabrication, erection and setting drawings, manufacturers' scale drawings, wiring and control diagrams, cuts or entire catalogs, pamphlets, and performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the Work required by the Contract. The County may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this Contract.
- 5.1.2 The Contractor shall coordinate all shop drawings and review them for accuracy, completeness, and compliance with Contract requirements, and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the County without evidence of the Contractor's approval shall be returned for resubmission. The Architect will indicate review for compliance of the shop drawings, and if not in compliance as submitted, shall indicate the reasons therefore. Any work done before such review shall be at the Contractor's risk. Review by the Architect shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this Contract, except with respect to variations described and approved in accordance with paragraph 5.1.3.
- 5.1.3 If shop drawings show any variations from the Contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Architect approves any such variation, no change in time or price will be allowed for Contractor changes. Should the Architect make changes on the shop drawings which affect time and/or cost, the Contractor will immediately notify the County with a Request for Information. If the Contractor fails to issue the Request for Information within seven (7) calendar days from receipt of the returned shop drawing, the Contractor shall have waived his right to any potential Change Order.
- 5.1.4 The Contractor shall submit shop drawings, coordination drawings, and schedules for review as required by the Contract Documents. The Contractor will provide a submittal schedule listing all shop drawings and submittals, the submission dates by the Contractor, and return dates from the Architect. This schedule will be provided fourteen (14) calendar days after the Notice to Proceed.
- 5.1.5 Shop drawings and schedules, other than catalogs, pamphlets, and similar printed material, shall be submitted with one reproducible plus one copy.
- 5.1.6 Each shop drawing or coordination drawing shall have a blank area 4 by 4 inches located adjacent to the title block. The title block shall display the following:
- 1) Number and title of drawing
 - 2) Date of drawing or revision
 - 3) Name of project building or facility
 - 4) Name of Contractor and (if appropriate) name of subcontractor submitting drawings
 - 5) Clear identity of contents and location on the work
 - 6) Project title and project number
 - 7) Submittal number
- 5.1.7 Unless otherwise provided in this Contract or otherwise directed by County, shop drawings, coordination drawings, and schedules shall be submitted to the Architect with a letter, sufficiently in advance of construction requirements to permit no less than twenty (21) calendar days for checking and appropriate action.

5.2 SAMPLES

- 5.2.1 After the award of the Contract, the Contractor shall deliver samples required by the specifications to the County for approval. The Contractor shall prepay any shipping charges. Any materials or equipment for which samples are required shall not be used in the Work until reviewed by County.
- 5.2.2 Each sample shall have a label indicating:
- 1) Name of project building or facility, project title, and project number.
 - 2) Name of Contractor and, if appropriate, name of subcontractor.
 - 3) Identification of material or equipment with specification requirement.
 - 4) Place of origin.
 - 5) Name of manufacturer and brand (if any).
 - 6) Identify by specification section.
- 5.2.3 Samples of finished materials shall have additional markings that will identify them in reference to the finish schedules.
- 5.2.4 The Contractor shall mail a letter in triplicate under separate cover submitting each shipment of samples and containing the information required in paragraph 5.2.2. He shall enclose a copy of this letter with the shipment and send a copy to the County representative on the project. Approval of a sample shall be only for the characteristics or use named in such review and shall not be construed to change or modify any Contract requirement. Substitutions will not be permitted unless they are approved under paragraph 5.3.
- 5.2.5 Approved samples not destroyed in testing will be sent to the County. Approved samples of hardware in good condition will be marked for identification and may be used in the Work. Materials and equipment incorporated in the Work shall match the approved samples. Other samples not destroyed in testing or not approved will be returned to the Contractor at his expense if so requested at time of submission.
- 5.2.6 Failure of any material to pass the specified tests will be sufficient cause for refusal to consider any further samples of the same brand or make of that material or equipment under this Contract.
- 5.2.7 Samples of various materials or equipment delivered on the site or in place, may be taken by the County for testing. Samples failing to meet Contract requirements will automatically void previous approvals of the items tested. The Contractor shall replace such materials or equipment found not to have met Contract requirements, or there shall be a proper adjustment of the Contract price as determined by the County.
- 5.2.8 Unless otherwise specified, when tests are required, only one test of each sample proposed for use will be made at the expense of the County. Samples which do not meet specification requirements will be rejected. Requests for testing of additional samples by Contractor may be made by the County at the expense of the Contractor.

5.3 SUBSTITUTIONS

- 5.3.1 Wherever the name, or brand, or manufacturer of an article is specified in the Contract Documents, it is used as a measure of quality and utility or a standard. Except in those instances where the product is designated to match others presently in use, specifications calling for a designated material, product, thing or service by specific brand or trade name shall be deemed to be followed by the words "or equal" so that bidders may propose any equal material, product, thing or service in their bid. If the Contractor desires to use any other brand or manufacturer of equal quality and utility to that specified, he shall list definite particulars of that which he considers equivalent to the specified item in his bid. The Contractor shall have thirty-five (35) days after the

award of the Contract for submission of data substantiating substitution of "equal" items. The County will then determine whether or not the proposed name brand or article is equal in quality and utility to that specified in the Contract Documents, and its written decision shall be final.

- 5.3.2 No proposal will be considered unless accompanied by complete information and descriptive data necessary to determine the equality of the offered materials, articles, or equipment. Samples shall be provided when requested by the County.
- 5.3.3 The burden of proof as to the comparative quality or suitability of the offered materials, articles, or equipment shall be upon the Contractor. The County shall be the sole judge as to such matters. In the event that the County rejects the use of such alternative materials, articles, or equipment, then one of the particular products designated by brand name in the specifications shall be furnished.
- 5.3.4 The County will examine Contractor's submittals with reasonable promptness. Return of the submittals to the Contractor shall not relieve the Contractor from responsibility for deviations and alternatives from the Contract Documents nor shall it relieve him from responsibility for errors in the submittals. A failure by the Contractor to identify, in his letter of transmittal, material deviations from the Contract Documents shall void the submittal and any action taken thereon by the County. When specifically requested by the County, the Contractor shall resubmit such shop drawing(s), descriptive data, and samples as may be required.
- 5.3.5 If any mechanical, electrical, structural, or design revisions are required for the proper installation and fit of alternative materials, articles, or equipment, or because of deviations from the Contract Documents, such changes shall not be made without the consent of the County's authorized representative, and shall be made without additional cost to the County, such costs, including the fees of the Architect, to be borne by the Contractor.

ARTICLE 6 SCHEDULES

6.1 CONSTRUCTION SCHEDULE

- 6.1.1 The Contractor shall prepare and submit to the County a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the salient features of the work (including acquiring materials and equipment). The schedule shall be in the form of a CPM (critical path method) schedule, of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. The scheduled completion date shall be the same as the contractual completion date, for the initial schedule and subsequent updates. Any proposed early completion date shall show the difference between that date and the contract completion date as Float, which shall belong to both the County and Contractor.
- 6.1.2 If, in the opinion of the County, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress, without additional cost to the County. The Contractor shall submit any supplementary schedule or schedules in CPM form as the County deems necessary to demonstrate how the approved rate of progress will be regained.
- 6.1.3 All schedule updates must accurately reflect the as-built schedule. There shall be no change to the Critical Path without the County's written consent.

ARTICLE 7 TIME, LIQUIDATED DAMAGES AND EXTENSIONS

7.1 TIME OF WORK

The Contractor shall commence work on this project immediately upon receipt of the written Notice to Proceed and shall perform the work diligently to completion within the number of calendar days specified in the Contract. Neither site access nor physical work shall be commenced before the Contract is fully executed, and bonds, insurance and the schedule are submitted as required by the Contract Documents. No work shall be done on Saturday, Sunday and holidays and no work shall be performed outside of normal working hours without the prior written consent of the County, unless required by these Specifications. See: Working Hours.

7.2 LIQUIDATED DAMAGES

If the Work is not completed within the time required, damage will be sustained by the County. It is and will be impracticable and extremely difficult to ascertain and determine actual damage which County will sustain by reason of such delay; and it is therefore agreed that Contractor will pay to County the sum of \$500.00 per day for each and every day's delay in finishing the Work beyond the time prescribed. If the Contractor fails to pay such liquidated damages, the County may deduct the amount thereof from any money due or that may become due the Contractor under the Contract.

7.3 UNAVOIDABLE DELAYS

7.3.1 TIME EXTENSION

- a. The Contractor will be granted an extension of time for completion of the Work beyond that named in the Contract Documents, for delays which may result through causes beyond the control of the Contractor and which he could not have avoided by the exercise of care, prudence, foresight and diligence. The appropriate extension of time shall constitute full compensation. Costs associated with extended overhead will not be considered.
- b. If the Contractor is allowed extensions of time in which to complete the Work equal to the sum of all unavoidable delays, plus any adjustments of contract time due to contract change orders, during such extension of time liquidated damages shall not be charged to the Contractor.
- c. Unavoidable delays within the meaning of this section shall be those caused by Acts of God or of the public enemy, fire, epidemics, or strike. There will be no liquidated damages for delays as described within this paragraph.
- d. Delays in the performance of parts of the work which may in themselves be unavoidable, but do not necessarily prevent or delay the performance of critical activity(s) while the activity(s) is on the Critical Path, will not be considered as unavoidable delays within the meaning of the contract and shall not be the basis of a claim for delay.

7.3.2 WEATHER

Inclement weather shall not be a prima facie reason for granting a time extension. The Contractor shall make every effort to continue work under prevailing conditions. However, if the inclement weather prevents the Contractor from beginning at the usual starting time, or prevents the Contractor from proceeding with seventy-five percent (75%) of the normal labor and equipment force towards completion of the day's current Critical Path activities (shown on the most current, and accepted schedule update) for a period of at least five (5) hours, and the crew is dismissed as a result thereof, the County will designate such time as unavoidable delay and grant a one (1) calendar day, non-compensable, time extension.

7.3.3 NOTICE OF DELAYS

- a. Whenever the Contractor foresees any delay in the performance of a Critical Path work activity, and in any event immediately upon the occurrence of any delay which he regards as an unavoidable delay, the Contractor shall notify the County in writing of such delay and its cause, in order that the County may take immediate steps to prevent, if possible, the occurrence or continuance of the delay, and may determine whether the delay is to be considered avoidable or unavoidable, how long it continues, and to what extent the prosecution and completion of the work are to be delayed thereby.
- b. After the completion of any part or the whole of the Work, the County, in calculating the amount due the Contractor, will assume that any and all delays which have occurred have been avoidable delays, except such delays as shall have been called to the attention of the County at the time of their occurrence and found by the County to have been unavoidable as substantiated by a change order. The Contractor shall make no claims that any delay not called to the attention of the County at the time of its occurrence has been an unavoidable delay.

7.4 REQUEST FOR TIME EXTENSION

7.4.1 In the event the Contractor requests an extension of contract time for unavoidable delay, justification shall be submitted no later than seven (7) calendar days after the initial occurrence of any such delay. When requesting time for proposed change orders, the request(s) must be submitted with the proposed change order with full justification. If the Contractor fails to submit justification he shall waive his right to a time extension at a later date. Justification must be based on the currently accepted contract schedule as updated at the time of occurrence of delay or execution of work related to any change(s) in the scope of work. The justification must include a schedule, including, but not limited to, the following information:

- a. The duration to perform the activity relating to the change(s) in the work and the resources (manpower, equipment, material, etc.) required to perform these activities within the stated duration.
- b. Logical activity ties to the contract schedule for the proposed changes and/or delay showing the activity/activities in the schedule whose start or completion dates are affected by the change and/or delay.

7.4.2 The County, after receipt of such justification and supporting evidence, shall make its finding of fact. The County's decision shall be final and conclusive and the County will advise the Contractor in writing of such decision. If the County finds that the Contractor is entitled to any extension of Contract time, the County's determination as to the total number of days of extension shall be based upon the latest updated version of the approved contract schedule.

7.4.3 In the event the Contractor disagrees with the County's decision, the Contractor shall be required to submit a claim pursuant to the DISPUTE article.

ARTICLE 8 PERFORMANCE

8.1 SUPERVISION & CONSTRUCTION PROCEDURES

8.1.1 The Contractor shall supervise and direct the work. The Contractor shall be solely responsible for all

construction means, methods, techniques, sequences, procedures, project safety, and shall coordinate all portions of the Work under the Contract, including the relations of the various trades to the progress of the Work, in accordance with the provisions of the Contract Documents.

8.1.2 The Contractor shall be responsible to the County for the acts and omissions of the Contractor's employees, subcontractors, and their agents and employees, and any other persons performing any of the work under a contract with the Contractor.

8.1.3 The Contractor is an independent contractor and nothing in the Contract Documents shall be interpreted to make the Contractor an agent of the County.

8.2 SUPERVISION

8.2.1 Within seven (7) days after the Notice to Proceed, the Contractor shall provide to the County an organization chart outlining key job personnel. The Contractor will also provide a Letter of Authority or Corporate Resolution for the individual(s) authorized to sign documents on its behalf, i.e., payment requests, change orders, inspection reports, etc.

8.2.2 The Contractor shall employ, during the progress of the Work, a competent Project Superintendent and any necessary assistants, as approved by the County. The Project Superintendent shall not be changed except with the consent of the Authorized Representative of County, unless the Superintendent proves to be unsatisfactory to the Contractor or ceases to be in his employ. The County shall be notified immediately of any new Superintendent appointed to the Work and the Contractor shall submit qualifications for approval. The Superintendent shall represent the Contractor and all directions given to him shall be as binding as if given to the Contractor.

8.2.3 The County shall be supplied at all times with the name and telephone number of a person in charge of or responsible for the Work, who can be reached for emergency work twenty-four (24) hours a day, seven (7) days a week.

8.3 CONDUCT OF WORK

8.3.1 In connecting one kind of work with another, marring or damaging same will not be permitted and, in the event such occurs, shall be corrected by the Contractor at its cost prior to acceptance by the County. Should improper work of any trade be covered by another which results in damage or defects, the whole work affected shall be made good by the Contractor without expense to County.

8.4 PROTECTION OF WORK & PROPERTY

8.4.1 The Contractor shall continuously maintain adequate protection of the Work from damage and shall protect the County's property from injury or loss in connection with this Contract. He shall make good any such damage, injury, or loss, except what may be directly due to errors in the Contract Documents or caused by agents or employees of the County. He shall adequately protect adjacent property as provided by law and the Contract Documents.

8.4.2 The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the Work site which are not to be removed and which do not unreasonably interfere with the work required under this Contract.

8.4.3 The Contractor shall protect from damage all existing improvements and utilities at or near the Work site and on adjacent property of a third party, the locations of which are made known to or should be known by the

Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this Contract or failure to exercise reasonable care in performing the Work. If the Contractor fails to repair the damage promptly, the County may have the necessary work performed and charge the cost to the Contractor.

8.5 CONTRACTOR'S RESPONSIBILITY FOR WORK

8.5.1 Until Acceptance of the Work by the County, Contractor shall have the charge and care thereof and shall bear risk of injury or damage to any part of the Work by action of the elements. If a separate Contractor sues the Owner, on account of any loss so sustained, the County shall notify the Contractor, who shall indemnify and hold harmless the County against any expenses, or judgment arising therefrom.

8.5.2 Contractor, at its cost, shall rebuild, repair, restore and make good all damages from the elements to any portion of the Work occasioned by such causes before its Acceptance.

8.5.3 No advertising of any description will be permitted in or about the Work, except by order of the County.

8.5.4 Contractor shall not create or permit the continued existence of any nuisance in or about the Work.

8.6 UTILITIES

8.6.1 Unless otherwise provided for under separate sections herein, Contractor will arrange all water, gas, and electricity required for construction purposes until acceptance of the Work. Contractor shall pay for such services unless otherwise specifically noted.

8.6.2 Utilities shall not be interrupted except with the approval of the County. A two (2) work day written notice is required prior to any and all interruptions. Interruptions shall be scheduled so as to minimize duration and disruption to existing operations.

- 8.6.3**
- a. The Contractor shall send notices, make all necessary arrangements, and perform all other services required in the care and maintenance of all public utilities.
 - b. Enclosing or boxing in, for protection of any public utility equipment, shall be done by the Contractor. Upon completion of the Work, the Contractor shall remove all enclosures, and leave in a finished condition.
 - c. All connections to public utilities shall be made and maintained in a manner so as not to interfere with the continuing use of same by the County during the entire progress of the Work.

8.7 WORKING HOURS

8.7.1 All work shall be performed on a calendar day basis during the customary working hours of the trades involved unless otherwise specified in this Contract. Work performed by the Contractor of his own volition outside such established working hours shall be at no additional expense to the County and without County approval.

8.7.2 It is expressly stipulated that no laborer, workman, or mechanic employed at any time by the Contractor or by any subcontractor(s) under this Contract upon the Work or any part thereof, shall be required or permitted to work thereon more than eight (8) hours during any one calendar day and forty (40) hours during any one calendar week, except, as provided by Section 1815 of the California Labor Code. It is further expressly stipulated that for each and every violation of Sections 1811-1815, inclusive, of the California Labor Code, all

the provisions of which are deemed to be incorporated herein, said contractor shall forfeit, as a penalty to County, twenty-five dollars (\$25.00) for each laborer, workman, or mechanic employed in the execution of this Contract by contractor for each calendar day during which said laborer, workman, or mechanic is required or permitted to work more than eight hours in any one calendar day and forty hours in any one calendar week in violation of the provisions of said Sections of the Labor Code.

8.7.3 The Contractor, and each subcontractor, shall keep an accurate record showing the names of and actual hours worked each calendar day and each calendar week by all laborers, workmen, and mechanics employed by them in connection with the Work contemplated by this Contract, which record shall be open at all reasonable hours to the inspection of the County or its officers or agents and to the Division of Labor Standards Enforcement of the Department of Industrial Relations.

8.7.4 No construction work shall be done on Saturdays, Sundays or County holidays and no work shall be performed outside of normal working hours without the prior written consent of the County. In any event, all work shall be subject to approval of the County. Prior to start of such work, the Contractor shall arrange with the County for the continuous or periodic inspection of the Work and testing of materials, when necessary. If requests are made by the Contractor for permission to work overtime, nights, Saturdays, Sundays or County holidays, and such requests are granted, the Contractor shall bear all extra expense to the County for inspection and other incidental expenses caused by such overtime work. If contractors are requested, in the interest of the County, to work overtime by the County, or if overtime work is specifically required by these specifications, all extra expense of inspection will be paid by the County.

8.8 MATERIAL & EQUIPMENT

8.8.1 Materials, equipment, and articles incorporated into the Work shall be new and of equal quality to the types and grades specified. When not particularly specified, the Contractor shall submit for approval satisfactory evidence as to the kind and quality of material. See SUBSTITUTION provision 5.3 concerning "or equal" requirements and procedure for submitting alternative material, articles, or equipment.

8.8.2 All materials shall be delivered so as to insure a speedy and uninterrupted progress of the Work. All materials shall be stored so as to cause no obstruction and so as to prevent overloading of any portion of the structure on the Work site, and the Contractor shall be entirely responsible for damage or loss by weather, theft, vandalism, or other cause.

8.8.3 Materials shall be stored to assure the preservation of their quality and fitness for the Work. Stored materials shall be reasonably accessible for inspection. When considered necessary by the County, stored materials shall be placed on wooden platforms or on other hard, clean surfaces and not directly on the ground, and shall be placed under cover when so directed.

8.9 LAYOUT OF WORK

8.9.1 The Contractor shall lay out its work from established base lines and bench marks indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, material, and labor required to lay out any part of the Work. The Contractor shall be responsible for executing the Work to the lines and grades that may be established or indicated in the Contract Documents. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the County until authorized to remove them. If such marks are destroyed by the Contractor before their removal is authorized, the County may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

8.10 USE OF PREMISES

8.10.1 The Contractor shall maintain the entire premises under his control in an orderly condition. He shall store his apparatus, materials, supplies and equipment in such a manner as will not interfere with the progress of his work or the work of other contractors.

8.11 OPERATIONS & STORAGE

8.11.1 The Contractor shall confine all operations (including storage of materials) on County premises to areas authorized or approved by the County.

8.11.2 Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the County and shall be built with labor and materials furnished by the Contractor without expense to the County. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at his expense upon completion of the work.

8.11.3 The Contractor shall, under regulations prescribed by the authority having jurisdiction, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the authority having jurisdiction. When materials are transported in performance of the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or County regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair, or pay for the repair, of any damaged curbs, sidewalks, or roads.

8.12 HEAT/POWER/LIGHT

8.12.1 Unless otherwise specified or already provided by the County, the Contractor shall:

- a. Provide heat, as necessary to protect all work, materials, and equipment against injury from dampness and cold;
- b. Provide heat as necessary in the area where work is to be done to provide the minimum temperature recommended by the supplier or manufacturer of the material;
- c. Provide electric power and light as required for performance of the Work.

8.13 CLEANING UP

8.13.1 The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. Before completing the Work, the Contractor shall remove from the work and premises any weeds, rubbish, tools, scaffolding, equipment, and materials that are not the property of the County. Upon completing the Work, the Contractor shall leave the work area in a clean, neat, and orderly condition satisfactory to the County.

ARTICLE 9 SAFETY & HEALTH

9.1 ACCIDENT PREVENTION

9.1.1 In performing this Contract, the Contractor shall provide for protecting the lives and health of employees and other persons; preventing damage to property, materials, supplies, and equipment; and avoiding work interruptions. For these purposes, the Contractor shall:

- a. Provide a copy of its safety program;

- b. Provide appropriate safety barricades, signs, and signal lights;
- c. Comply with standards issued by the U.S. Government, State, County and City, and other governing agencies having jurisdiction;
- d. Ensure that any additional measures the County determines to be reasonably necessary for this purpose are taken.

9.1.2 The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this Contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment. The Contractor shall report this data in the manner prescribed by the County.

9.1.3 Before beginning excavation for a trench 5 feet or more in depth, Contractor shall provide evidence of having obtained a permit from the authority having jurisdiction.

9.1.4 Nothing herein shall be deemed to allow use of shoring, sloping, or protective systems less effective than those required by the Construction Safety Orders of the California Division of Industrial Safety.

9.2 SANITARY FACILITIES

9.2.1 Contractor shall supply and maintain at its expense such toilets and other sanitary facilities including those which are accessible by the disabled as per ADA and Title 24 requirements necessary for use by visitors and workers employed at the job site. Such facilities shall be approved by the County.

9.3 RESPONSIBILITY FOR COMPLIANCE WITH CAL-OSHA

9.3.1 All work, materials, work safety procedures and equipment shall be in full accordance with the latest Cal-OSHA rules and regulations.

9.3.2 Contractor warrants that he and each of his subcontractors shall, in performance of this Contract, comply with each and every compliance order issued pursuant to Cal-OSHA. The Contractor assumes full and total responsibility for compliance with Cal-OSHA standards by his subcontractors as well as himself. The cost of complying with any order and/or payment of any penalty assessed pursuant to Cal-OSHA shall be borne by the Contractor. Nothing contained therein shall be deemed to prevent the Contractor and his subcontractors from otherwise allocating between themselves responsibility for compliance with Cal-OSHA requirements; provided, however, that the Contractor shall not thereby, in any manner whatsoever, be relieved of his responsibility to the County as herein set forth.

9.4 TOXIC AND HAZARDOUS MATERIALS AND WASTE

9.4.1 ASBESTOS

Operations which may cause release of asbestos fibers into the atmosphere shall meet the requirements of Title 8 CCR General Industrial Safety Orders, Section 5208 and California law. Some operations which may cause such concentrations include sanding, grinding, abrasive blasting, sawing, drilling, shoveling, or otherwise handling materials containing asbestos so that dust will be raised.

9.4.2 TOXIC MATERIALS

Operations which release toxic materials into the atmosphere shall meet the requirements of Title 8 CCR.

General Industrial Safety Orders. Some operations which may release such materials include use of adhesives, sealants, paint, and other coatings.

9.4.3 LEAD-BASED PAINT

Lead-based paint is prohibited. Lead-based paint is defined as:

- a. Any paint containing more than five-tenths of one percentum lead by weight (calculated as lead metal in the total non-volatile content of the paint) or the equivalent measure of lead in the dried film of paint applied or both; or
- b. For paint manufactured after June 22, 1977, any paint containing more than six one-hundredths of one percentum lead by weight (calculated as lead metal) in the total content of the paint or the equivalent measure of lead in the dried film or paint already applied.

9.4.4 HAULING AND DISPOSAL

All hauling and disposal shall meet requirements of Title 22 CCR, Division 4. Chapter 30, "Minimum Standards for Management of Hazardous and Extremely Hazardous Wastes."

9.4.5 ASBESTOS PROHIBITED

No products or materials containing asbestos shall be incorporated into the Work without the prior written approval of the County.

ARTICLE 10 COUNTY-FURNISHED PROPERTY

10.1 COUNTY-FURNISHED PROPERTY

- 10.1.1 The County may furnish to the Contractor property as identified in the specification(s) to be incorporated or installed into the Work or used in performing the Contract. The listed property will be furnished f.o.b. railroad cars at the place specified in the Contract or f.o.b. truck at the project site. The Contractor is required to accept delivery. When the property is delivered, the Contractor shall verify its quantity and condition and acknowledge receipt in writing to the County within twenty-four (24) hours of delivery, also specifying any damage to or shortage of the property as received. All such property shall be installed or incorporated into the Work at the expense of the Contractor, unless otherwise indicated in this Contract.
- 10.1.2 Each item of property to be furnished under this clause shall be identified by the Contractor in a schedule by quantity, item, and description. Schedule form will be provided by the County.
- 10.1.3 The Contractor shall be held responsible for all material delivered to him and deductions will be made from any moneys due him to make good any shortages and deficiencies, from any cause whatsoever, which may occur after such delivery.
- 10.1.4 The Contractor shall set up accounting records and establish an inspection procedure as approved by the County.

ARTICLE 11 BENEFICIAL OCCUPANCY

11.1 BENEFICIAL OCCUPANCY

- 11.1.1 The County shall have the right to take possession of or use any completed or partially completed portion of the Work. The County's possession or use shall not be deemed an acceptance of any Work under the Contract. The Contractor will continue to pay for any portion of the utilities which he is using.
- 11.1.2 While the County has such possession or use, the Contractor shall be relieved of the responsibility for the loss of or damage to that portion of the Work resulting from the County's possession or use. If Contractor believes the partial possession or use by the County will delay the progress of the Work or will cause additional expense to the Contractor, Contractor shall immediately submit a written request for an equitable adjustment in the Contract price or the time of completion. County will then consider such request and, if in its judgment it is justified, the County will modify the contract in writing accordingly. In the event the Contractor disagrees with the County's decision, the Contractor shall be required to submit a claim pursuant to the DISPUTE article.

ARTICLE 12 INSPECTION AND TESTING

12.1 INSPECTION AND TESTING

- 12.1.1 The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work called for by this Contract conforms to contract requirements. The Contractor shall maintain complete inspection records and make them available to the County. The County shall at all times have access to the Work, and the Contractor shall provide proper facilities for such access and for inspection.
- 12.1.2 County inspections and tests are for the sole benefit of the County and do not:
- a. Relieve the Contractor of responsibility for providing adequate quality control measures;
 - b. Relieve the Contractor of responsibility for damage to or loss of the material before Acceptance;
 - c. Constitute or imply Acceptance; or
 - d. Affect the continuing rights of the County after Acceptance regarding latent defects, gross mistakes, fraud or the County's rights under any warranty or guarantee.
- 12.1.3 The presence or absence of a County inspector does not relieve the Contractor from any Contract requirement, nor is the inspector authorized to change any term or condition of the specifications without the County's written authorization.
- 12.1.4 The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the County. The County may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. Special, full size, and performance tests shall be performed as described in the Contract.
- 12.1.5 The Contractor shall, without charge, replace or correct work found by the County not to conform to contract requirements, unless in the public interest the County consents to accept the work with an appropriate adjustment in Contract price. The Contractor shall promptly segregate and remove rejected material from the premises.
- 12.1.6 If, before Acceptance of the Work, the County decides to examine already completed work by removing it or tearing it out, the Contractor, on request, shall promptly furnish all necessary facilities, labor, and material. If

the work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray the expenses of the examination and of satisfactory reconstruction. However, if the work is found to meet Contract requirements, the County shall issue a Change Order for such removal and reinstallation.

- 12.1.7 The Contractor shall at all times maintain proper facilities and provide safe access for inspection by the County to all parts of the work, and to the shops wherein the work is in preparation. Where the specifications require work to be specially tested or approved, it shall not be tested or covered up without timely notice to the County of its readiness for inspection and without the approval or consent of County. Should any such work be covered up without such notice, approval, or consent, it must, if required by County, be uncovered for examination at the Contractor's expense.
- 12.1.8 The Contractor shall notify the County at least one (1) work day in advance of the time scheduled for the inspection. Should the Contractor fail to notify the County and proceed with work requiring inspection, all such work is rejected, and no further work shall be done on that portion of the project until the rejected work is accepted by the County. Should the Contractor request acceptance of such rejected work the County shall, at the Contractor's expense, secure the services of private material testing laboratories, consulting engineers or licensed land surveyors, who shall certify that said work does in fact conform to the requirements of the Contract Documents. The work previously rejected shall be accepted by the County after receipt of such certification if the County approves of such certification.
- 12.1.9 If the Contractor does not promptly replace or correct rejected work, the County may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor or (2) terminate for default the Contractor's right to proceed.
- 12.1.10 Construction review of the Contractor's performance by the County is not intended to include the review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- 12.1.11 The County will pay for initial testing services specified to be performed by the County. When initial tests indicate non-compliance with the Contract Documents, subsequent retesting occasioned by the non-compliance shall be performed by the same testing agency, and costs thereof will be deducted by the County from the Contract sum.

12.2 INSPECTION BY OTHER JURISDICTIONS

Whenever any part of the Work to be performed is under the jurisdiction or control of another public entity, including but not limited to: The United States Government, State of California, or City, such work shall be subject to inspection by the officials of such entities and it must pass inspection, in addition to County inspection, and such other inspections as may otherwise be provided for in the Contract Documents.

12.3 FINAL INSPECTION AND TESTS

The Contractor shall give the County at least ten (10) calendar days advance written notice of the date the Work will be fully completed and ready for final inspection and tests. Final inspection and tests will be started within ten (10) calendar days from the date specified in the aforementioned notice unless the County determines that the Work is not ready for final inspection and so informs the Contractor.

ARTICLE 13 ACCEPTANCE

13.1 ACCEPTANCE OF THE WORK

- 13.1.1 After the final inspection by County and all the contract documentation has been received, it will be recommended to the County Board of Supervisors to accept the Work and file a Notice of Completion. Upon approval of the Notice of Completion, a copy will be sent to the Contractor. (See final payment clause.) Upon Acceptance of the Work, Contractor will be relieved of the duty of maintaining and protecting the Work. Neither determination by the County that the Work is complete, nor Acceptance thereof, shall operate as a bar to County's claim against Contractor pursuant to Contractor's warranty and guarantees.
- 13.1.2 Partial payments shall not be construed as acceptance of any part of the Work.
- 13.1.3 In judging the Work, no allowance for deviations from the drawings and specifications will be made, unless already approved in writing at the time and in the manner as called for herein.
- 13.1.4 County shall be given adequate opportunity to make any necessary arrangements for fire insurance and extended coverage.
- 13.1.5 The Acceptance of the Work will not be recommended until all requirements of the Contract Documents are complete and approved by the County. This shall include, but is not limited to, all construction, guarantee forms, parts lists, schedules, tests, operating instructions, as-built drawings, and all other documentation identified by the Contract Documents.

ARTICLE 14 **WARRANTY AND GUARANTEES**

14.1 **CONTRACTOR'S WARRANTY AND GUARANTEE**

- 14.1.1 Contractor warrants that all materials and equipment furnished under this Contract shall be new unless otherwise specified, and that all Work performed under this Contract conforms to the Contract requirements and is free of any defect whether performed by the Contractor or any subcontractor or supplier.
- 14.1.2 This warranty shall continue for a period of one (1) year from the date of filing of Notice of Completion on the Work. The Performance Bond shall remain in force during the warranty period.
- 14.1.3 The Contractor shall remedy at the Contractor's expense any damage to County-owned or controlled real or personal property, when that damage is the result of:
- a. The Contractor's failure to conform to Contract requirements or
 - b. Any defect of equipment, material, workmanship, or design furnished by the Contractor.
- 14.1.4 The Contractor shall restore any work damaged in fulfilling the terms and conditions of this Article. The Contractor's warranty with respect to work repaired or replaced will run for one (1) year from the date of repair or replacement.
- 14.1.5 The County shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage. The Contractor shall within ten (10) calendar days after being notified in writing by the County of any work not in accordance with the requirements of the Contract or any defects in the Work, commence, and perform with due diligence, all work necessary to fulfill the terms of this Article. If the Contractor fails to remedy any defect, or damage within fourteen (14) calendar days after receipt of notice, the County shall have the right to replace, repair, or otherwise remedy the defect, or damage at the Contractor's expense. Payment due to the Architect from the County for extra architectural services required in the enforcement of Contractor's guarantee after Acceptance of the Work shall be paid to the County by the Contractor.

14.1.6 In the event of any emergency constituting an immediate hazard to health or safety of County employees, property, or licensees, when caused by work of the Contractor that is not in accordance with the Contract requirements, the County may undertake at Contractor's expense and without prior notice, all work necessary to correct such hazardous condition(s).

14.1.7 With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this Contract, the Contractor shall:

- a. Obtain all warranties that would be given in normal commercial practice;
- b. Require all warranties to be executed, in writing, for the benefit of the County, unless directed otherwise by the County; and
- c. Enforce all warranties for the benefit of the County, unless otherwise directed by the County.

14.1.8 This warranty shall not limit the County's rights under the Inspection and Acceptance section(s) of this Contract with respect to latent defects, gross mistakes, or fraud.

ARTICLE 15 ENVIRONMENTAL PROTECTION

15.1 DUST CONTROL

15.1.1 The Contractor shall provide any and all dust control required.

15.1.2 Whenever the Contractor is negligent in providing dust control, the County shall order the Contractor to provide such dust control. If the Contractor does not comply promptly with such order, the County shall have the authority to provide such dust control and charge the Contractor therefore by deducting the cost from progress payments to the Contractor as such costs are incurred by the County. The County shall not be held responsible for schedule delays due to actions taken by County to mitigate the failure of the Contractor in providing dust control.

15.2 EXCESSIVE NOISE

15.2.1 The Contractor shall use only such equipment on the Work and in such state of repair, that the emission of sound therefrom is within the noise tolerance level of that equipment as established by CAL-OSHA.

15.2.2 Should the County determine that the muffling device on any equipment used on the Work is ineffective or defective so that the noise tolerance of such equipment is exceeded, such equipment shall not, after such determination by the County, be used on the Work until its muffling device is repaired or replaced so as to bring the noise tolerance level of such equipment within such standards.

15.3 POLLUTION CONTROL, CLEANING

15.3.1 The Contractor shall not, in connection with the Work, discharge any smoke, dust, or other contaminants into the atmosphere which are in violation of South Coast Air Quality Management District standards or discharge any fluids or materials into any lake, river, stream, or channel as will violate regulations of State of California Water Resources Board. The Contractor shall control accumulation of waste materials and rubbish and dispose of waste materials and rubbish off-site at a minimum of weekly intervals. Burning of materials is not permitted.

ARTICLE 16 EMPLOYMENT PRACTICES

16.1 QUALIFICATIONS FOR EMPLOYMENT AND APPRENTICESHIP STANDARDS

16.1.1 In accordance with Section 1735 of the California Labor Code, no person under the age of 16 years and no person currently serving sentence in a penal or correctional institution shall be employed to perform any Work under this Contract. No person whose age or physical condition is such as to make his employment dangerous to his health or safety or to the health or safety of others shall be employed to perform Work under this Contract; provided that this requirement shall not operate against any physically handicapped persons otherwise employable where such persons may be safely assigned to Work which they ably perform.

16.1.2 This contract is subject to the provisions of Sections 1777.5 and 1777.6 of the California Labor Code concerning the employment of apprentices by the Contractor or any subcontractor under him. Section 1777.5 as amended, requires the Contractor or subcontractor employing tradesmen in any apprenticeable occupation to apply to the Joint Apprenticeship Committee nearest the site of this project and which administers the apprenticeship program in that trade for a certificate of approval. The certificate will also fix the ratio of apprentices to journeymen that will be used in the performance of the Contract.

16.1.3 The Contractor is required to make contributions to funds established for the administration of apprenticeship programs if he employs registered apprentices or journeymen in any apprenticeable trade on such contracts and if other contractors on the public works site are making contributions.

16.1.4 All employees engaged in work on the project under this Contract shall have the right to organize and bargain collectively through representatives of their own choosing, and such employees shall be free from interference, restraint, and coercion of employers in the designation of such employees for the purpose of collective bargaining or other mutual aid or protection, and no person seeking employment under this Contract shall be required as a condition of initial or continued employment to join any company, union, or to refrain from joining, organizing, or assisting a labor organization of such person's own choosing. No person in the employment of the County shall be employed by this contractor.

16.2 WAGES & RECORDS

16.2.1 WAGE RATES

- a. Pursuant to Section 1770 and 1773 et seq. of the Labor Code of the State of California, the Director of Industrial Relations has ascertained the general prevailing rate of per diem wages and the rates for overtime and holiday work in the locality in which the work is to be performed for each craft, classification, or type of workman needed to execute the contract which will be awarded to the successful bidder, copies of which are on file and available upon request at the Clerk of the Board, Board of Supervisors, 4080 Lemon St., 14th Floor, Riverside, CA 92501-3655, and shall be posted at the job site.
- b. It shall be mandatory upon the Contractor and upon any subcontractor under him, to pay not less than the said specified rates to all laborers, workmen, and mechanics employed in the execution of the Contract. It is further expressly stipulated that the Contractor shall, as a penalty to County, forfeit twenty-five dollars (\$25.00) for each calendar day, or portion thereof, for each laborer, workman, or mechanic paid less than the stipulated prevailing rates for any work done under this Contract by him or by any subcontractor under him; and Contractor agrees to comply with all provisions of Section 1770 et. seq. of the Labor Code.
- c. In case it becomes necessary for the Contractor or any sub-contractor to employ on the

project under this Contract any person in a trade or occupation (except executives, supervisory, administrative, clerical, or other non-manual workers as such) for which no minimum wage rate is herein specified, the Contractor shall immediately notify the County who will promptly thereafter determine the prevailing rate for such additional trade or occupation and shall furnish the Contractor with the minimum rate based thereon. The minimum rate thus furnished shall be applicable as a minimum for such trade or occupation from the time of the initial employment of the person affected and during the continuance of such employment.

- d. The County will not recognize any claim for additional compensation because of the payment by the Contractor of any wage rate in excess of the prevailing wage rate set forth as provided herein. The possibility of wage increases is one of the elements to be considered by the Contractor in determining his bid, and will not under any circumstances be considered as the basis of a claim against the County on the Contract.

16.2.2 WAGE RECORDS

- a. The Contractor and each subcontractor shall keep or cause to be kept an accurate record (certified payroll) showing the names and occupations of all laborers, workers, and mechanics employed by him in connection with the execution of this Contract or any subcontract thereunder. The record shall show the actual per diem wages paid to each of said workers, which records shall be provided to the County, and to the Division of Labor Standards Enforcement upon its request. Copies provided will include one which has the name and social security numbers marked out.

16.3 NOTICE OF LABOR DISPUTES

16.3.1 If the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this Contract, the Contractor shall immediately give notice, including all relevant information, to the County.

16.3.2 The Contractor agrees to insert the substance of this clause, including this paragraph into any subcontract in which a labor dispute may delay the timely performance of this Contract; except that each subcontract shall provide that in the event its timely performance is delayed or threatened by delay by any actual or potential labor dispute, the subcontractor shall immediately notify the next higher tier subcontractor or the prime Contractor, as the case may be, of all relevant information concerning the dispute.

16.4 NONDISCRIMINATION

16.4.1 EQUAL EMPLOYMENT OPPORTUNITY

- a. Contractor agrees for the duration of this Contract that it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, age, political affiliation, marital status, or handicap. The Contractor will take affirmative action to insure that employees are treated during employment or training without regard to their race, color, religion, sex, national origin, age, political affiliation, marital status, or handicap. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the

provisions of this nondiscrimination clause.

- b. The Contractor will in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, age, political affiliation, marital status, or handicap.
- c. The Contractor will send to each labor union or other representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice advising the workers' representative of the Contractor commitments under this agreement.
- d. The Contractor agrees that it will comply with the provisions of Titles VI and VII of the Civil Rights Act, Revenue Sharing Act Title 31, U.S. Code Section 2716, and California Government Code Section 12990.
- e. The Contractor agrees that it will assist and cooperate with the County, the State of California and the United States Government in obtaining compliance with the equal opportunity clause, rules, regulations, and relevant orders of the State of California and United States Government issued pursuant to the Acts.
- f. In the event of the Contractor's non-compliance with the discrimination clause, the affirmative action plan of this contract, or with any of the said rules, regulations or orders, this Contract may be canceled, terminated, or suspended in whole or in part by the County.

16.4.2 HANDICAPPED NON-DISCRIMINATION

This project is subject to Section 504 of the Rehabilitation Act of 1973 as amended, (29 U.S.C. 794), and the Americans with Disabilities Act of 1990, as amended, and all requirements imposed by the guidelines and interpretations issued thereto. In this regard, the County and all of its contractors and subcontractors will take all reasonable steps to ensure that handicapped individuals have the maximum opportunity for the same level of aid, benefit or service as any other individual.

16.4.3 FAIR EMPLOYMENT AND HOUSING ACT ADDENDUM

In the performance of this Contract, the Contractor will not discriminate against any employee or Applicant for employment because of race, sex, color, religion, ancestry, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, sex, color, religion, ancestry, or national origin. Such action shall include, but not limited to, the following: employment, upgrading, promotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor shall post in conspicuous places, available to employees and applicants for employment, notices to be provided by the State or local agency setting forth the provisions of this Fair Employment and Housing Section.

16.4.4 ACCESS TO RECORDS

The Contractor will permit access to his records of employment, employment advertisements, application forms, and other pertinent data and records by the State Fair Employment and Housing Commission, or any other agency of the State of California designated by the awarding authority, for the purposes of investigation to ascertain compliance with the Fair Employment and Housing section of this Contract.

16.4.5 REMEDIES FOR WILLFUL VIOLATION

The State or local agency may determine a willful violation of the Fair Employment and Housing provision to have occurred upon receipt of a final judgment having that effect from a court in an action to which Contractor was a party, or upon receipt of a written notice from the Fair Employment and Housing Commission that it has investigated and determined that the Contractor has violated the Fair Employment and Housing Act and has issued an order or obtained an injunction under Government Code Sections 12900, et seq.

ARTICLE 17 SUBCONTRACTING

17.1 SUBCONTRACTORS

17.1.1 A subcontractor is an individual, firm or corporation having a direct contract with the Contractor or with any other subcontractor for the performance of a part of the Work. In accordance with Section 4104 of the Public Contract Code, each Contractor, in his bid, shall include the name and location of each subcontractor who will perform work or labor, or render services to the Contractor in or about the Work in an amount in excess of one half of 1% of the Contractor's total bid.

17.1.2 The County reserves the right to approve all subcontractors. Such approval shall be a consideration to the awarding of the Contract and unless notification to the contrary is given to the Contractor prior to the signing of the Contract, the list of subcontractors which is submitted with his proposal will be deemed to be acceptable.

17.1.3 The Contractor shall be as fully responsible to the County for the acts and omissions of his subcontractors and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

17.1.4 Nothing contained in the Contract Documents shall create any contractual relationship between any subcontractor and the County.

17.1.5 The divisions or sections of the specifications are not intended to control the Contractor in dividing the Work among subcontractors or to limit the work performed by any trade.

17.2 RELATIONS OF CONTRACTOR AND SUBCONTRACTOR

17.2.1 The Contractor agrees to bind every subcontractor by the terms of the Contract with the County, the General Conditions, Supplementary Conditions, and the drawings and specifications as far as applicable to his work, unless specifically noted to the contrary in a subcontract approved in writing as adequate by the County.

17.3 SUBCONTRACTS

17.3.1 Pursuant to the provisions of Sections 4100 to 4114 of the California Public Contract Code, inclusive, the Contractor shall not, without the consent of the County, either:

- a. Substitute any persons as subcontractors in place of the subcontractors designated in his original bid without the consent of County. (The County's consent can only be given in cases permitted by Public Contract Code Section 4107.)
- b. Permit any subcontract to be assigned or transferred or allow any work to be performed by anyone other than the original subcontractor listed in his bid.

- c. Sublet or subcontract any portion of the work in excess of one-half of one percent of his bid to which his original bid did not designate a subcontractor.

Should the Contractor violate any of the provisions of Sections 4100 to 4114, inclusive, of the Public Contract Code, his so doing shall be deemed a violation of this Contract, and the County may either cancel the contract, or assess the Contractor a penalty in the amount of not more than ten (10) percent of the amount of the subcontract involved, or both.

ARTICLE 18 TAXES

18.1 SALES AND PAYROLL TAXES

- 18.1.1 Each Contractor, subcontractor, and material dealer shall include in their bid all applicable taxes including but not limited to sales tax and payroll taxes required by law.

ARTICLE 19 CHANGES

19.1 CHANGE ORDER WORK

- 19.1.1 The County reserves the right to make changes in the work without impairing the validity of the Contract. The County may make changes to the work, or suspend the work, and all such changes or suspension are within the contemplation of the parties and will not be a basis for compensable delay. Such changes may be made in accordance with any of the following methods:

- a. By written change order to the Contract ordered by the Board of Supervisors.
- b. By written change order, signed by the Assistant County Executive Officer/EDA, in the manner and amounts specified by Board Policy B-11.
- c. By written authorization, issued by the Assistant County Executive Officer/EDA, for items of work done under unit prices. The cost or credit for such added or omitted work shall be determined by multiplying the number of units added to or omitted from the work by the applicable unit price.

- 19.1.2 Upon receipt of a proposed Change Order from County, the Contractor shall submit a proposal in accordance with the requirements and limitations set forth in this "Change Orders" article, for work involved in the contemplated change.

- 19.1.3 The Contractor must submit a cost proposal within fifteen (15) calendar days after receipt of the proposed change order. The Contractor must submit cost proposals in less than fifteen (15) calendar days if requested by the County or if required by schedule limitations.

- 19.1.4 If the Contractor fails to submit the cost proposal within the 15-day period (or as requested), the County has the right to order the Contractor in writing to commence the work immediately on a force account basis and/or issue a lump sum change to the contract price in accordance with the County's estimate of cost. If the change is issued based on the County estimate, the Contractor will waive his right to dispute the action unless within fifteen (15) calendar days following completion of the added/deleted work, the Contractor presents proof that the County's estimate was in error.

- 19.1.5 If the County disagrees with the proposal submitted by Contractor, it will notify the Contractor in writing and the Contractor may elect to proceed under the DISPUTE article of this Contract, or, in the event either party

contests the price or time extension of Change work, or time is of the essence, the County may issue a Construction Change Directive and the contractor shall proceed with the work. The County will provide its opinion of the appropriate price and/or time extension in a "Response to Change Order Request." If the contractor agrees with the County's estimate, a change order will be issued by the County. If no agreement can be reached, the County shall have the right to issue the Change Order Directive setting forth its unilateral determination of the reasonable additions or savings in costs and time attributable to the extra or deleted work. Such determination shall become final and binding if the Contractor fails to submit a Claim in writing to the County, within twenty-one (21) days of the Change Order Directive, disputing the terms of such Directive. No dispute, disagreement or failure of the parties to reach agreement regarding the amount, if any, of any adjustment to the contract sum or contract time shall relieve the Contractor from the obligation to proceed with performance of the work, including extra work, promptly and expeditiously."

- 19.1.6 The Contractor will give notice of a requested change on his letterhead within seven (7) calendar days of discovery and, if the County agrees, a proposed change order will be issued on the County's standard change order form.
- 19.1.7 If any change involves an increase or decrease in the cost of the Contractor's work, a change order shall state the amount to be added or deducted from the Contract amount, and the additional time, if any, needed for the performance of such work.
- 19.1.8 Any changes to the Contract amount shall be in a lump sum mutually agreed to by the Contractor and the County, except that when, in the opinion of the County, such basis is not feasible the change to the Contract amount shall be determined upon a cost-plus-percentage basis with a guaranteed maximum lump sum cost within the limitations provided by law.
- 19.1.9 Each lump sum quotation from the Contractor shall be accompanied by sufficiently detailed estimates to permit verification of totals in accordance with (a) through (d) in 19.1.11 below.
- 19.1.10 When the work is to be done on a cost-plus-percentage basis, the Contractor shall submit statements as required by the County showing all labor, material, and equipment costs incurred, and upon completion of the work, a summary of costs, including overhead and profit, and in accordance with Item (a) through (d) in 19.1.11 below.
- 19.1.11 Estimates for lump sum quotations and accounting for cost-plus-percentage work shall be limited to direct expenditures necessitated specifically by the subject extra work, and shall be segregated as follows:
- a. Labor. The costs of labor will be the actual cost for wages prevailing locally for each craft or type of worker at the time the extra work is done, plus employer payments of payroll taxes and insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State or local laws, as well as assessment or benefits required by lawful collective bargaining agreements. The use of a labor classification which would increase the extra work cost will not be permitted unless the contractor establishes the necessity for such additional costs. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.
 - b. Materials. The cost of materials reported shall be at invoice or lowest current price at which such materials are locally available in the quantities involved, plus sales tax, freight and delivery.
 - c. Tool and Equipment Use. No payment will be made for the use of tools which have a

replacement value of \$100 or less. Regardless of ownership, the rates to be used in determining equipment use costs shall not exceed listed rates prevailing locally at equipment rental agencies, or distributors, at the time the work is performed.

- d. Overhead, Profit and Other Charges. The mark-up for overhead and profit on work added to the Contract shall be according to the following Schedule.
- (1) For work performed by the Contractor's forces the added cost for overhead and profit shall not exceed fifteen (15%) percent of the net cost of the work, equipment, labor and materials.
 - (2) For work performed by a subcontractor, the added cost for overhead and profit shall not exceed fifteen (15%) percent of the net cost of the work, equipment, labor and materials, to which the Contractor may add five (5) percent of the subcontractor's price of the work.
 - (3) For work performed by a sub-subcontractor the added cost for overhead and profit shall not exceed fifteen (15 %) percent of the net cost for work, equipment, labor and materials to which sub-contractor and general contractor may each add an additional five (5 %) percent of the total price from the lower tier subcontractor.
 - (4) "Net Cost" is defined as consisting of costs of labor, materials and equipment use and/or rental only. The costs of applicable insurance and bond premium will be reimbursed to the Contractor and subcontractors at cost only, without mark-up.
 - (5) The cost of direct supervision, except when provided by working foreman whose time is included above, of change order work when done exclusively, and not in conjunction or at the same time as, other work performed on the job and when approved in advance by the County's authorized representative, including only payroll taxes, insurance, pension and direct costs for the labor of supervision may be charged to the change order. The cost of transportation, use of vehicle and other costs incurred by supervision will not be allowed.

19.1.12 For added or deducted work by subcontractors, the Contractor shall furnish to the County the subcontractor's signed detailed estimate of the cost of labor, material and equipment, including the markup by such subcontractor for overhead and profit. The same requirement shall apply to sub-subcontractors.

19.1.13 For added or deducted work furnished by a vendor or supplier, the Contractor shall furnish to the County a detailed estimate or quotation of the cost to the Contractor for such work, signed by such vendor or supplier.

19.1.14 Any change in the work involving both extras and credits shall show a new total cost, including subcontracts. Allowance for overhead and profit, as specified therein, shall be applied if the net total cost is an extra; overhead and profit allowances shall not be applied if the net total cost is a credit. The estimated cost of deductions shall be based on labor and material prices on the date the Contract was executed.

19.1.15 The Contractor shall identify any adjustment in time of the final completion of the Work as a whole which is directly attributable to the changed work within fifteen (15) calendar days of receipt of the proposed change order. The Contractor's request for a change in time will be supported by a detailed schedule analysis including a schedule indicating the activities which have been affected and the additional time being requested.

- a. For a change in time for the Work, the Contractor shall be entitled only to such adjustments where completion of the entire Work (critical path) is delayed due to the performance of the changed work. Failure to request extra time when submitting such estimate shall constitute waiver of the right to subsequently claim adjustment in time for final completion based upon such changed work.
- b. If the County and the Contractor fail to arrive at an agreement on the amount of extra cost, credit or time extension for a proposed change, a change order will be processed in the amount believed by the County to be reasonable, and the Contractor shall proceed with the work. If the Contractor believes that the amount or time stipulated in the change order is not reasonable for the work required, he may elect to issue a notification in accordance with the DISPUTES article for review by the County, stating therein the basis for his dispute with such change order.

19.1.16 Any change in the Work shall conform to the original Contract Documents insofar as they may apply without conflict to the conditions involved in the change.

19.1.17 Payment for additional work or extras, if any, shall become due and payable in accordance with the provisions for payment in the Contract.

19.1.18 Contractor shall not reserve a right to assess impact cost, extended job site costs, extended overhead, and/or constructive acceleration at a later date as related to any and all changes. All costs or estimated costs must be supported with full schedule and cost documentation with each proposed change within the prescribed submission times. If a request for a change is denied and the Contractor disputes the denial, the Contractor must supply the aforementioned documentation to support his claim under the DISPUTES article of this Contract. No claims shall be allowed for impact, extended overhead costs, and/or construction acceleration due to the multiplicity of changes and/or clarifications. Any attempt by Contractor to change or modify the change order form (sample included herein) shall void the form, including any letters the Contractor may issue in conjunction therewith.

19.1.19 All alterations, extensions of time, extra and additional work and other changes authorized by these specifications or any part of the Contract may be made without securing consent of the surety or sureties on the contract bonds.

19.2 CHANGE ORDERS AND LABOR RATES GUIDELINES

19.2.1 The following are guidelines for preparing change orders:

- a. Labor Rates:
 - (1) To establish the labor rate for each classification and trade, a breakdown shall be submitted to the County.
 - (2) Labor rates are based on current prevailing state and federal wages. Only those benefits mandated by law or a valid labor contract are paid by the County.
 - (3) Payroll taxes shall be paid as mandated by law. Labor related insurances shall be paid according to industry standard average.
 - (4) No other costs related to labor shall be paid by County.

b. Change Orders:

- (1) Change orders shall be prepared in accordance with the project contract.
- (2) No insurance costs are paid by County, except for labor insurances specified in this guideline under section 1 titled "LABOR RATES".
- (3) Material cost shall be broken down on a separate sheet, and for those jobs designated as time and material shall be supported by valid invoices from suppliers.
- (4) Hours for non-productive labor, such as non-working foremen or general foremen, shall be paid only when justified in the opinion of the County, and approved by the County. The total number of nonproductive labor hours shall be limited to a maximum of 15% of the total number of productive labor hours.
- (5) Cost of use of special equipment shall be paid when justified in the opinion of the County, and approved by the County. Equipment refers to special equipment that is needed to perform that specific job, and does not include the usual tools customarily required for that trade. Small tools costs are not paid by County.
- (6) Material transportation costs are paid by County when justified in the opinion of the County, and approved by the County's authorized representative.
- (7) Overhead, profit and fees on subcontracts, are paid according to the contract.
- (8) No costs other than those designated above shall be paid by County. The percentages of overhead and fee allowed with change orders have been established to account for any other direct or indirect costs that might be incurred due to the change order.

19.3 AUDIT

19.3.1 The County shall have the right to examine and audit all books, estimates, records, contracts, documents, bid documents, subcontracts, and other data of the Contractor (including computations and projections) related to negotiating, pricing, or performing the modification in order to evaluate the accuracy and completeness of the cost or pricing data at no additional cost to the County.

19.3.2 The Contractor shall make available at its office at all reasonable times the materials described in paragraph 19.3.1 above, for examination, audit, or reproduction, until 4 years after final payment under this Contract.

19.3.3 The Contractor shall insert a clause containing all the provisions of this 19.3, including this paragraph, in all subcontracts over \$10,000 under this contract.

ARTICLE 20 PAYMENT

20.1 PROGRESS PAYMENTS

20.1.1 The County shall pay the Contractor the price as provided in this Contract.

20.1.2 The County shall make progress payments monthly as the Work proceeds, on estimates approved by the County. The Contractor shall furnish a breakdown of the total contract price, in a format provided by the

County, showing the amount included therein for each principal category of the work, in such detail as requested, to provide a basis for determining progress payments.

- 20.1.3** Contractor shall submit to the County vouchers, schedule activities, or other satisfactory proof of the value of any work for which he claims payment on such account, and receipts showing that progress payments have been duly made on such contracts, and for materials furnished.
- 20.1.4** In the preparation of estimates, the County may authorize 75% of the value of material delivered and satisfactorily stored on the site, and preparatory work done to be taken into consideration for major equipment if:
- a. Consideration is specifically authorized by this Contract; and
 - b. The Contractor furnishes certified receipt that it has acquired title and paid invoices for such material and that the material will be used to perform this Contract.
- 20.1.5** On the 25th of each month the Contractor will submit his request for payment. Prior to that submittal the County will review the requested percentage of completion for each activity. The payment request will be in the format as provided by the County and will refer to the schedule.
- 20.1.6** Upon receipt of a payment request, the County shall:
- a. Review that request as soon as practicable after receipt for the purpose of determining that the payment request is a proper payment request; and
 - b. Any payment request determined not to be a proper request suitable for payment shall be returned to the Contractor as soon as practicable, but not later than seven (7) calendar days after receipt. The returned request for payment shall be accompanied by a document setting forth in writing the reasons why the payment request is not proper.
- 20.1.7** Any progress payment which is undisputed and properly submitted and remains unpaid for thirty (30) calendar days after receipt by County shall accrue interest to the Contractor equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the California Code of Civil Procedure. The number of days available to the County to make a payment without incurring interest pursuant to this section shall be reduced by the number of days by which the County exceeds the seven-day return requirement set forth in 20.1.6 above.
- 20.1.8** In making these progress payments, there shall be retained ten percent (10%) from the amount of each progress payment until the work is 50% complete. After the 50% completion point, if satisfactory progress is being made and at the sole discretion of the County, the retention may be reduced to a minimum of 5% of the contract.
- 20.1.9** Except as otherwise prohibited by law, the Contractor may elect to receive all payments due under the contract pursuant to this section without any retention, by posting securities in accordance with Public Contract Code Section 22300.
- 20.1.10** Contractor and each subcontractor shall pay each of its employees engaged in work under this Contract in full (less deductions made mandatory by law) in accordance with California law.
- 20.1.11** The County may withhold (in excess of retentions) or, on account of subsequently discovered evidence, nullify the whole or a part of any certificate to such extent as may be necessary to protect the County from loss on

account of:

- a. Defective work not remedied.
- b. Claims filed or reasonable evidence indicating probable filing of claims.
- c. Failure of the Contractor to make payments properly to subcontractors or for material or labor.
- d. Damage to another Contractor.
- e. Delays in progress toward completion of the work, with the stipulated amount of liquidated damages being withheld for each day of delay for which no extension is granted.
- f. Default of the Contractor in the performance of the terms of the Contract.

20.1.12 Should stop notices be filed with the County, County shall withhold the amount required plus 25% from certificates until such claims shall have been resolved pursuant to applicable law. California Civil Code Section 3179 et seq.

20.1.13 Contractor shall provide (1) forms of conditional releases of stop notice and bond rights upon progress payment, complying with California Civil Code Section 3262(d)(1), for all work performed during the time period covered by the current Application for Payment, signed by the Contractor and the subcontractors of every tier; and (2) forms of unconditional release of stop notice and bond rights upon progress payment, complying with Civil Code Section 3262(d)(2) for all work performed during the time period covered by previous Application for Payment, signed by Contractor and the subcontractors of every tier.

20.1.14 All material and work covered by progress payments made shall, at the time of payment, become the sole property of the County, but this shall not be construed as:

- a. An acceptance of any work not in accordance with the Contract Documents; or
- b. Waiving the right of the County to require the fulfillment of all of the terms of the contract.

20.2 FINAL PAYMENT

20.2.1 GENERAL

- a. The County shall pay the amount due the Contractor under this Contract after:
 - 1.) The Acceptance of all work and Notice of Completion per the terms of this Contract;
 - 2.) Presentation of a properly executed voucher;
 - 3.) Submission of conditional releases and waivers of stop notice and bond rights upon final payment in the form required by California Civil Code Section 3262(d)(3) executed by Contractor and by all the subcontractors of every Tier.
 - 4.) Presentation of release of all claims against the County arising by virtue of this Contract, other than claims and disputes in stated amounts, that the Contractor has

specifically excepted from the operation of the release.

- b. The Contractor may, if any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the County, to indemnify him against any lien.

20.2.2 FINAL CERTIFICATE FOR PAYMENT

- a. When the work is ready for acceptance by the County, the Economic Development Agency will certify and submit to the Board of Supervisors a Notice of Completion. Upon approval of the Notice of Completion, a copy will be sent to the Contractor.
- b. Notice of Completion will be recorded by the County upon completion and Acceptance of the Work. Providing no stop notices have been filed, thirty-five (35) calendar days after filing of such Notice of Completion, payment due under the contract will become due to the Contractor and the County shall so certify authorizing the final payment.

20.2.3 FINAL PAYMENT

- a. After Acceptance of Work, the County will submit to Contractor a statement of the sum due Contractor under this contract, together with County payment in the amount thereof. Said statement shall take into account the contract price, as adjusted by any change orders; amounts already paid; sums to be withheld for incomplete work; liquidated damages; and for any other cause under the Contract.
- b. The Contractor shall, from the effective date of Acceptance until the expiration of four years after final settlement under this Contract, preserve and make available to the County, all its books, records, documents, and other evidence bearing on the costs and expenses of the Contractor under this Contract.

ARTICLE 21 SUSPENSION OF WORK/TERMINATION

21.1 NON-COMPLIANCE WITH CONTRACT REQUIREMENTS

- 21.1.1 In the event the Contractor, after receiving written notice from the County of non-compliance with any requirement of this Contract, fails to promptly initiate appropriate action to comply with the specified requirement, the County shall have the right to withhold payment for work completed under the Contract until the Contractor has complied with the notice or has initiated such action as may be appropriate to comply, within a reasonable period of time. The Contractor shall not be entitled to any extension of contract time or payment for any costs incurred for work under this article.
- 21.1.2 Should the Contractor abandon the Work called for under the Contract, or assign his Contract, or unnecessarily and unreasonably delay the work, or willfully violate or perform the work in bad faith, the County shall have the power to notify the Contractor to discontinue all work or any part thereof under this Contract, and thereupon the Contractor shall cease to continue said work or such part thereof as the County may designate, and the County shall have the power to employ such persons as it may consider desirable, and to obtain by contract, purchase, hire or otherwise, such implements, tools, material or materials as the County may deem advisable to work at and be used to complete the work herein described, or such part thereof as shall have not been completed, and to use such material as it may find upon the site of the work, and to charge the expense of such labor and material, implements and tools to the Contractor, and the expense so charged shall be deducted and paid by the County out of such monies as may either be due, or may at any time thereafter become due to the Contractor under the Contract.

21.2 TERMINATION

21.2.1 TERMINATION FOR BREACH

If the Contractor should be adjudged bankrupt or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he or any of his subcontractors should violate any of the provisions of the Contract, the County may serve written notice upon him and his surety of its intention to terminate Contractor's performance hereunder, said notice shall contain the reasons for such intention to terminate Contractor's performance, and, unless within ten (10) calendar days after serving of said notice, such violation shall cease and satisfactory arrangements for correction thereof be made, Contractor's performance shall, upon the expiration of said ten (10) calendar days, cease and terminate. In the event of any such termination, the County shall immediately serve written notice thereof upon the surety and the Contractor, and the County may take over the Contractor's work and prosecute the same to completion by contract or by any other method it may deem advisable, for the account and at the expense of the Contractor, and the Contractor and his surety shall be liable to the County for any excess cost occasioned the County thereby, and in such event the County may without liability for so doing take possession of and utilize in completing the work, such materials, appliances, plants, and other property belonging to the Contractor as may be on the site of the work and necessary therefore.

21.2.2 TERMINATION FOR CONVENIENCE

- a. If the construction of the project herein is damaged, which damage is determined to have been proximately caused by an Act of God, in excess of 5% of the contract amount, provided that the work damaged is built in accordance with applicable building standards and the plans and specifications, then the County may, without prejudice to any other right or remedy, terminate the Contract.
- b. The County may terminate performance of work under this Contract in whole or in part, if the County determines that a termination is in the County's interest. The County shall terminate by delivering to the Contractor a Notice to Terminate specifying the extent of termination and the effective date.
- c. After receipt of such Notice, and except as directed by the County, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due under this clause:
 - (1) Stop work as specified in the notice.
 - (2) Place no further subcontracts or orders (referred to as subcontracts in this clause) for materials, services, or facilities, except as necessary to complete any continued portion of the Contract.
 - (3) To terminate all subcontracts to the extent they relate to the work terminated.
 - (4) With approval or ratification to the extent required by the County, settle all outstanding liabilities and termination settlement proposals arising from termination of subcontracts; the approval or ratification will be final for purposes of this clause.

- (5) As directed by the County, transfer title and deliver to the County (1) the fabricated or unfabricated parts; work in progress, completed work, supplies, and other material produced or acquired for the work terminated; and (2) the completed or partially completed plans, drawings, information, and other property that, if the contract had been completed, would be required to be furnished to the County.
 - (6) Complete performance of work not terminated.
 - (7) Take any action that may be necessary, or that the County may direct, for the protection and preservation of the property related to this contract that is in the possession of the Contractor and in which the County has or may acquire an interest.
 - (8) Use its best efforts to sell, as directed or authorized by the County, any property of the types referred to in subparagraphs above; provided, however, that the Contractor (1) is not required to extend credit to any purchaser and (2) may acquire the property under the conditions prescribed by, and at prices approved by the County. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the County under this contract, credited to the price or cost of the work, or paid in any other manner directed by the County.
- d. After termination, the Contractor shall submit a final termination settlement proposal to the County in the form and with the certification prescribed by the County. The Contractor shall submit the proposal promptly, but no later than thirty (30) days from the effective date of termination. If the Contractor fails to submit the proposal within the time allowed, the County may determine, on the basis of information available, the amount, if any, due the Contractor because of the termination and shall pay the amount determined.
- e. Subject to subparagraph (2) above, the Contractor and the County may agree upon the whole or any part of the amount to be paid because of the termination. The amount may include a reasonable allowance for profit on work done. However, the agreed amount, may not exceed the total contract price as reduced by:
- (1) the amount of payments previously made and;
 - (2) the contract price of work not terminated. The contract shall be amended with a Change Order, and the Contractor paid the agreed amount.
- f. If the Contractor and County fail to agree on the whole amount to be paid the Contractor because of the termination of work, the County shall pay the Contractor the amounts determined as follows:
- (1) For contract work performed before the effective date of termination, the total (without duplication of any terms) of:
 - (i) The cost of this work;
 - (ii) The cost of settling and paying termination settlement proposals under terminated subcontracts that are properly chargeable to the terminated portion of the contract if not included in subdivision (i) above; and

- (iii) A sum, as profit on (i) above, determined by the County to be fair and reasonable; however, if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, the County shall allow no profit under this subdivision (iii).
 - (2) The reasonable costs of settlement of the work terminated including:
 - (i) Accounting, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data; and
 - (ii) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory.
- g. Except for normal spoilage, the County shall exclude from the amounts payable to the Contractor the fair value, as determined by the County, of defective work, and of property that is destroyed, lost, stolen, or damaged so as to become undeliverable.
- h. The Contractor shall have the right to make a claim under the DISPUTES article, from any determination made by the County.
- i. In arriving at the amount due the Contractor, there shall be deducted:
 - (1) All unliquidated advance or other payments to the Contractor under the terminated portion of this Contract;
 - (2) Any claim which the County has against the Contractor under this Contract; and
 - (3) The agreed price for, or the proceeds of sale of, materials, supplies, or other things acquired by the Contractor or sold under the provisions of this clause and not recovered by or credited to the County.
- j. If the termination is partial, the Contractor may file a proposal with the County for a Change Order of the price(s) of the continued portion of the Contract. The County shall process any Change Order agreed upon. Any proposal by the Contractor for an equitable adjustment under this clause shall be requested within thirty (30) days from the effective date of termination unless extended in writing by the County.
- k. The County may, under the terms and conditions it prescribes, make partial payments and payments against costs incurred by the Contractor for the terminated portion of the Contract, if the County believes the total of these payments will not exceed the amount to which the Contractor will be entitled. If the total payments exceed the amount finally determined to be due, the Contractor shall repay the excess to the County upon demand, together with interest.
 - l. Unless otherwise provided in this Contract or by statute, the Contractor will maintain all records and documents relating to the terminated portion of this Contract for 4 years after final settlement. This includes all books and other evidence bearing on the Contractor's costs and expenses under this Contract. The Contractor shall make these records and documents available to the County, State and/or the U.S. Government or their representatives at all reasonable times, without any direct charge.

ARTICLE 22 DISPUTES/CLAIMS

22.1 CLAIMS RESOLUTION

In accordance with Public Contract Code Sections 20104 20104.6 and other applicable law, public works claims of \$375,000 or less which arise between the Contractor and the Owner shall be resolved under the following the statutory procedure unless the Owner has elected to resolve the dispute pursuant to Public Contract Code Section 10240 et seq.

- a. All claims shall be submitted in writing and accompanied by substantiating documentation. Claims must be filed on or before the date of final payment unless other notice requirements are provided in the contract. "Claim" means a separate demand by the claimant for (1) a time extension, (2) payment of money or damages arising from work done by or on behalf of the claimant and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled, or (3) an amount the payment of which is disputed by the Owner.
- b. Claims Under \$50,000. The Owner shall respond in writing to the claim within 45 days of receipt of the claim, or, the Owner may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses or claims the Owner may have. Of additional information is needed thereafter, it shall be provided upon mutual agreement of the Owner and the claimant. The Owner's written response shall be submitted 15 days after receiving the additional documentation, or within the same period of time taken by the claimant to produce the additional information, whichever is greater.
- c. Claims over \$50,000 but less than or equal to \$375,000. The Owner shall respond in writing within 60 days of receipt, or, may request in writing within 30 days of receipt of the claim, any additional documents supporting the claim or relating to defenses or claims the Owner may have against the claimant. If additional information is needed thereafter, it shall be provided pursuant to mutual agreement between the Owner and the claimant. The Owner's response shall be submitted within 30 days after receipt of the further documents, or within the same period of time taken by the claimant to produce the additional information or documents, whichever is greater. The Contractor shall make these records and documents available to the County, State and/or the U.S. Government or their representatives at all reasonable times, without any direct charge.
- d. If the claimant disputes the Owner's response, or if the Owner fails to respond within the statutory time period(s), the claimant may so notify the Owner within 15 days of the receipt of the response or the failure to respond, and demand an informal conference to meet and confer for settlement. Upon such demand, the Owner shall schedule a meet and confer conference within 30 days.
- e. If following the meet and confer conference, the claim or any portion thereof remains in dispute, the claimant may file a claim pursuant to Government Code 900 et seq. and Government Code 910 et seq. For purposes of those provisions, the time within which a claim must be filed shall be tolled from the time the claimant submits the written claim until the time the claim is denied, including any time utilized for the meet and confer conference.
- f. If a civil action is filed to resolve any claim, the provisions of Public Contract Code 20104.4 shall be followed, providing for nonbinding mediation and judicial arbitration.

22.2 CLAIM FORMAT/REQUIREMENTS

22.2.1 The Contractor will submit the claim justification in the following format:

- a. Summary of claim merit and price plus clause under which the claim is made.
- b. List of documents relating to claim
 - (a) Specifications
 - (b) Drawings
 - (c) Clarifications (RFIS)
 - (d) Schedules
 - (e) Other
- c. Chronology of events and correspondence
- d. Analysis of claim merit
- e. Analysis of claim cost
- f. Analysis of Time in CPM format
- g. Cover letter and certification (form included herein)

22.2.2 If any claim submitted includes a request for overhead, the County may request a Profit & Loss statement and supporting documentation from Contractor. If requested, such documentation must be submitted for the County to consider the claim.

22.2.3 Submission of a claim, properly certified, with all required supporting documentation, and written rejection or denial of all or part of the claim by County, is a condition precedent to any action, proceeding, litigation, suit, general conditions claim, or demand for arbitration by Contractor.

22.3 NOTICE OF THIRD PARTY CLAIMS

The County shall provide notification to the Contractor within a reasonable time after receipt of any third-party claim relating to the Construction Contract.

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SECTION 01 1200**MULTIPLE CONTRACT SUMMARY****1.1 SUMMARY OF CONTRACTS**

- A. Owner may issue separate contracts for operations scheduled to precede and be substantially completed before beginning of The Work under this Contract.
 - 1. Contractor will be given written notice from such contractors of any revisions to scheduled completion of their work at least 30 days in advance. Owner will reimburse Contractor for expenses incurred by Contractor by failure to be properly notified.

- B. Owner has issued or will issue separate contracts for operations scheduled to be completed between Notice to Proceed and Substantial Completion.
 - 1. General:
 - a. Schedule performance of work covered by such separate contracts in Contractor's Construction Schedule so as to avoid delays in Substantial Completion. Give written notice to such contractors and to Owner of any revisions to scheduled delivery and work dates at least 30 days in advance.
 - b. Complete work necessary to accommodate items provided under such separate contracts before scheduled date for performance of such work. Contractor will be back charged for actual expenses incurred by Owner for failure to timely complete such work including, but not limited to, cost of crews during downtime or for call backs and costs to correct substrate deficiencies.
 - c. Store and protect completed work provided under separate contracts until date of Substantial Completion.
 - 2. Testing and Inspection. See Section 01 4523 "Testing and Inspection" for testing, inspection, special testing, and testing laboratory services for materials, products, and construction methods:
 - a. Air System Testing, Adjusting, and Balance.
 - b. Concrete.
 - c. Drill-In Mechanical Anchors / Adhesive Anchors / Screw Anchors.

END OF SECTION

SECTION 01 1400**WORK RESTRICTIONS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Work Restrictions.

1.2 PROJECT CONDITIONS

- A. During construction period, Contractor will have use of premises for construction operations. Contractor will ensure that Contractor, its employees, subcontractors, and their employees comply with following requirements:
1. Confine operations to areas within Contract limits shown on Drawings. Do not disturb portions of site beyond Contract limits.
 2. Do not allow alcoholic beverages, illegal drugs, or persons under their influence on Project site.
 3. Do not allow use of tobacco in any form on Project Site.
 4. Do not allow pornographic or other indecent materials on site.
 5. Do not allow work on Project site on Saturdays and Sundays except for emergency work or without consent from Riverside County.
 6. Refrain from using profanity or being discourteous or uncivil to others on Project Site or while performing The Work.
 7. Wear shirts with sleeves, wear shoes, and refrain from wearing immodest, offensive, or obnoxious clothing, while on Project Site.
 8. Do not allow playing of obnoxious and loud music on Project Site. Do not allow playing of any music within existing facilities.
 9. Do not build fires on Project Site.
 10. Do not allow weapons on Project Site, except those carried by law enforcement officers or other uniformed security personnel who have been retained by Owner or Contractor to provide security services.
- B. Existing Facilities:
1. Existing facility shall remain in operation throughout the duration of construction. Contractor shall coordinate with Riverside County representative as well as with the facility operating Director prior to impacting the normal operations of the facility or impact on the facility residents.
- C. Do not load or permit any part of the structure to be loaded with a weight that will endanger its safety. Questions of structural loading as part of construction means and methods shall be addressed by a licensed structural engineer engaged by Contractor, subject to the review by Architect.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 2900
PAYMENT PROCEDURES

1.1 PAYMENT REQUESTS

- A. Use Payment Request forms provided by Owner.
- B. Each Payment Request will be consistent with previous requests and payments certified by Architect and paid for by Owner.
- C. Request Preparation:
 - 1. Complete every entry on Payment Request form.
 - 2. Entries will match data on approved schedule of values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
 - 3. Submit signed Payment Request to Architect with current Construction Schedule.
- D. Provide following submittals before or with submittal of Initial Payment Request:
 - 1. List of Subcontractors.
 - 2. Initial progress report.
 - 3. Contractor's Construction Schedule.
 - 4. Submittal Schedule.
- E. Provide Affidavit of Contractor and Consent of Surety with Payment Request following Substantial Completion.

1.2 SCHEDULE OF VALUES

- A. Submit schedule of values on Owner's standard form to Architect 20 days minimum before submission of Initial Payment Request as a necessary condition before payment will be processed. Coordinate preparation of schedule of values with preparation of Contractor's Construction Schedule. Correlate line items in Schedule of Values with other required administrative schedules and forms, including:
 - 1. Contractor's Construction Schedule.
 - 2. Payment Request form.
 - 3. Schedule of Allowances.
 - 4. Schedule of Alternates.

END OF SECTION

SECTION 01 3100**PROJECT MANAGEMENT AND COORDINATION****1.1 PROJECT COORDINATION**

- A. Project designation for this Project is Indio Mental Health Milestones Building Renovation, Project No. FM08410000039.
- B. This Project designation will be included on documents generated for Project by Contractor and Subcontractors, or be present on a cover letter accompanying such documents.

1.2 MULTIPLE CONTRACT COORDINATION

- A. Contractor shall be responsible for accurately maintaining and reporting schedule of The Work from Notice to Proceed to date of Substantial Completion.
- B. Contractor shall be responsible for providing Temporary Facilities And Controls for those who perform work on Project from Notice to Proceed to date of Substantial Completion.
- C. Contractor shall be responsible for providing Construction Waste Management And Disposal services for those who perform work on Project from Notice to Proceed to date of Substantial Completion.
- D. Contractor shall be responsible for Final Cleaning for entire Project.

1.3 PROJECT MEETINGS AND CONFERENCES

- A. Preconstruction Conference:
 - 1. Attend preconstruction conference and organizational meeting scheduled by Architect at Project site or other convenient location.
 - 2. Be prepared to discuss items of significance that could affect progress, including such topics as:
 - a. Status of permits.
 - b. Construction schedule.
 - c. Critical Work sequencing.
 - d. Designation of responsible personnel.
 - e. Procedures for processing interpretations and Modifications.
 - f. Procedures for processing Payment Requests.
 - g. Distribution of Contract Documents.
 - h. Submittal of Product Data, Shop Drawings, Samples, Quality Assurance / Control submittals.
 - i. Preparation of record documents and O & M manuals.
 - j. Use of the premises.
 - k. Office, work, and storage areas.
 - l. Equipment deliveries and priorities.
 - m. Security.
 - n. Project cleanup.
 - o. Working hours.
 - p. Work restrictions.
 - q. Current problems.
 - r. General schedule of inspections by Architect and its consultants.
 - s. General inspection of tests.
 - 3. Architect will record minutes of meetings and distribute copies to Owner and Contractor within three working days.
- B. Progress Meetings:

1. Attend progress meetings at Project site at regularly scheduled intervals determined by Architect, at least once a month.
 2. Progress meetings will be open to Owner, Architect, Subcontractors, and anyone invited by Owner, Architect, and Contractor.
 3. Be prepared to discuss items of significance that could affect progress, including following:
 - a. Progress since last meeting.
 - b. Whether Contractor is on schedule.
 - c. Activities required to complete Project within Contract Time.
 - d. Labor and materials provided under separate contracts.
 - e. Off-site fabrication problems.
 - f. Access.
 - g. Site use.
 - h. Temporary facilities and services.
 - i. Hours of work.
 - j. Hazards and risks.
 - k. Project cleanup.
 - l. Quality and Work standards.
 - m. Status of pending modifications.
 - n. Documentation of information for Payment Requests.
 - o. Maintenance of Project records.
 4. Architect will prepare minutes of progress meetings and distribute copies of minutes to Owner and Contractor within three working days.
- C. Pre-Installation Conferences:
1. Attend pre-installation conferences specified in Contract Document.
 - a. If possible, schedule these conferences on same day as regularly scheduled Progress Meetings. If this is not possible, coordinate scheduling with Architect.
 - b. Request input from attendees in preparing agenda.
 2. Be prepared to discuss following items:
 - a. Requirements of Contract Documents.
 - b. Completed work necessary for installation of items or systems.
 - c. Conditions not in compliance with installation requirements.
 - d. Installation and inspection schedule.
 - e. Coordination between trades.
 - f. Space and access limitations.
 - g. Testing.
 3. Architect will prepare meeting minutes and distribute minutes to Owner and Contractor within three working days.

END OF SECTION

SECTION 01 3200**CONSTRUCTION PROGRESS DOCUMENTATION****PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes But is Not Limited To:**

1. Administrative and procedural requirements for documenting the progress of construction during performance of the Work.

1.2 SCHEDULING OF WORK**A. Bar Chart Schedule:**

1. Submit schedule bar chart schedule (Critical Path Method) before Preconstruction Conference. Provide separate time bar for each construction activity listed on Owner's payment request form. Within each time bar, show estimated completion percentage. Provide continuous vertical line to identify first working day of each week. Show each activity in chronological sequence. Show graphically sequences necessary for completion of related portions of The Work. As The Work progresses, place contrasting mark in each bar to indicate actual completion.
2. Provide copies of schedule for Architect and Owner and post copy in field office.
3. Revise schedule monthly. Send copy of revised schedule to Owner and Architect and post copy in field office.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 3300
SUBMITTAL PROCEDURES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Submittal Procedures.

1.2 SUBMITTAL SCHEDULE

- A. Furnish submittal schedule within 5 days after receipt of Notice to Proceed, listing items specified to be furnished for review to Architect including product data, shop drawings, samples, and Informational submittals.
1. Coordinate submittal schedule with Contractor's construction schedule.
 2. Enclose the following information for each item:
 - a. Scheduled date for first submittal.
 - b. Related Section number.
 - c. Submittal category.
 - d. Name of Subcontractor.
 - e. Description of part of the Work covered.
 - f. Scheduled date for resubmittal.
 - g. Scheduled date for Architect's final release or approval.
- B. Print and distribute copies to Architect and Owner and post copy in field office. When revisions are made, distribute to same parties and post in same location.
- C. Revise schedule monthly. Send copy of revised schedule to Owner and Architect and post copy in field office.

1.3 SUBMITTAL PROCEDURES

- A. Coordination:
1. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently before performance of related construction activities to avoid delay.
 - a. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - b. Coordinate transmittal of different types of submittals required for related elements of The Work so processing will not be delayed by need to review submittals concurrently for coordination. Architect reserves right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 2. Processing Time:
 - a. Allow sufficient review time so installation will not be delayed by time required to process submittals, including time for resubmittals.
 - 1) Allow 21 days for initial review. Allow additional time if processing must be delayed to allow coordination with subsequent submittals. Architect will promptly advise Contractor when submittal being processed must be delayed for coordination.
 - 2) If an intermediate submittal is necessary, process same as initial submittal.
 - 3) Allow 10 days for reprocessing each submittal.

- 4) No extension of Contract Time will be authorized because of failure to transmit submittals to Architect in sufficient time before work is to be performed to allow processing.
3. Identification:
 - a. Place permanent label or title block on each submittal for identification. Include name of entity that prepared each submittal on label or title block.
 - 1) Provide space approximately 4 by 5 inches on label or beside title block on Shop Drawings to record Contractor's review and approval markings and action taken.
 - 2) Include following information on label for processing and recording action taken:
 - a) Project name.
 - b) Date.
 - c) Name and address of Architect.
 - d) Name and address of Contractor.
 - e) Name and address of Subcontractor.
 - f) Name and address of supplier.
 - g) Name of manufacturer.
 - h) Number and title of appropriate Specification Section.
 - i) Drawing number and detail references, as appropriate.
4. Transmittal:
 - a. Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using transmittal letter. On transmittal, record relevant information and requests for data. Include Contractor's certification that information complies with Contract Document requirements, or, on form or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations.
 - b. Submittals received from sources other than Contractor or not marked with Contractor's approval will be returned without action.

1.4 ACTION SUBMITTALS

- A. Product Data:
 1. Submit Product Data, as required by individual Sections of Specifications.
 2. Mark each copy of each set of submittals to show choices and options used on Project. Where printed Product Data includes information on products that are not required for Project, mark copies to indicate information relating to Project.
 3. Certify that proposed product complies with requirements of Contract Documents. List any deviations from those requirements on form or separate sheet.
 4. Submit six copies of each required submittal unless otherwise required. Architect will return three copies marked with action taken and with corrections or modifications required.
 5. Submit electronic files PDF: Architect will return a PDF copy marked with action taken and with corrections or modifications required.
- B. Shop Drawings:
 1. Submit newly prepared graphic data to accurate scale. Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 36 by 48 inches. Highlight, encircle, or otherwise show deviations from Contract Documents. Include following information as a minimum:
 - a. Dimensions.
 - b. Identification of products and materials included.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 2. Do not reproduce Contract Documents or copy standard information as basis of Shop Drawings. Standard printed information prepared without specific reference to Project is not acceptable as Shop Drawings.
 3. Review and designate (stamp) approval of shop drawings. Unless otherwise specified, submit to Architect six copies of shop drawings required by Contract Documents. Shop drawings not required by Contract Documents, but requested by Contractor or supplied by Subcontractor, need not be submitted to Architect for review.

C. Samples:

1. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
 - a. Mount, display, or package Samples so as to ease review of qualities specified. Prepare Samples to match samples provided by Architect, if applicable. Include following:
 - 1) Generic description of Sample.
 - 2) Sample source.
 - 3) Product name or name of manufacturer.
 - 4) Compliance with recognized standards.
 - 5) Availability and delivery time.
2. Submit Samples for review of kind, color, pattern, and texture, for final check of these characteristics with other elements, and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 - a. Where variations in color, pattern, texture or other characteristics are inherent in material or product represented, submit set of three samples minimum that show approximate limits of variations.
 - b. Refer to other specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
 - c. Refer to other Sections for Samples to be returned to Contractor for incorporation into The Work. Such Samples shall be undamaged at time of use. On transmittal, indicate special requests regarding disposition of Sample submittals.
3. Where Samples are for selection of color, pattern, texture, or similar characteristics from a range of standard choices, submit full set of choices for material or product. Preliminary submittals will be reviewed and returned with Architect's mark indicating selection and other action.
4. Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit three sets. One will be returned marked with action taken.
5. Samples, as accepted and returned by Architect, will be used for quality comparisons throughout course of construction.
 - a. Unless noncompliance with Contract Documents is observed, submittal may serve as final submittal.
 - b. Sample sets may be used to obtain final acceptance of construction associated with each set.

1.5 INFORMATIONAL SUBMITTALS

- A. Informational submittals are design data, test reports, certificates, manufacturer's instructions, manufacturer's field reports, and other documentary data affirming quality of products and installations. Submit five copies of each required submittal unless otherwise required. Architect will return three copies marked with action taken and with corrections or modifications required. [or] Submit electronic files: PDF. Architect will return a PDF copy marked with action taken and with corrections or modifications required.
 1. Certificates: Describe certificates intended to document affirmations by Contractor or others that the work is in accordance with the Contract Documents, but do not repeat provisions of Parts 2 or 3.
 2. Delegated Design Submittals / Design Data: Describe submittals intended to demonstrate design work prepared by Contractor's licensed professionals.
 3. Test And Evaluation Reports: Describe submittal of test reports or evaluation service reports intended to document required tests.
 4. Manufacturer Instructions: Describe submittals intended to document manufacturer instructions.
 5. Source Quality Control Submittals: Describe submittal of source quality control documentation.
 6. Field Quality Control Submittals: Describe submittal of field quality control documentation.
 7. Manufacturer Reports: Describe submittal of Manufacturer reports as documentation of manufacturer activities.

8. **Special Procedure Submittals:** Describe submittals intended to document special procedures. An example would be construction staging or phasing for remodeling an existing facility while keeping it in operation. While the Contractor would normally be responsible for managing this, submittal of his plan as documentation could be specified.
9. **Qualification Statements:** Describe submittals intended to document qualifications of entities employed by Contractor.

1.6 CLOSEOUT SUBMITTALS

- A. This title groups submittals that occur during project closeout. Coordinate with section 01 7800 Closeout Submittals.
 1. **Maintenance Contracts:** Describe submittal of the maintenance contract.
 2. **Operations & Maintenance Data:** Describe submittal of operation and maintenance data necessary for products of the Section.
 3. **Bonds:** Describe submittals of bonds specific to this Section.
 4. **Warranty Documentation:** Describe submittal of final executed warranty document.
 5. **Record Documentation:** Describe submittal of record documentation specific to this Section.
 6. **Software:** Describe submittal of extra copy operating system and other utility software necessary to operate and maintain software during life of product.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. This title groups maintenance material submittals required by Section.
 1. **Spare Parts:** Describe spare parts necessary for Owner's use in facility operation and maintenance. 'Parts' are generally understood to be items such as filters, motor drive belts, lamps, and other similar manufactured items that require only simple replacement.
 2. **Extra Stock Materials:** Describe extra stock materials to be provided for Owner's use in facility operation and maintenance. Extra stock materials are generally understood to be items such as ceiling tiles, flooring, paint etc.
 3. **Tools and Software:**
 - a. Describe tools to be provided for Owner's use in facility operation and maintenance. Tools are generally understood to be wrenches, gauges, circuit setters, etc, required for proper operation or maintenance of a system.
 - b. If necessary, describe submittal of an extra copy of operating system and other utility software necessary to operate and maintain the software during expected life of product.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 3500
SPECIAL PROCEDURES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Special Procedures.

1.2 ACCELERATION OF WORK

- A. Complete The Work in accordance with Construction Schedule. If Contractor falls behind schedule, take such actions as are necessary, at no additional expense to Owner, to bring progress of The Work back in accordance with schedule.
- B. Owner may request proposal for completion of The Work at date earlier than expiration of Contract Time. Promptly provide requested proposal showing cost of such acceleration of The Work. Consult with Owner and Architect regarding possible options to decrease cost of such acceleration. If Owner determines to order acceleration of The Work, change in Contract Sum and Contract Time resulting from acceleration will be included in a Change Order.

1.3 OWNER'S SAFETY REQUIREMENTS

- A. Personal Protection:
1. Contractor shall ensure:
 - a. Positive means of fall protection, such as guardrails system, safety net system, personal fall arrest system, etc, is provided to employees whenever exposed to a fall six feet or more above a lower level.
 - b. Personnel working on Project shall wear hard hats and safety glasses as required by regulation and hazard.
 - c. Personnel working on Project shall wear long or short sleeve shirts, long pants, and hard-toed boots or other sturdy shoes appropriate to type and phase of work being performed.
- B. Contractor Tools And Equipment:
1. Contractor shall ensure:
 - a. Tools and equipment are in good working condition, well maintained, and have necessary guards in place.
 - b. Ground Fault Circuit Interrupters (GFCI) is utilized on power cords and tools.
 - c. Scaffolding and man lifts are in good working condition, erected and maintained as required by governmental regulations.
 - d. Ladders are in good condition, well maintained, used as specified by Manufacturer, and secured as required.
- C. Miscellaneous:
1. Contractor shall ensure:
 - a. Protection is provided on protruding rebar and other similar objects.
 - b. General Contractor Superintendent has completed the OSHA 10-hour construction outreach training course or equivalent.
 - c. Implementation and administration of safety program on Project.
 - d. Material Safety Data Sheets (MSDS) are provided for substances or materials for which an MSDS is required by governmental regulations before bringing on site.
 - e. Consistent safety training is provided to employees on Project.

2. Report accidents involving injury to employees on Project that require off-site medical treatment to Owner's designated representative.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are used to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
1. Specific quality assurance and quality control requirements for individual construction activities are specified in Sections that specify those activities and Section 01 4523. Requirements in those Sections may also cover production of standard products.
 2. Specified tests, inspections, and related actions do not limit Contractor's other quality control procedures that facilitate compliance with Contract Document requirements.
 3. Requirements for Contractor to provide quality assurance and quality control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Requirements:
1. Section 01 3200: 'Construction Progress Documentation' for developing a schedule of required tests and inspections.
 2. Section 01 3300: 'Submittal Procedures'.
 3. Section 01 4301: 'Quality Assurance - Qualifications' establishes minimum qualification levels required.
 4. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 5. Section 01 7300: 'Executions' for cutting and patching for repair and restoration of construction disturbed by testing and inspecting activities.
 6. Divisions 02 thru 49 establish responsibility for providing specific testing and inspections.

1.3 REFERENCES

- A. Association Publications:
1. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15th St., NW, Washington, DC 20005; 202-347-7474; www.acec.org).
 2. International Code Council (IBC):
 - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.
 3. The American Institute of Architects. AIA Document A201, *General Conditions of the Contract for Construction*. Washington, DC. 2007.
 4. The Construction Specifications Institute. *Project Resource Manual/CSI Manual of Practice*, 5th Edition. New York, McGraw-Hill, 2005.
- B. Definitions:

1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
2. Approved: To authorize, endorse, validate, confirm, or agree to.
3. Contract Documents: Engineering and Architectural Drawings and Specifications issued for construction, plus clarification drawings, addenda, approved change orders and contractor designed elements.
4. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with requirements indicated; and having complied with requirements of authorities having jurisdiction.
5. Field Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
6. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
7. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards. "Inspection" is not required by code provisions but may be required by Contract Documents. "Special inspection" is required by code provisions and by Contract Documents.
 - a. Inspection-Continuous: Full-time observation of work requiring inspection by approved inspector who is present in area where the work is being performed.
 - b. Inspection-Periodic: Part-time or intermittent observation of work requiring inspection by approved inspector who is present in area where the work has been or is being performed and at completion of the work.
8. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - a. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of corresponding generic name.
9. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish standard by which the Work will be judged.
10. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
11. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) whom will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
12. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
13. Product Testing: Tests and inspections that are performed by Testing Agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
14. Service Provider: Agency or firm qualified to perform required tests and inspections.
15. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
16. Special Inspector: Certified individual or firm that implements special inspection program for project.
17. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
18. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.

19. **Test/Special Test:** Field or laboratory tests to determine characteristics and quality of building materials and workmanship. "Test" is not required by code provisions but may be required by Contract Documents. "Special test" is required by code provisions and by Contract Documents.
20. **Verification:** Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.

1.4 CONFLICTING REQUIREMENTS

- A. **General:** If compliance with two or more standards is specified and standards establish different or conflicting requirements for minimum quantities or quality levels, comply with most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. **Minimum Quantity or Quality Levels:** Quantity or quality level shown or specified shall be minimum provided or performed. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for context of requirements. Refer uncertainties to Architect for decision before proceeding.

1.5 SUBMITTALS

- A. **Qualification Data:** Testing Agency to demonstrate their capabilities and experience per Article 1.7 "Quality Assurance".
- B. **Schedule of Tests and Inspections:** Prepare in tabular form and include following:
 1. Specification Section number and title.
 2. Description of test and inspection.
 3. Identification of applicable standards.
 4. Identification of test and inspection methods.
 5. Number of tests and inspections required.
 6. Time schedule or time span for tests and inspections.
 7. Entity responsible for performing tests and inspections.
 8. Requirements for obtaining samples.
- C. **Certified written reports of each inspection, test, or similar service will include, but not be limited:**
 1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of Testing Agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.

1.6 QUALITY ASSURANCE

- A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to verify compliance and guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Activities performed by Owner's Quality Assurance Testing Agency include, but are not limited to following:
 - 1. Preconstruction:
 - a. Review inspection requirements.
 - b. Review inspection frequency.
 - c. Review other material submittals.
 - d. Prepare non-compliance log to track non-compliant testing or inspections.
 - e. Review Quality Assurance personnel qualifications.
 - 2. Weekly Activities:
 - a. Summarize and track any non-compliance issues.
 - b. Provide summary report of previous week's performed Work.
 - c. Visit contractors periodically to find out if they have any concerns with Quality Assurance inspectors and check on any schedule changes.
 - d. Visit Owner's representatives periodically to find out if they have any concerns with how project is progressing.

1.7 QUALITY CONTROL

- A. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements performed by Contractor. They do not include inspections, tests or related actions performed by Architect, Owner, governing authorities or independent agencies hired by Owner or Architect.
 - 1. Where services are indicated as Contractor's responsibility, engage a qualified Testing Agency to perform these quality control services.
 - a. Contractor shall not employ same testing entity engaged by Owner, without Owner's written approval.
- B. Manufacturer's Field Services: Where indicated, engage factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 3300: "Submittal Procedures."
- C. Coordination: Coordinate sequence of activities to accommodate required quality assurance and quality control services with minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- D. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify Testing Agency sufficiently in advance of operations to permit assignment of personnel. Provide following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist Testing Agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require quality control by Testing Agency.
 - 7. Security and protection for samples and for testing and inspecting equipment at Project site.

- E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Weekly Activities:
 - a. Ensure that non-compliance log is current.
 - b. Provide summary reports of performed Work.

1.8 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified Testing Agency to conduct special tests and inspections required by authorities having jurisdiction as responsibility of Owner, and as follows:
 - 1. Requirements of Section 01 4523: "Testing and Inspecting Services" apply.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with Contract Document requirements for Section 01 7300 "Execution" for Cutting and Patching.
- B. Protect construction exposed by or for Quality Assurance and Quality Control activities.
- C. Repair and protection are Contractor's responsibility, regardless of assignment of responsibility for Quality Assurance and Quality Control Services.

END OF SECTION

SECTION 01 4100
REGULATORY REQUIREMENTS

1.1 ASBESTOS

- A. Contract Documents for this Project have been prepared in accordance with generally accepted professional architectural and engineering practices. Accordingly, no asbestos or products containing asbestos have been knowingly specified for this Project. Notify Architect immediately for instructions if materials containing asbestos are brought to site for inclusion in the Work.
- B. At Architect's direction and with Owner's approval, a certified asbestos inspector will collect samples and an independent testing laboratory will perform testing procedures on suspect materials.
- C. Certify that based upon best knowledge, information, inspection, and belief no building materials containing asbestos were used in construction of Project. Submit certification on form provided by Owner.

END OF SECTION

SECTION 01 4200

REFERENCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes But is Not Limited To:

1. Reference standards, definitions, specification format, and industry standards.

1.2 REFERENCES

A. Definitions:

1. Approved: The term "approved," when used to convey Architect's action on Contractor's submittals, applications, and requests, is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
2. Directed: The term "directed" is a command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," and "permitted" have the same meaning as "directed."
3. Experienced: The term "experienced," when used with an entity, means having successfully completed a minimum of ten previous projects similar in size and scope to this Project; being familiar with the special requirements indicated, and having complied with requirements of authority having jurisdiction.
4. Furnish: The term "furnish" means supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
5. General: Basic Contract definitions are included in the Conditions of the Contract.
6. Indicated: The term "indicated" refers to requirements expressed by graphic representations, or in written form on Drawings, in Specifications, and in other Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.
7. Install: The term "install" describes operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
8. Installer: An "Installer" is the Contractor or another entity engaged by the Contractor, as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
9. Project Site: The term "Project site" means the space available for performing construction activities. The extent of the Project site is shown on the Drawings and may not be identical with the description of the land on which the Project is to be built.
10. Provide: The term "provide" means to furnish and install, complete and ready for the intended use.
11. Regulations: The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
12. Submitted: The terms "submitted," "reported," "satisfactory" and similar words and phrases means submitted to Architect, reported to Architect and similar phrases.
13. Testing Agencies: A "testing agency" is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, or to report on and, if required, to interpret results of those inspections or tests.
14. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

B. References Standards:

1. Specification Format: Specifications will follow MasterFormat™ 2004 for organizing numbers and titles. (The Construction Specifications Institute, Project Resource Manual/CSI Manual of Practice, 5th Edition. New York, McGraw-Hill, 2005).
 - a. Specification Identifications:
 - 1) The Specifications use section numbers and titles to help cross referencing in the Contract Documents.
 - 2) Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
 - b. Specification Language:
 - 1) Specifications should be prepared, with concern and respect for their legal status. Specifications should be Clear, Concise, Correct and Complete.
 - 2) Streamlining: Streamlining is used to list products, materials, reference standards, and other itemized specifications. This technique places the subject first and provides keywords for quick reference
 - c. Sentence Structure:
 - 1) Specifications to be written in the "Imperative Mood".
 - a) The verb that clearly defines the action becomes the first word in the sentence.
 - b) The imperative sentence is concise and readily understandable.
 - 2) Streamlining is used to list products, materials, reference standards, and other itemized specifications. This technique places the subject first and provides keywords for quick reference.
 - d. Abbreviated Language:
 - 1) Abbreviations should be used only on drawings and schedules where space is limited.
 - 2) Abbreviations with multiple meanings should be avoided, unless used in different disciplines where their meaning is clear from the context in which they are used.
 - 3) Abbreviations should be limited to five or fewer letters
 - a) The verb that clearly defines the action becomes the first word in the sentence.
 - e. Symbols:
 - 1) Caution should apply to symbols substituted for words or terms.
 - f. Numbers:
 - 1) The use of Arabic numerals rather than words for numbers is recommended.
- C. Industry Standards:
 1. Except where Contract Documents specify otherwise, construction industry standards will apply and are made a part of Contract Documents by reference.
 2. Where compliance with two or more standards is specified and standards apparently establish different or conflicting requirements for minimum quantities or quality levels, refer to Architect for decision before proceeding. Quantity or quality level shown or specified will be minimum provided or performed. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for context of requirements. Refer uncertainties to Architect for decision before proceeding.
 3. Each entity engaged in construction on Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with Contract Documents. Where copies of standards are needed for performance of a required construction activity, Contractor will obtain copies directly from publication source.
 4. Trade Association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in Contract Documents, are defined to mean association names. Names and addresses are subject to change and are believed to be, but are not assured to be, accurate and up to date as of date of Contract Documents.

AABC	Associated Air Balance Council	Washington	DC	(202) 737-0202	www.aabchq.com
AAMA	American Architectural Manufacturers Association	Schaumburg	IL	(847) 303-5664	www.aamanet.org
AASHTO	American Association of State Highway & Transporta-	Washington	DC	(202) 624-5800	www.aashto.org

	tion Officials				
AAMA	American Architectural Manufacturers Association	Schamamburg	IL	(847) 303-5774	www.aamanet.org
AASHTO	American association of State Highways and Transportation Officials	Washington	DC		www.transportation.org www.aashto.org
ACI	American Concrete Institute International	Farmington Hills	MI	(248) 848-3700	www.aci-int.org
AGA	American Gas Association	Washington	DC	(202) 824-7000	www.aga.org
AHRI	Air Conditioning Heating & Refrigeration Institute	Arlington	VA	(703) 524-8800	www.ari.org
AIA	American Institution of Architects	Washington	DC	(202) 626-7300	www.aia.org
AISC	American Institute of Steel Construction	Chicago	IL	(312) 670-2400	www.aisc.org
AISI	American Iron & Steel Institute	Washington	DC	(202) 452-7100	www.steel.org
AITC	American Institution of Timber Construction	Englewood	CO	(303) 792-9559	www.aitc-glulam.org
AMCA	Air Movement & Control Association International	Arlington Heights	IL	(847) 394-0150	www.amca.org
ANSI	American National Standards Institute	New York	NY	(212) 642-4900	www.ansi.org
APA	APA-Engineered Wood Association	Tacoma	WA	(253) 565-6600	www.apawood.org
API	American Petroleum Institute	Washington	DC	(202) 682-8000	www.api.org
AQMD	South Coast Air Quality Management District	Diamond Bar	CA	(909) 396-2000	www.aqmd.gov
ASHRAE	American Society of Heating, Refrigerating, & Air-Conditioning Engineers	Atlanta	GA	(404) 636-8400	www.ashrae.org
ASME	American Society of Mechanical Engineers International	New York	NY	(800) 843-2763	www.asme.org
ASTM	ASTM International	West Conshohocken	PA	(610) 832-9500	www.astm.org
AWI	Architectural Woodwork Institute	Potomac Falls	VA	(571) 323-3636	www.awinet.org
AWPA	American Wood Protection Association	Birmingham	AL	(205) 733-4077	www.awpa.com
AWS	American Welding Society	Miami	FL	(800) 443-9353	www.aws.org
AWWA	American Water Works Assoc	Denver	CO	(303) 794-7711	www.awwa.org
BHMA	Builders Hardware Manufacturers Association	New York	NY	(212) 297-2122	www.buildershardware.com
BIA	Brick Industry Association	Reston	VA	(703) 620-0010	www.bia.org
CFI	International Certified Floor-covering Installers, Inc.	Kansas City	MO	(816) 231-4646	www.cfi-installers.org
CRI	Carpet & Rug Institution	Dalton	GA	(706) 278-3176	www.carpet-rug.com
CRSI	Concrete Reinforcing Steel Institute	Schaumburg	IL	(847) 517-1200	www.crsi.org
CISPI	Cast Iron Soil Pipe Institute	Chattanooga	TN	(423) 892-0137	www.cispi.org
DHI	Door & Hardware Institute	Chantilly	VA	(703) 222-2010	www.dhi.org
DIPRA	Ductile Iron Pipe Research Association.	Birmingham	AL	(205) 402-8700	www.dipra.org
EIMA	EIFS Industry Members Association	Morrow	GA	(800) 294-3462	www.eima.com

FM	FM Global	Johnston	RI	(401) 275-3000	www.fmglobal.com
FSC	Forest Stewardship Council	Bonn, Germany		+49 (0) 228 367 66 0	www.fsc.org
GA	Gypsum Association	Hyattsville	MD	(301) 277-8686	www.gypsum.org
GS	Green Seal	Washington	DC	(202) 872-6400	www.greenseal.org
HPVA	Hardwood Plywood & Veneer Association	Reston	VA	(703) 435-2900	www.hpva.org
ICC	International Code Council	Washington	DC	(888) 422-7233	www.iccsafe.org
ICC-ES	ICC Evaluation Service	Whittier	CA	(562) 699-0543	www.icc-es.org
ICBO	International Conference of Building Officials				(See ICC)
ISO	International Organization for Standardization	Geneva, Switzerland			www.iso.org
ISSA	International Slurry Surfacing Association	Annapolis	MD	(410) 267-0023	www.slurry.org
KCMA	Kitchen Cabinet Manufacturers Association	Reston	VA	(703) 264-1690	www.kcma.org
LPI	Lightning Protection Institute	Maryville	MO	(800) 488-6864	www.lightning.org
MFMA	Maple Flooring Manufacturers' Association	Deerfield	IL	(888) 480-9138	www.maplefloor.org
MSS	Manufacturer's Standardization Society of The Valve and Fittings Industry	Vienna	VA	(703) 281-6613	www.mss-hq.com
NAAMM	National Association of Architectural Metal Manufacturers	Glen Ellyn	IL	(630) 942-6591	www.naamm.org
NEC	National Electric Code	(from NFPA).			
NEMA	National Electrical Manufacturer's Association	Roslyn	VA	(703) 841-3200	www.nema.org
NFPA	National Fire Protection Association	Quincy	MA	(800) 344-3555	www.nfpa.org
NFRC	National Fenestration Rating Council	Greenbelt	MD	(301) 589-1776	www.nfrc.org
NSF	NSF International	Ann Arbor	MI	(734) 769-8010	www.nsf.org
PCA	Portland Cement Association	Skokie	IL	(847) 966-6200	www.cement.org
PCI	Precast / Prestressed Concrete Institute	Chicago	IL	(312) 786-0300	www.pci.org
PEI	Porcelain Enamel Institute	Norcross	GA	(770) 676-9366	www.porcelainenamel.com
RFCI	Resilient Floor Covering Institute	LaGrange	GA	(706) 882-3833	www.rfci.com
SCTE	Society of Cable Telecommunications Engineers	Exton	PA	(800) 542-5040	www.scte.org
SDI	Steel Deck Institute	Fox River Grove	IL	(847) 458-4647	www.sdi.org
SDI	Steel Door Institute	Westlake	OH	(440) 899-0010	www.steeldoor.org
SIGMA	Sealed Insulating Glass Manufacturer's Association	Chicago	IL	(312) 644-6610	www.arcat.com
SJI	Steel Joist Institute	Myrtle Beach	SC	(843) 293-1995	www.steeljoist.org
SMACNA	Sheet Metal & Air Conditioning Contractors National Association	Chantilly	VA	(703) 803-2980	www.smacna.org
SPIB	Southern Pine Inspection Bureau	Pensacola	FL	(850) 434-2611	www.spib.org
SSMA	Steel Stud Manufacturer's Association	Glen Ellyn	IL	(630) 942-6592	www.ssma.com
TCNA	Tile Council of North Amer-	Anderson	SC	(864) 646-8453	www.tileusa.com

	ica				
TPI	Truss Plate Institute	Alexandria	VA	(703) 683-1010	www.tpinst.org
TPI	Turfgrass Producers International (formally American Sod Producers Association)	East Dundee	IL	(847) 649-5555	www.turfgrasssod.org
UL	Underwriters Laboratories	Camas	WA	(877) 854-3577	www.ul.com
WDMA	Window and Door Manufacturer's Association	Chicago	IL	(312) 321-6802	www.nwwda.org
WWPA	Western Wood Products Association	Portland	OR	(503) 224-3930	www.wwpa.org

D. Federal Government Agencies:

- Names and titles of federal government standard or specification producing agencies are often abbreviated. Following acronyms or abbreviations referenced in Contract Documents represent names of standard or specification producing agencies of federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up to date as of date of Contract Documents.

CS	Commercial Standard (U S Department of Commerce)	Washington	DC	(202) 512-0000	www.doc.gov
EPA	Environmental Protection Agency	Washington	DC	(202) 272-0167	www.epa.gov
FCC	Federal Communications Commission	Washington	DC	(888) 225-5322	www.fcc.gov
FS	Federal Specifications Unit (Available from GSA)	Washington	DC	(202) 619-8925	www.gsa.gov
MIL	Military Standardization Documents (U S Department of Defense)	Philadelphia	PA	(215) 697-2179	www.dod.gov
NIST	National Institute of Standards and Technology, technology Administration (US Department of Commerce)	Gaithersburg	MD	(301) 975-4500	www.ts.nist.gov
OSHA	Occupational Safety & Health Administration (U S Department of Labor)	Washington	DC	202) 219-8148	www.osha.gov
PS	Product Standard of NBS (U S Department of Commerce)	Washington	DC	(202) 512-1800	www.doc.gov

E. Governing Regulations / Authorities:

- Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.
- Obtain copies of regulations required to be retained at Project Site, available for reference by parties who have a reasonable need for such reference.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 4301**QUALITY ASSURANCE - QUALIFICATIONS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Related Documents:
1. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Requirements:
1. Section 01 4000: 'Quality Requirements' includes administrative and procedural requirements for quality assurance and quality control.
 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.

1.2 REFERENCES

- A. Definitions:
1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
 2. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
 3. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
 4. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
- B. Reference Standards:
1. ASTM International:
 - a. ASTM E329-09, 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.'

1.3 QUALIFICATIONS

- A. Qualifications: Qualifications paragraphs in this Article establish minimum qualification levels required; individual Specification Sections specify additional requirements:
1. Fabricator / Supplier / Installer Qualifications: Firm experienced in producing products similar to those indicated for this Project and with record of successful in-service performance, as well as sufficient production capacity to produce required units.
 2. Factory-Authorized Service Representative Qualifications:
 - a. Authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
 3. Installer Qualifications:
 - a. Firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
 4. Manufacturer Qualifications:

- a. Firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
5. Manufacturer's Field Services Qualifications:
 - a. Experienced authorized representative of manufacturer to inspect field-assembled components and equipment installation, including service connections.
6. Professional Engineer Qualifications:
 - a. Professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
7. Specialists:
 - a. Certain sections of Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations.
 - b. Specialists shall satisfy qualification requirements indicated and shall be engaged for activities indicated.
 - c. Requirement for specialists shall not supersede building codes and regulations governing the Work.
8. Testing Agency Qualifications:
 - a. Independent Testing Agency with experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1) Testing Laboratory:
 - a) AASHTO Materials Reference Laboratory (AMRL) Accreditation Program.
 - b) Cement and Concrete Reference Laboratory (CCRL).
 - c) Nationally Recognized Testing Laboratory (NRTL): Nationally recognized testing laboratory according to 29 CFR 1910.7.
 - d) National Voluntary Laboratory (NVLAP): Testing Agency accredited according to National Institute of Standards and Technology (NIST) Technology Administration, U. S. Department of Commerce Accreditation Program.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 4500
QUALITY CONTROL

1.1 FIELD QUALITY CONTROL PROCEDURES

- A. Inspection and testing by Owner, Architect, Contractor, their consultants or government agencies to examine Work performed by Contractor does not relieve Contractor of responsibility for compliance with Contract Documents.
- B. Quality control services include inspections, tests and related actions including reports, performed by Contractor. They do not include inspections, tests or related actions performed by Architect, Owner, governing authorities or independent agencies hired by Owner or Architect.
 - 1. Contractor and each agency engaged to do inspections, tests, and similar services will coordinate sequence of activities to accommodate required services with minimum of delay. In addition, Contractor and each agency will coordinate activities to avoid necessity of removing and replacing construction to accommodate inspections and tests. Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
 - 2. Provide inspections, tests, and similar quality control services specified in individual specification Sections or required by governing authorities.
 - 3. Where results of inspections, tests, or similar services show that the Work does not comply with Contract Document requirements, correct the deficiencies in the Work.
 - 4. Cooperate with agencies performing required inspections, tests, and similar services and provide reasonable auxiliary services as requested. Notify agency sufficiently before operations to allow assignment of personnel. Auxiliary services required include but are not limited to:
 - a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
 - b. Taking adequate quantities of representative samples of materials that require testing or helping agency in taking samples.
 - c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
 - d. Providing agency with preliminary design mix proposed for use for materials mixes that require control by testing agency.
 - e. Securing and protecting samples and test equipment at Project site.
- C. Upon completion of inspection, testing, sample-taking, and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Documents in making such repairs.
- D. Protect construction exposed by or for quality control service activities, and protect repaired construction.
- E. Repair and protection is Contractor's responsibility, regardless of who caused the inspection, testing, or similar services.

1.2 TESTING AND INSPECTING SERVICES

- A. Engage inspection and testing service agencies, including independent testing laboratories and written approval of Architect. Each independent inspection and testing agency engaged on Project will be licensed and authorized to operate in the jurisdiction in which Project is located.
- B. Duties of Testing Agency:
 - 1. Independent testing agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual specification Sections will cooperate with Architect and Contractor

in performance of its duties and will provide qualified personnel to perform required inspections and tests.

2. Agency will notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
3. Agency is not authorized to release, revoke, alter, or enlarge requirements of Contract Documents, or approve or accept any portion of the Work.
4. Agency will not perform any duties of Contractor.

C. Submittals:

1. Independent testing agency will submit certified written report of each inspection, test, or similar service, to Architect, in duplicate, unless Contractor is responsible for service. If Contractor is responsible for service, submit certified written report of each inspection, test, or similar service through Contractor, in duplicate.
 - a. Submit additional copies of each written report directly to governing authority, when authority so directs.
 - b. Written reports of each inspection, test, or similar service will include, but not be limited to:
 - 1) Date of issue.
 - 2) Project title and number.
 - 3) Name, address and telephone number of testing agency.
 - 4) Dates and locations of samples and tests or inspections.
 - 5) Names of individuals making the inspection or test.
 - 6) Designation of the Work and test method.
 - 7) Identification of product and specification Section.
 - 8) Complete inspection or test data.
 - 9) Test results and interpretations of test results.
 - 10) Ambient conditions at time of sample-taking and testing.
 - 11) Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
 - 12) Name and signature of laboratory inspector.
 - 13) Recommendations on retesting.

END OF SECTION

SECTION 01 4523**TESTING AND INSPECTING SERVICES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes testing, inspections, special testing, special inspections, and testing laboratory services for materials, products, and construction methods as specified hereafter for the Work.
- B. Specified tests, inspections, and related actions do not limit Contractor's quality control procedures to fully comply with Contract Document requirements in all regards.
- C. Costs: Costs of initial services for testing and inspection personnel will be paid by Owner unless otherwise noted.
1. If initial tests indicate non-compliance with contract document requirements, any subsequent testing will be performed by same personnel and paid for by Contractor.
- D. Related Requirements:
1. Section 01 4000: 'Quality Requirements' includes administrative and procedural requirements for quality assurance and quality control.
 2. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
 3. Divisions 02 thru 49 Establish responsibility for providing specific testing and inspections and Field Tests and Inspections.

1.3 REFERENCES

- A. Association Publications:
1. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15th St., NW, Washington, DC 20005; 202-347-7474; www.acec.org).
 2. International Code Council (IBC):
 - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.
- B. Definitions:
1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
 2. Approved: To authorize, endorse, validate, confirm, or agree to.
 3. Contract Documents: Engineering and Architectural Drawings and Specifications issued for construction, plus clarification drawings, addenda, approved change orders and contractor designed elements.
 4. Experienced: When used with an entity, "experienced" means having successfully completed minimum of five previous projects similar in size and scope to this Project; being familiar with requirements indicated; and having complied with requirements of authorities having jurisdiction.

5. Field Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
 6. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
 7. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards. "Inspection" is not required by code provisions but may be required by Contract Documents. "Special inspection" is required by code provisions and by Contract Documents.
 - a. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
 - b. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
 8. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
 - a. Using term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of corresponding generic name.
 9. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation. They are not samples. Approved mockups establish standard by which the Work will be judged.
 10. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
 11. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) whom will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
 12. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
 13. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
 14. Service Provider: Agency or firm qualified to perform required tests and inspections.
 15. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
 16. Special Inspector: Certified individual or firm that implements special inspection program for project.
 17. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
 18. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
 19. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship. "Test" is not required by code provisions but may be required by Contract Documents. "Special test" is required by code provisions and by Contract Documents.
 20. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.
- C. Reference Standards:
1. ASTM International:
 - a. ASTM C1021-08, 'Standard Practice for Laboratories Engaged in Testing of Building Sealants.'
 - b. ASTM C1077-09b, 'Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.'

- c. ASTM C1093-09, 'Standard Practice for Accreditation of Testing Agencies for Masonry.'
- d. ASTM D3666-09a, 'Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials.'
- e. ASTM D3740-08, 'Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.'
- f. ASTM E329-09: 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.'
- g. ASTM E543-09, 'Standard Specification for Agencies Performing Nondestructive Testing.'
- h. ASTM E1212-09, 'Standard Practice for Quality Management Systems for Nondestructive Testing Agencies.'

1.4 SUBMITTALS

- A. Informational Submittals:
 - 1. Certificates:
 - a. Testing Agency will submit certified written report of each inspection, test, or similar service.
- B. Tests and Evaluation Reports:
 - 1. Testing and Inspection Reports:
 - a. Testing Agency or Agencies will prepare logs, test reports, and certificates applicable to specific tests and inspections and deliver copies (or electronic record) distributed as follows:
 - 1) 1 copy to Owner's Representative.
 - 2) 1 copy to Architect.
 - 3) 1 copy to Consulting Engineers (Engineer of Record).
 - 4) 1 copy to General Contractor.
 - 5) 1 copy to Authorities Having Jurisdiction (if required).
 - b. Other tests, certificates, and similar documents will be obtained by Contractor and delivered to Owner's Representative and Architect in such time as not to delay progress of the Work or final payment therefore.
 - 2. Source Quality Control Submittals:
 - a. Testing Agency will submit following prior to commencing the Work:
 - 1) Qualifications of Testing Agency management and personnel designated to project.
 - 2) Testing Agency "Written Practice for Quality Assurance."
 - 3) Qualification records for Inspector and non-destructive testing technicians designated for project.
 - 4) Testing Agency non-destructive testing procedures, equipment calibration records, and personnel training records.
 - 5) Testing Agency Quality Control Plan for monitoring and control of testing operations.
 - 6) Welding Inspection Procedures (Structural Steel testing).
 - 7) Bolting Inspection Procedures (Structural Steel testing).
 - 8) Shear Connector Stud Inspection Procedures (Structural Steel testing).
 - 9) Seismic Connections Inspection Procedures (Structural Steel testing).
- C. Additional submittal requirements are specified in Individual Sections in Divisions 02 through 49.

1.5 QUALITY ASSURANCE

- A. Owner or Owner's designated representative(s) will perform quality assurance. Owner's quality assurance procedures may include observations, inspections, testing, verification, monitoring and any other procedures deemed necessary by Owner to verify compliance with Contract Documents.
- B. Owner will employ independent Testing Agencies to perform certain specified testing, as Owner deems necessary. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents.

- C. Certification: Product producers and associations, which have instituted approved systems of quality control and which have been approved by document approval agencies, are not required to have further testing. Concrete mixing plants, plants producing fabricated concrete and wood or plywood products certified by agency, lumber, plywood grade marked by approved associates, and materials or equipment bearing underwriters' laboratory labels require no further testing and inspection.
- D. Written Practice for Quality Assurance: Testing Agency will maintain written practice for selection and administration of inspection personnel, describing training, experience, and examination requirements for qualification and certification of inspection personnel. Written practice will describe testing agency procedures for determining acceptability of structure in accordance with applicable codes, standards, and specifications. Written practice will describe Testing Agency inspection procedures, including general inspection, material controls, visual welding inspection, and bolting inspection.

1.6 QUALITY CONTROL

- A. Quality Control will be sole responsibility of Contractor. Contractor will be responsible for testing, coordination, start-up, operational checkout, and commissioning of all items of the Work included in Project. All costs for these services will be included in Contractor's cost of the Work.
- B. Contractor will assign one employee to be responsible for Quality Control. This individual may have other responsibilities and may be Contractor's Project superintendent or Contractor's Project Manager.
- C. Notify results of all Testing and Inspection performed by Contractor's independent Testing Agencies to Architect and Owner's Representative within 24 hours of test or inspection having been performed.
 - 1. Testing and Inspection Reports will be distributed as follows:
 - a. 1 copy to Owner's Representative.
 - b. 1 copy to Architect.
 - c. 1 copy to Consulting Engineer(s) (Engineer of Record).
 - d. 1 copy to Authorities Having Jurisdiction (if required).

1.7 TESTS AND INSPECTIONS - GENERAL

- A. Testing specifically identified to be conducted by Owner, will be performed by an independent entity and will be arranged and paid for by Owner.
- B. Individual Sections in Divisions 02 through 49 indicate if Owner will provide testing and inspection of the Work of that Section.
- C. Owner may engage additional consultants for testing, air balancing, commissioning, or other special services. Activities of any such Owner consultants are in addition to Contractor testing of materials or systems necessary to prove that performance is in compliance with Contract requirements. Contractor must cooperate with persons and firms engaged in these activities.
- D. Scheduling Testing Agency:
 - 1. Contractor will coordinate the Work and facilitate timeliness of such testing and inspecting services so as not to delay the Work.
 - 2. Contractor will notify Testing Agency and Architect to schedule tests and / or inspections.
 - a. Architect will notify Owner's Representative before each test and / or inspection.
- E. For "building-wide" and/or life safety systems, such as emergency lighting, emergency power uninterruptible power supply systems, fire alarm, fire sprinkler systems, smoke evacuation systems, toxic gas monitoring, capturer exhaust systems, etc. formal start-up inspection will be completed prior to requesting Substantial Completion Inspection for any area of Project:
 - 1. Manufacturer's representatives and installing contractor will demonstrate both operation and compliance to Owner's agents and consultants. If coordinated and scheduled appropriately by

Contractor, these equipment and/or systems inspections may also serve to provide required Owner training, if approved in advance by Owner.

2. Contractor responsible for requesting that Architect arrange for inspection of materials, equipment, and work prior to assembly or enclosure that would make materials, equipment, or work inaccessible for inspection and at other times as may be required.

1.8 CONTRACTOR'S RESPONSIBILITY

- A. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents.
- B. Tests and inspections that are not explicitly assigned to Owner are responsibility of Contractor.
- C. Cooperate with Testing Agency(s) performing required inspections, tests, and similar services and provide reasonable auxiliary services as requested. Notify Testing Agency before operations to allow assignment of personnel. Auxiliary services required include but are not limited to:
 1. Providing access to the Work and furnishing incidental labor, equipment, and facilities deemed necessary by Testing Agency to facilitate inspections and tests at no additional cost to Owner.
 2. Taking adequate quantities of representative samples of materials that require testing or helping Testing Agency in taking samples.
 3. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
 4. Providing Testing Agency with preliminary design mix proposed for use for materials mixes that require control by Testing Agency.
- D. Contractor will integrate Owner's independent Testing Agency services within Baseline Project Schedule and with other Project activities.
- E. For any requested inspection, Contractor will complete prior inspections to ensure that items are ready for inspection.
- F. All Work is subject to testing and inspection and verification of correct operation prior to 100% payment to Contractor of line item(s) pertaining to that aspect of the Work.
- G. For Mechanical Equipment, inspection and documented approval of individual equipment and/or system(s) must be accomplished prior to requesting Substantial Completion Inspection for any area affected by said equipment and/or system.
 1. Contractor will perform thorough checkout of operations with manufacturer's representatives prior to requesting formal inspection by Owner. Contractor must notify Owner's Representative, in advance, as to when manufacturer's representative is scheduled to arrive at Site.
- H. Comply:
 1. Upon completion of Testing Agency's inspection, testing, sample-taking, and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.
 2. Comply with Contract Documents in making such repairs.
- I. Data: Furnish records, drawings, certificates, and similar data as may be required by testing and inspection personnel to assure compliance with Contract Documents.
- J. Defective Work (Non-Conforming Work): Non-conforming Work as covered in General Conditions applies, but is not limited to following requirements:
 1. Where results of inspections, tests, or similar services show that the Work does not comply with Contract Document requirements, correct deficiencies in the Work promptly to avoid Work delays.
 2. Where testing personnel take cores or cut-outs to verify compliance, repair prior to acceptance.
 3. Contractor responsible for any and all costs incurred resulting from inspection that was scheduled prematurely or retesting due to failed tests.

4. Remove and replace any Work found defective or not complying with contract document requirements at no additional cost to Owner.
 5. Should test return unacceptable results, Contractor will bear all costs of retesting and re-inspection as well as cost of all material consumed by testing, and replacement of unsatisfactory material and/or workmanship.
- K. Protection:
1. Protect construction exposed by or for quality assurance and quality control service activities, and protect repaired construction.
- L. Scheduling: Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
1. Schedule testing and inspections in advance so as not to delay the Work and to eliminate any need to uncover Work for testing or inspection.
 2. Notify Testing Agency and Architect as noted in Sections in Divisions 02 thru 49 prior to any time required for such services.
 3. Incorporate adequate time for performance of all inspections and correction of noted deficiencies.
 4. Schedule sequence of activities to accommodate required services with minimum of delay.
 5. Schedule sequence of activities to avoid necessity of removing and replacing construction to accommodate testing and inspections.
- M. Test and Inspection Log:
1. Provide system of tracking all field reports, describing items noted, and resolution of each item. Prepare record of tests and inspections. Include following:
 - a. Date test or inspection was conducted.
 - b. Description of the Work tested or inspected.
 - c. Date test or inspection results were transmitted to Architect.
 - d. Identification of Testing Agency or inspector conducting test or inspection.
 2. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

1.9 TESTING AGENCY SERVICES AND RESPONSIBILITIES

- A. Testing Agency, including independent testing laboratories, will be licensed and authorized to operate in jurisdiction in which Project is located.
1. Approved Testing Agency Qualifications: Requirements of Section 01 4301 apply.
- B. Testing and Inspection Services:
1. Testing Agency will not release, revoke, alter, or increase Contract Document requirements or approve or accept any portion of the Work.
 2. Testing Agency will not give direction or instruction to Contractor.
 3. Testing Agency will have full authority to see that the Work is performed in strict accordance with requirements of Contract Documents and directions of Owner's Representative and/or Architect.
 4. Testing Agency will not provide additional testing and inspection services beyond scope of Work without prior approval of Owner's Representative and / or Architect.
- C. Testing Agency Duties:
1. Independent Testing Agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual specification Sections will cooperate with Architect and Contractor in performance of its duties and will provide qualified personnel to perform required inspections and tests.
 2. Testing Agency will test or obtain certificates of tests of materials and methods of construction, as described herein or elsewhere in technical specification.
 3. Testing Agency will provide management, personnel, equipment, and services necessary to perform testing functions as outlined in this section.
 4. Testing Agency must have experience and capability to conduct testing and inspecting indicated by ASTM standards and that specializes in types of tests and inspections to be performed.

5. Testing Agency will comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, ASTM D3666, ASTM D3740, and other relevant ASTM standards.
 6. Testing Agency must calibrate all testing equipment at reasonable intervals (minimum yearly) with accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.
 7. Welding Procedure Review: Testing Agency will provide review and approval or rejection of all welding procedures to be used and will verify compliance with all reference standard requirements.
- D. Testing and Inspection Reports:
1. Conduct and interpret tests and inspections and state in each report whether tested and inspected the Work complies with or deviates from requirements.
 2. Laboratory Reports: Testing Agency will furnish reports of materials and construction as required, including:
 - a. Description of method of test.
 - b. Identification of sample and portion of the Work tested.
 - 1) Description of location in the Work of sample.
 - 2) Time and date when sample was obtained.
 - 3) Weather and climatic conditions at time when sample was obtained.
 - c. Evaluation of results of tests including recommendations for action.
 3. Inspection Reports: Testing Agency will furnish "Inspection at Site" reports for each site visit documenting activities, observations, and inspections. Include notation of weather and climatic conditions, time and date conditions and status of the Work, actions taken, and recommendations or evaluation of the Work.
 4. Reporting Testing and Inspection (Conforming Work):
 - a. Submit testing and inspection reports as required within 24 hours of test or inspection having been performed.
 5. Reporting Testing and Inspection Defective Work (Non-Conforming Work):
 - a. Testing Agency, upon determination of irregularities, deficiencies observed or test failure(s) observed in the Work during performance of its services of test or inspection having been performed, will:
 - 1) Verbally notify results to Architect, Contractor, and Owner's Representative within one hour of test or inspection having been performed (if Defective Work (Non-Conforming Work) is incorporated into project).
 - 2) Submit written inspection report and test results as required within 24 hours of test or inspection having been performed.
 6. Final Report:
 - a. Submit final report of tests and inspections at Substantial Completion, which identify unresolved deficiencies.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
1. Field Tests and Inspections requirements are described in 'Field Quality Control' in Divisions 02 thru 49 Sections.

END OF SECTION

SECTION 01 4546**DUCT TESTING, ADJUSTING, AND BALANCING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Test, balance, and adjust new air duct systems as described in Contract Documents.
- B. Related Sections: :
 - 1. Section 01 4000: "Quality Requirements" for administrative and procedural requirements for quality assurance and quality control.
 - 2. Section 01 4301: "Quality Assurance – Qualifications" for minimum qualification levels required.
 - 3. Section 01 4523: "Testing and Inspecting" for testing, inspection, special testing, and testing laboratory services for materials, products, and construction methods.
 - 4. Division 23:
 - a. Completing installation and start-up of mechanical systems, and changing sheaves, belts, and dampers as required for correct balance.
 - b. Maintain HVAC system and equipment in full operation each working day of testing, balancing, and adjusting.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Assisting Testing Agency in testing and balancing of mechanical system.
- B. Scheduling:
 - 1. Schedule this work in cooperation with other Sections involved and to comply with completion date for test, balance, and adjust air duct systems as described in Contract Documents.
 - 2. Contact Testing Agency and coordinate:
 - a. One inspection when 100 percent of equipment and ductwork is installed.
 - 3. Contact Testing Agency and coordinate date(s) for test and balance work when the following is completed:
 - a. HVAC and exhaust systems including installation of specialties, devices, and new filters.
 - b. Proper function of control system components including electrical interlocks, damper sequences, air and water reset, and fire and freeze stats has been verified.
 - c. Automatic temperature controls have been calibrated and set for design operating conditions.
 - d. Verification of proper thermostat calibration and setting of control components such as static pressure controllers and other devices that may need set points changed during process of balancing system.
 - 4. If, in the opinion of the Testing Agency, the systems are not ready for test and balance, reschedule as required.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Test and Evaluation Reports:
 - a. Preliminary Report(s):
 - 1) Four copies to be given to Owner's Representative.
 - b. Final Report :

- 1) Four copies to be given to Owner's Representative.

B. Closeout Submittals:

1. Operations and Maintenance Data: Include following in Operations And Maintenance Manual specified in Section 01 7800.
 - a. Final report.

C. Closeout Submittals:

1. Operations and Maintenance Material: Include following in Operations And Maintenance Manual specified in Section 01 7800.
 - a. Bind approved copy of Test and Evaluation report in Operations And Maintenance Manual for Division 23.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Approved Testing Agency. See Section 01 4301.
 - a. Testing Agency shall specialize in testing and balancing of heating, ventilating, and cooling systems to balance, adjust, and test air moving equipment, air distribution, and exhaust systems.
 - b. Testing Agency shall provide proof of having successfully completed at least five years of specialized experience in air and hydronic system balancing.
 - c. Testing Agency shall provide testing under direct supervision of qualified heating and ventilating engineer.
 - d. Neither Architect's engineering consultant nor anyone performing work on this Project under other Sections of Division 23 shall be permitted to do this work.
2. Testing and Inspection.
 - a. Owner will provide Testing and Inspection:
 - 1) See Section 01 1200: "Multiple Contract Summary".

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 PREPARATION

- A. Heating, ventilating, and cooling systems and equipment shall be in full operation and continue in operation during each working day of testing and balancing.

END OF SECTION

SECTION 01 5100
TEMPORARY UTILITIES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Temporary Utilities.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Where necessary, engage appropriate local utility companies to install temporary service or connect to existing service. Where utility company provides only part of service, provide remainder with matching, compatible materials and equipment. Comply with utility company's recommendations.
1. Comply with industry standards and applicable laws and regulations of authorities having jurisdiction.
 2. Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.
 3. Arrange with utility company and existing users for time when service can be interrupted, where necessary, to make connections for temporary services.
 4. Provide adequate capacity at each stage of construction. Before temporary utility availability, provide trucked-in services.
 5. Obtain construction easements necessary to bring temporary and/or permanent utilities to site.
 6. Use qualified personnel for installation and maintenance of temporary facilities. Locate facilities where they will serve Project adequately and result in minimum interference with the Work of Owner or other Contractors on Project Site. Relocate and modify facilities as required.
 7. Pay cost and use charges for temporary facilities and utilities.
- B. Prepare schedule indicating dates for implementation and termination of each temporary utility. At earliest feasible time and when acceptable to Owner, change over from use of temporary service to use of permanent service.
- C. Keep temporary utilities clean and neat in appearance. Operate in safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or allow them to interfere with progress of The Work. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on Project site.
- D. Limit availability of temporary utilities to essential and intended uses to reduce waste and abuse.
- E. Maintain utilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour day basis where required to achieve indicated results and to avoid possibility of damage.
 2. Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- F. Remove each temporary utility and control when need has ended, or when replaced by authorized use of permanent utility, or by Substantial Completion. Complete permanent construction that may have been delayed because of interference with temporary utility. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that make up temporary utilities are property of Contractor.

2. By Substantial Completion, clean and renovate permanent utilities used during construction period, including but not limited to:
 - a. Replace air filters and clean inside of ductwork and housings.
 - b. Replace significantly worn parts and parts subjected to unusual operating conditions.
 - c. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

1.3 TEMPORARY ELECTRIC POWER

- A. Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period.

1.4 TEMPORARY FIRE PROTECTION

- A. Install and maintain temporary fire protection facilities of types needed to protect against predictable and controllable fire losses. At a minimum, provide and maintain in working order two Standard UL Labeled ABC all-purpose 10 lb fire extinguishers. Do not incorporate these extinguishers into final Project.
 1. Locate fire extinguishers where convenient and effective for their intended purpose.
 2. Store combustible materials in containers in fire-safe locations.
 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires.
 4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
 5. At earliest feasible date in each area of Project, complete installation of permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 5200
CONSTRUCTION FACILITIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Construction Facilities.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Prepare schedule indicating dates for implementation and termination of each temporary facility.
- B. Keep temporary facilities clean and neat in appearance. Operate in safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or allow them to interfere with progress of The Work. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on Project site.
- C. Maintain facilities in good operating condition until removal.
- D. Remove each temporary facility when need has ended, or when replaced by authorized use of permanent facility, or by Substantial Completion. Complete permanent construction that may have been delayed because of interference with temporary facility. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that make up temporary facilities are property of Contractor.
 2. By Substantial Completion, clean and renovate permanent facilities used during construction period.

1.3 FIELD OFFICES

- A. Provide and maintain insulated, weather tight temporary office of sufficient size to accommodate Contractor's personnel at Project site and for use by Owner, Architect and Subcontractors.
1. Keep office clean and orderly.
 2. Heat and cool office as needed.
 3. Furnish office with locking door, light(s), table(s), bench(es), rack(s) for drawings, telephone, and FAX machine.
 4. Make office available for progress meetings.
 5. Provide an operable fire extinguisher in facility.
 6. Provide hardhats for Owner's Representatives for site visits.
- B. If Owner agrees to permit removal of temporary office before Substantial Completion, Contractor may use a room as an office after temporary office is removed. Equip room as specified above and restore to 'like-new' condition before Substantial Completion.

1.4 SANITARY FACILITIES

- A. Provide temporary sanitary toilet. Service and maintain temporary toilet in a clean, sanitary condition.

1100033RA

Indio Mental Health
Milestones Building Renovation

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 5500

VEHICULAR ACCESS AND PARKING

1.1 TEMPORARY PARKING AREAS

- A. Coordinate with Owner and facility staff for designated Contractor access and parking. Do not interfere or obstruct facility staff parking or access. The facility will remain open and in operation during entire construction period.

1.2 STAGING AREAS

- A. Coordinate with Owner and facility staff for location of staging area. Contractor shall not block or prevent access to facility while setting up, maintaining or removal of staging area.
- B. Contractor will be required to have a storage container for onsite material and/or equipment to be installed at construction site.

END OF SECTION

SECTION 01 5600**TEMPORARY BARRIERS AND ENCLOSURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Temporary Barriers and Enclosures.

1.2 GENERAL

- A. Protection Of Existing Improvements: Protect streets and sidewalks, including overhead protection where required. Repair damage to existing improvements caused by construction activities.
- B. Protection Of Adjacent Property: Provide necessary protection for adjacent property and lateral support thereof.

1.3 TEMPORARY BARRICADES

- A. Comply with standards and code requirements in erecting barricades, warning signs, and lights.
- B. Take necessary precautions to protect persons, including members of the public, from injury or harm.

1.4 TEMPORARY FENCING

- A. Before construction begins, install 6 foot high enclosure fence with lockable entrance gates. Enclose portion of site sufficient to accommodate construction operations. Coordinate location with Owner prior to installation of temporary fencing.

1.5 TEMPORARY SECURITY BARRIERS

- A. Install temporary enclosures of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and other violations of security.
- B. Secure materials and equipment stored on site.
- C. Secure building at the end of each work day.
- D. Maintain exterior building security until Substantial Completion.

1.6 TEMPORARY TREE AND PLANT PROTECTION

- A. Protection:
 - 1. Before commencing site work, build and maintain protective fencing around existing trees and vegetation.
 - 2. Individual trees will have protective fencing built beyond drip line if required.
 - 3. Build protective fencing around groups of trees and other vegetation as required for protection of existing trees.
 - 4. Keep areas within protective fencing undisturbed and do not use for any purpose.

B. Maintenance:

1. Maintain existing tree, shrubs, and vegetation:
 - a. Remove and replace vegetation that dies or is damaged beyond repair due to construction activities.
 - b. Damage to any tree, shrub, or vegetation that has been indicated to remain and be protected, will have a cost associated with it. This includes branches, trunk and root systems:
 - 1) Trees: \$1,000.00.
 - 2) Shrubs: \$ 100.00.
 - 3) Vegetation: \$ 50.00.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 6100

COMMON PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Common Product Requirements.

1.2 GENERAL

- A. Provide products that comply with Contract Documents, that are undamaged, and, unless otherwise indicated, new and unused at time of installation. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and for intended use and effect.
- B. Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on surfaces of products that will be exposed to view in occupied spaces or on building exterior.
1. Locate required product labels and stamps on concealed surface or, where required for observation after installation, on accessible surface that is not conspicuous.
 2. Provide permanent nameplates on items of service-connected or power-operated equipment. Locate on easily accessible surface that is inconspicuous in occupied spaces. Nameplate will contain following information and other essential operating data:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
- C. Where specifications describe a product or assembly by specifying exact characteristics required, with or without use of brand or trade name, provide product or assembly that provides specified characteristics and otherwise complies with Contract requirements.
- D. Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by manufacturer for application described. General overall performance of product is implied where product is specified for specific application. Manufacturer's recommendations may be contained in published product literature, or by manufacturer's certification of performance.
- E. Where specifications only require compliance with an imposed code, standard, or regulation, select product that complies with standards, codes or regulations specified.
- F. Where Specifications require matching an established Sample, Architect's decision will be final on whether proposed product matches satisfactorily. Where no product available within specified category matches satisfactorily nor complies with other specified requirements, refer to Architect.
- G. Where specified product requirements include phrase *' . . . as selected from manufacturer's standard colors, patterns, textures . . . '* or similar phrase, select product and manufacturer that comply with other specified requirements. Architect will select color, pattern, and texture from product line selected.

- H. Remove and replace products and materials not specified in Contract Documents but installed in the Work with specified products and materials at no additional cost to Owner and for no increase in Contract time.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 6200
PRODUCT OPTIONS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Product Options.

1.2 GENERAL

- A. Product Selection:
1. When option of selecting between two or more products is given, product selected will be compatible with products previously selected, even if previously selected products were also options.
- B. Non-Conforming Work:
1. Non-conforming work as covered General Conditions applies, but is not limited, to use of non-specified products or manufacturers.
- C. Product selection is governed by Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include:
1. Substitutions And Equal Products:
 - a. Generally speaking, substitutions for specified products and systems, as defined in the Uniform Commercial Code, are not acceptable. However, "or equal" products may be submitted and approved upon compliance with Contract Document requirements.
 - b. Acceptable Products / Manufacturers / Suppliers / Installers:
 - 1) Use specified products / manufacturers unless approval to use other products / manufacturers has been obtained from Architect by Addendum.
 - 2) Use specified products / manufacturers unless approval to use other products and manufacturers has been obtained from Architect in writing before installing or applying unlisted or private-labeled products.
 - 3) Use 'Equal Product Approval Request Form' to request approval of equal products, manufacturers, or suppliers before bidding or before installation, as noted in individual Sections.
 - c. Quality / Performance Standard Products / Manufacturers:
 - 1) Use specified product / manufacturer or equal product from specified manufacturers only.
 - 2) Products / manufacturers used shall conform to Contract Document requirements.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 6400**OWNER - FURNISHED PRODUCTS****1.1 SUMMARY**

- A. Install items furnished by Owner or receive and store in safe condition items purchased directly by Owner according to requirements of Contract Documents.
1. Pantry Shelving:
 2. Range, refrigerator, freezer and all kitchen equipment per schedule:

1.2 ADMINISTRATIVE REQUIREMENTS

- A. General:
1. Review 'Contractor Notification Report' listing Owner-furnished products to be delivered for Project.
 - a. Review delivery dates and vendor lead times for each item and coordinate with construction schedule. Immediately report recommended changes to Owner's Purchasing Coordinator listed in 'Contractor Notification Report.' Contact vendors directly if changes to delivery dates become necessary during construction.
 - b. Report problems in coordinating delivery dates with construction schedule to Architect and Owner's Purchasing Coordinator.
 2. Receive and unload Owner-furnished materials and products.
 - a. Provide labor and equipment necessary to receive, unload, and store materials and products.
 - b. Verify that number of packages received matches number listed on bill of lading.
 - c. Check for external damage.
 - d. Note discrepancies between pieces received and pieces listed on bill of lading as well as instances of visible damage on bill of lading before signing. Include Project Name and Project Number on bill of lading
 - e. Store and protect deliveries. Report deliveries made outside of delivery schedule to Owner's Purchasing Coordinator.
 3. Within 24 hours of delivery:
 - a. Open and inspect each piece of freight delivered. Note concealed damage not observed at time of delivery.
 - b. Compare 'Contractor Notification Report' with packing slips. Note discrepancies in number, size, color, model numbers, etc.
 - c. Deliver bills of lading on which loss or damage is recorded, or copy, to Owner's Purchasing Coordinator together with report of concealed damage and discrepancies.
 - d. Notify Owner's Purchasing Coordinator immediately of damage and discrepancies.
 4. As directed by Owner, either repair or replace shortages and damaged items not recorded and reported as specified above at no additional cost to Owner.

END OF SECTION

SECTION 01 6500**PRODUCT DELIVERY, STORAGE, AND HANDLING REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Product Delivery, Storage, and Handling Requirements.

1.2 GENERAL

- A. Deliver, store, and handle products according to manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1.3 DELIVERY AND ACCEPTANCE REQUIREMENTS

- A. Schedule delivery to reduce long-term storage at site and to prevent overcrowding of construction spaces.
- B. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
- C. Deliver products to site in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
- D. Inspect products upon delivery to ensure compliance with Contract Documents, and to ensure that products are undamaged and properly protected.

1.4 STORAGE AND HANDLING REQUIREMENTS

- A. Store products at site in manner that will simplify inspection and measurement of quantity or counting of units.
- B. Store heavy materials away from Project structure so supporting construction will not be endangered.
- C. Store products subject to damage by elements above ground, under cover in weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 7100
EXAMINATION AND PREPARATION

1.1 MOBILIZATION

A.

1.2 ACCEPTANCE OF EXISTING CONDITIONS

- A. Prior to commencing work, photograph and document existing conditions.
- B. Notify Architect and County representative in writing of any conditions that will prohibit installation or construction of items described in the Contract Documents.

1.3 FIELD ENGINEERING

- A. Construction Layout:
 - 1. Stake location and elevations of:
 - a. Catch basins, drains and other site drainage elements.
 - b. Clean outs for sewer/waste lines.

1.4 PROTECTION OF ADJACENT CONSTRUCTION

- A. Protect in place existing structures to include but not limited to, perimeter walls, wrought iron fence, concrete masonry unit planters, sidewalks, etc.

END OF SECTION

SECTION 01 7300**EXECUTION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for governing Execution of the Work.

1.2 COMMON INSTALLATION PROVISIONS

- A. Manufacturer's Instructions: Comply with Manufacturer's installation instructions and recommendations to extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents. Notify Architect of conflicts between Manufacturer's installation instructions and Contract Document requirements.
- B. Provide attachment and connection devices and methods necessary for securing Work. Secure work true to line and level. Anchor each product securely in place, accurately located, and aligned with other Work. Allow for expansion and building movement.
- C. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain best visual effect. Refer questionable choices to Architect for final decision.
- D. Install each component during weather conditions and Project status that will ensure best possible results. Isolate each part of completed construction from incompatible material as necessary to prevent deterioration.
- E. Coordinate temporary enclosures with required inspections and tests, to reduce necessity of uncovering completed construction for that purpose.
- F. Mounting Heights: Where mounting heights are not shown, install individual components at standard mounting heights recognized within the industry or local codes for that application. Refer questionable mounting height decisions to Architect for final decision.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 7400**CLEANING AND WASTE MANAGEMENT****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Administrative and procedural requirements for Cleaning and Waste Management as described in Contract Documents.
- B. Related Requirements:
 - 1. In addition to standards described in this section, comply with all requirements for cleaning-up as described in various other Sections of these Specifications.

1.2 REFERENCES

- A. Definitions:
 - 1. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
 - 2. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
 - 3. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
 - 4. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
 - 5. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
 - 6. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION****3.1 PROGRESS CLEANING**

- A. Comply with regulations of authorities having jurisdiction and safety standards for cleaning.
- B. Keep premises broom clean during progress of the Work.
- C. Keep site and adjoining streets reasonably clean. If necessary, sprinkle rubbish and debris with water to suppress dust.
- D. During handling and installation, protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from soiling, damage, or deterioration until Substantial Completion.
- E. Clean and maintain completed construction as frequently as necessary throughout construction period. Adjust and lubricate operable components to ensure ability to operate without damaging effects.

- F. Supervise construction activities to ensure that no part of construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.
- G. Before and during application of painting materials, clear area where such work is in progress of debris, rubbish, and building materials that may cause dust. Sweep floors and vacuum as required and take all possible steps to keep area dust free.
- H. Clean exposed surfaces and protect as necessary to avoid damage and deterioration.
- I. Place extra materials of value remaining after completion of associated work have become Owner's property as directed by Owner or Architect.
- J. Construction Waste Management And Disposal:
 - 1. Remove waste materials and rubbish caused by employees, Subcontractors, and contractors under separate contract with Owner and dispose of legally. Remove unsuitable or damaged materials and debris from building and from property.
 - a. Provide adequate waste receptacles and dispose of materials when full.
 - b. Properly store volatile waste and remove daily.
 - c. Do not deposit waste into storm drains, sanitary sewers, streams, or waterways. Do not discharge volatile, harmful, or dangerous materials into drainage systems.
 - 2. Do not burn waste materials or build fires on site. Do not bury debris or excess materials on Owner's property.

3.2 FINAL CLEANING

- A. Immediately before Substantial Completion, thoroughly clean building and area where The Work was performed. Remove all rubbish from under and about building, landscaped areas and parking lot and leave building and Project Site ready for occupancy by Owner.
- B. Comply with individual manufacturer's cleaning instructions.
- C. Clean each surface or unit to condition expected in normal, commercial building cleaning and maintenance program, including but not limited to:
 - 1. Interior Cleaning:
 - a. Remove marks, stains, fingerprints and dirt.
 - b. Remove labels that are not permanent labels.
 - c. Clean surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean light fixtures and lamps.
 - d. Remove temporary floor protection and clean floors.
 - 2. Exterior Cleaning:
 - a. Remove temporary protection systems.
 - b. Clean dirt, mud, and other foreign material from paving, sidewalks, and gutters.
 - c. Remove trash, debris, and foreign material from landscaped areas.

END OF SECTION

SECTION 01 7700
CLOSEOUT PROCEDURES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Closeout Procedures.

1.2 GENERAL

- A. Schedule closeout procedures in the four weeks before expiration of Contract Time. Weeks will be marked by three Architect's weekly visits before Final Closeout Review, Final Closeout Review, and expiration of Contract Time.
- B. Date of Substantial Completion shall fall within week between Architect's final weekly visit and Final Closeout Review. Date of Substantial Completion shall not occur until Construction Schedule shows completion of construction work, unless agreed to by Architect and included on Certificate of Substantial Completion.

1.3 PRELIMINARY CLOSEOUT REVIEWS

- A. Confirm with Architect when Substantial Completion of The Work will be achieved.
1. Final three Architect's weekly visits will serve as Preliminary Closeout Reviews to determine if Final Closeout Review will occur as scheduled and that Substantial Completion of the Work will be achieved by that date.
 2. By final weekly Architect visit, notify Owner and Architect of date when Substantial Completion of The Work will be achieved.
- B. Arrange with Architect date for Final Closeout Review to confirm Substantial Completion.

1.4 CLOSEOUT REQUIREMENTS

- A. Before Final Closeout Review:
1. Deliver Closeout Submittals to Architect.
 2. Deliver tools, spare parts, extra stock, and similar items as required by the Contract Documents.
 3. Complete start-up testing of systems, and instruction of Owner's maintenance personnel as required by the Contract Documents.
 4. Discontinue or change over and remove temporary facilities from site, along with construction tools, mock-ups, and similar elements.
 5. Complete final cleaning requirements.

1.5 FINAL CLOSEOUT REVIEW

- A. Participate in Final Closeout Review.
- B. When Owner and Architect have confirmed that Contractor has achieved Substantial Completion of The Work, Owner, Architect, and Contractor will execute Certificate of Substantial Completion that contains:
1. Date of Substantial Completion.

2. Punch List of Work not yet accepted.
 3. Amount to be withheld for completion of Punch List work.
 4. Time period for completion of Punch List work.
 5. Amount of liquidated damages set forth in Supplementary Conditions to be assessed if Contractor fails to complete Punch List work within time set forth in Certificate.
- C. Final Acceptance Conference:
1. Notify Architect in writing when work on Punch List has been completed.
 2. Arrange with Architect date and time for Final Acceptance Conference.
 3. When Owner and Architect have confirmed that Contractor has completed Punch List work, Architect will issue letter to Owner authorizing final payment.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Closeout Submittals.

1.2 GENERAL

- A. Workmanship bonds, final certifications, equipment check-out sheets, and similar documents.
- B. Releases enabling Owner unrestricted use of The Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
- C. Project photographs, damage or settlement survey, and similar record information required by Contract Documents.

1.3 OPERATIONS AND MAINTENANCE DATA

- A. Operations And Maintenance Manuals that include:
1. Copy of complete Project Manual including Addenda, Modifications as defined in General Conditions, and other interpretations issued during construction.
 - a. Mark these documents to show variations in actual Work performed in comparison with text of specifications and Modifications. Show substitutions, selection of options, and similar information, particularly on elements that are concealed or cannot otherwise be readily discerned later by direct observation.
 - b. Note related record drawing information and Product Data.
 2. Operations and maintenance submittals required by Contract Documents.
 3. Certifications required by Contract Documents.
 4. Copies of warranties required by Contract Documents.
 5. Testing and Inspection Reports required by Contract Documents.

1.4 WARRANTIES

- A. When written guarantees beyond one year after substantial completion are required by Contract Documents, secure such guarantees and warranties properly addressed and signed in favor of Owner. Include these documents in Operations & Maintenance Manuals specified above.
- B. Delivery of guarantees and warranties will not relieve Contractor from obligations assumed under other provisions of Contract Documents.

1.5 PROJECT RECORD DOCUMENTS

- A. Do not use record documents for construction purposes. Protect from deterioration and loss in secure, fire-resistive location. Provide access to record documents for Architect's reference during normal working hours.

- B. Maintain clean, undamaged set of Drawings. Mark set to show actual installation where installation varies from the Work as originally shown. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
 - 1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
 - 2. Mark new information that is important to Owner, but was not shown on Drawings.
 - 3. Note related Change Order numbers where applicable.

1.6 SPARE PARTS

- A. Provide items that are indicated in individual Sections.

1.7 EXTRA STOCK MATERIALS

- A. Provide items that are indicated in individual Sections.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

DIVISION 03: CONCRETE

03 1000 CONCRETE FORMING AND ACCESSORIES

03 1511 CONCRETE ANCHORS AND INSERTS

03 2000 CONCRETE REINFORCING

03 2100 REINFORCING STEEL

03 3000 CAST-IN-PLACE CONCRETE

03 3111 NORMAL WEIGHT STRUCTURAL CONCRETE

END OF TABLE OF CONTENTS

SECTION 03 1511**CONCRETE ANCHORS AND INSERTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Concrete anchors and inserts not specified elsewhere.

- B. Related Requirements:
 - 1. Section 01 4000: "Quality Requirements" for administrative and procedural requirements for quality assurance and quality control.
 - 2. Section 01 4301: "Quality Assurance – Qualifications" for minimum qualification levels required.
 - 3. Section 03 3111: Installation of cast-in-place anchors and inserts.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. 'ASTM A563-07a, 'Standard Specification for Carbon and Alloy Steel Nuts.'
 - b. ASTM A615 / A615M-08b, 'Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.'
 - c. ASTM F1554-07a, 'Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.'

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: Manufacturer's product literature for each item.

- B. Informational Submittals:
 - 1. Test And Evaluation Reports: ICC ES Evaluation Report indicating conformance with the current applicable ICC ES Acceptance Criteria.
 - 2. Manufacturer's Instructions: Manufacturer's published installation recommendations for each item.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Scheduling:
 - 1. Inspection shall be performed according to Manufacturer's submitted ICC ES Evaluation Report.
- QUALITY ASSURANCE**
- A. Inspection.
 - 1. Owner will provide Inspection:
 - a. See Section 01 1200: "Multiple Contract Summary".

PART 2 - PRODUCTS**2.1 MATERIALS****A. Manufactured Units:**

1. General:
 - a. Use hot-dipped galvanized or stainless steel with matching nuts and washers in exterior and moist interior applications unless indicated otherwise on Drawings.
 - b. Nut: Conform to requirements of ASTM A563, Grade A, Hex.
2. Adhesive Anchors:
 - a. Cartridge Injection Adhesive Anchors.
 - b. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria AC308 for concrete.
 - c. Rod diameter and embedment length as indicated on Drawings.
 - d. Acceptable Products:
 - 1) HIT-RE 500-SD Epoxy by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) SET-XP Epoxy by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
3. Drilled-In Mechanical Anchors (Expansion Bolts):
 - a. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria AC193 for concrete.
 - b. Acceptable Products:
 - 1) Kwik Bolt TZ, HSL-3, HDA by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Strong-Bolt by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION**3.1 EXAMINATION****A. Verification of Conditions:**

1. Embedded Items:
 - a. Identify position of reinforcing steel and other embedded items before drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Take precautions as necessary to avoid damaging pre-stressing tendons, electrical and telecommunications conduit, and gas lines.
 - b. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling.
2. Base Material Strength: Unless otherwise specified, do not drill holes in concrete until concrete has achieved full design strength.

3.2 INSTALLATION**A. Drilled-In Anchors:**

1. General:
 - a. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits.
 - b. Unless otherwise shown on the Drawings, drill holes perpendicular to concrete surface.
 - c. Where anchors are to be installed in cored holes, use core bits with matched tolerances specified by Manufacturer. Cored holes may only be used if acceptable to Manufacturer.
 - d. Perform anchor installation in accordance with Manufacturer's published instructions.

2. Adhesive Anchors:
 - a. Clean holes in accordance with Manufacturer's published instructions before installation of adhesive. Follow Manufacturer's recommendations to ensure proper mixing of adhesive components.
 - b. Inject adhesive into holes proceeding from bottom of hole and progressing toward surface so as to avoid introduction of air pockets into adhesive. Inject sufficient adhesive into hole to ensure that annular gap is filled to surface.
 - c. Remove excess adhesive from surface.
 - d. Shim anchors with suitable device to center anchor in hole. Do not disturb or load anchors before Manufacturer's specified cure time has elapsed.
 - e. Observe Manufacturer's recommendations with respect to installation temperatures for adhesive anchors. Base material temperatures must be maintained above minimum temperatures allowed by the Manufacturer for the full required epoxy cure time.
3. Drilled-in Mechanical Anchors (Expansion Bolts):
 - a. Protect threads from damage during anchor installation.
 - b. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10 percent of specified torque, 100 percent of specified torque shall be reached within 7 or fewer complete turns of nut. If specified torque is not achieved within required number of turns, remove and replace anchor, unless otherwise directed by Architect.

3.3 FIELD QUALITY CONTROL

- A. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength, non-shrink, non-metallic grout acceptable to Architect. Anchors that fail to meet proof load or installation torque requirements will be regarded as malfunctioning.

END OF SECTION

SECTION 03 2100
REINFORCING STEEL**PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install concrete reinforcing steel as described in Contract Documents.

1.2 REFERENCES

- A. Reference Standards:
1. American Concrete Institute:
 - a. ACI 318-08, 'Building Code Requirements for Structural Concrete and Commentary.'
 2. ASTM International:
 - a. ASTM A615 / A615M-8b, 'Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.'

1.3 SUBMITTALS

- A. Action Submittals:
1. Shop Drawings: Reinforcing placement drawings.
- B. Informational Submittals:
1. Certificates: Mill certificates for mill tests for reinforcing in accordance with ASTM A615.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver bars separated by size and tagged with manufacturer's heat or test identification number.
- B. Reinforcing steel shall be free of heavy rust scales and flakes, or other coating at time of delivery and placing. Properly protect rebar on site after delivery.

PART 2 - PRODUCTS**A. MATERIAL**

- B. Reinforcing Steel:
1. Reinforcing bars shall have grade identification marks and conform to ASTM A615.
 - a. Grade 60 minimum. Field bent dowels may be Grade 40.
 - b. Bars shall be deformed type.
 2. Bars shall be free of heavy rust scales and flakes, or other bond-reducing coatings.

2.2 ACCESSORIES

- A. Bar Supports:
1. Type Two Acceptable Products:
 - a. Concrete 'dobies' or blocks wired to reinforcing.

- b. Manufactured chairs with 4 sq in bearing surface on sub-grade, or other feature to prevent chair from being pushed into sub-grade or damaging the vapor retarder under slabs on grade.
- c. Equals as approved by Architect before installation. See Section 01 6200.

2.3 FABRICATION

- A. Fabricate reinforcing steel according to 'ACI Detailing Manual,' 2004 edition, and details on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Bend bars cold.
- B. Accurately place and support with chairs, bar supports, spacers, or hangers as recommended by 'ACI Detailing Manual,' 2004 edition, except slab on grade work. Support bars in slabs on grade and footings with specified bar supports around perimeter and at 4-1/2 feet on center each way maximum to maintain specified concrete cover. Install bar supports at bar intersections.

END OF SECTION

SECTION 03 3111**NORMAL WEIGHT STRUCTURAL CONCRETE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install Project concrete work as described in Contract Documents.
 - 2. Quality of concrete used on Project but furnished under other Sections.

- B. Products Installed But Not Furnished Under This Section:
 - 1. Inserts, bolts, boxes, templates, and fastening devices for other work, including those for bases.
 - 2. Concrete accessories.

- C. Related Requirements:
 - 1. Section 01 4000: "Quality Requirements" for administrative and procedural requirements for quality assurance and quality control.
 - 2. Section 01 4301: "Quality Assurance – Qualifications" for minimum qualification levels required.
 - 3. Divisions 22, 23, And 26: Mechanical and electrical devices including boxes, conduits, pipes, hangers, inserts, and other work to be embedded in concrete work before placing.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American Concrete Institute:
 - a. ACI 117-06: 'Specifications for Tolerances for Concrete Construction and Materials and Commentary.'
 - b. ACI 224.3R-95, 'Joints in Concrete Construction (Reapproved 2008).'
 - c. ACI 302.1R-04, 'Guide for Concrete Floor and Slab Construction.'
 - d. ACI 318-08, 'Building Code Requirements for Structural Concrete and Commentary.'
 - 2. ASTM International:
 - a. ASTM C33 / C33M-08, 'Standard Specification for Concrete Aggregates.'
 - b. ASTM C94 / C94M-09, 'Standard Specification for Ready-Mixed Concrete.'
 - c. ASTM C150-07, 'Standard Specification for Portland Cement.'
 - d. ASTM C260-06, 'Standard Specification for Air-Entraining Admixtures for Concrete.'
 - e. ASTM C494 / C 494M-08a, 'Standard Specification for Chemical Admixtures for Concrete.'
 - f. ASTM C595-08a, 'Standard Specification for Blended Hydraulic Cements.'
 - g. ASTM C618-08a, 'Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.'
 - h. ASTM C989-09, 'Standard Specification for Slag Cement for use in Concrete and Mortars.'
 - i. ASTM E1155-96 (2008), 'Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.'
 - j. ASTM C1157-08a, 'Standard Performance Specification for Hydraulic Cement.'

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Schedule pre-installation conference prior to placing of footings, installation of foundation forms and reinforcing steel, and installation of anchors, dowels, inserts, and block outs in foundation walls and slabs.
 - 2. In addition to agenda items specified in Section 01 3100, review following:
 - a. Approved mix design and use of admixtures.

- b. Installation scheduling, coordination, and placement of items installed in and under floor slab.
 - c. Placement, finishing, and curing of concrete including cold and hot weather requirements.
 - d. Concrete slab tolerances and corrective measures if tolerances not met.
- B. Scheduling:
1. Notify Architect one day minimum before placing concrete for exterior site work concrete (sidewalks, etc.) and footings.

1.4 SUBMITTALS

- A. Action Submittals:
1. Shop Drawings: Show dimensioned locations of anchor bolts for hold-down anchors and columns.
- B. Informational Submittals:
1. Certificates:
 - a. Require mix plant to furnish delivery ticket for each batch of concrete. Keep delivery tickets at job-site for use of Owner or his representatives. Tickets shall show following:
 - 1) Name of ready-mix batch plant.
 - 2) Serial number of ticket.
 - 3) Date and truck number.
 - 4) Name of Contractor.
 - 5) Name and location of Project.
 - 6) Specific class or designation of concrete conforming to that used in Contract Documents.
 - 7) Amount of concrete.
 - 8) Time loaded.
 - 9) Type, name, manufacturer, and amount of admixtures used.
 - 10) Amount and type of cement.
 - 11) Total water content.
 - 12) Sizes and weights of sand and aggregate.
 2. Design Data:
 - a. Submit mix designs to meet following requirements:
 - 1) Proportions:
 - a) Mix Type A:
 - (1) 3000 psi (minimum) at 28 days.
 - (2) Water / Cement Ratio: 0.47 to 0.53 by weight.
 - b) Air Entrainment: 6 percent, plus or minus 1-1/2 percent for Exterior Concrete and foundation walls exposed to freeze thaw conditions.
 - c) Do not add water any time during mixing cycle above amount required to meet specified water / cement ratio. No reduction in the amount of cementitious material is allowed.
 - 2) Slump:
 - a) 4 inch slump maximum before addition of high range water reducer.
 - b) 8 inch slump maximum with use of high range water reducer.
 - 3) Admixtures:
 - a) Mix design shall show proposed admixture, amount, usage instructions, and justification for proposed use. Do not use any admixture without Architect's written approval.
 - b) Mineral: An amount of specified fly ash not to exceed 20 percent of weight of cement may be substituted for cement. If substituted, consider fly ash with cement in determining amount of water necessary to provide specified water / cement ratio.
 - c) Chemical: Specified accelerator or retarder may be used if necessary to meet environmental conditions.

1.5 QUALITY ASSURANCE

- A. Testing and Inspection.
 - 1. Owner will provide Testing and Inspection:
 - a. See Section 01 1200: "Multiple Contract Summary".

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. BASF Admixtures, Cleveland, OH www.basf-admixtures.com.
 - b. Bonsal American, Charlotte, NC www.bonsal.com.
 - c. Dayton Superior Specialty Chemicals, Kansas City, KS www.daytonsuperiorchemical.com.
 - d. Euclid Chemical Company, Cleveland, OH www.euclidchemical.com.
 - e. Fritz-Pak Concrete Admixtures, Dallas, TX www.fritzpak.com.
 - f. Grace Construction Products, Cambridge, MA www.graceconstruction.com and Grace Canada Inc, Ajax, ON (905) 683-8561.
 - g. L & M Construction Chemicals, Omaha, NE www.lmcc.com.
 - h. Larsen Weldcrete by Larsen Products Corp, Rockville, MD www.larsenproducts.com.
 - i. Sika Corporation, Lyndhurst, NJ www.sikaconstruction.com and Sika Canada, Pointe Claire, QC www.sika.ca.
 - j. Sonneborn / BASF Building Systems, Shakopee, MN www.chemrex.com.
 - k. TAMMS Industries, Mentor, OH www.tamms.com.
 - l. Unitex, Kansas City, MO www.unitex-chemicals.com.
 - m. U S Mix Products Co, Denver, CO www.usspec.com.
 - n. W R Meadows, Hampshire, IL www.wrmeadows.com.
- B. Performance:
 - 1. Design Criteria: Conform to requirements of ASTM C94 unless specified otherwise.
 - 2. Capacities:
 - a. For testing purposes, following concrete strengths are required:
 - 1) At 7 days: 60 percent minimum of 28 day strengths.
 - 2) At 28 days: 100 percent minimum of 28 day strengths.
 - 3) At 28 days:
 - a) Mix Type A: 3000 psi.

C. Materials:

Portland Cement / Blended Hydraulic Cement Equivalencies		
ASTM C150 (Low Alkali)	ASTM C595	ASTM C1157
Type I	IP	GU
Type II	IP (MS)	MS

- 1. Hydraulic Cement: Meet requirements of ASTM C150, Type <Insert Type>.
 - a. Meet requirements of ASTM C595, Type <Insert Type>.
 - b. Meet requirements of ASTM C1157, Type <Insert Type>.
- 2. Aggregates:
 - a. Coarse:
 - 1) Meet requirements of ASTM C33 or nonconforming aggregate that by test or actual service produces concrete of required strength and conforms to local governing codes.
 - 2) Aggregate shall be uniformly graded by weight as follows:
 - a) Flat Work, Size No. 67.

Sieve	Percent Passing
One Inch	100
3/4 Inch	90 - 100
3/8 Inch	20 - 55

No. 4	0 - 10
No. 8	0 - 5

b) All Other, Size No. 57.

Sieve	Percent Passing
1-1/2 Inch	100
One Inch	95 - 100
1/2 Inch	25 - 60
No. 4	0 - 10
No. 8	0 - 5

b. Fine:

- 1) Meet requirements of ASTM C33.
- 2) Aggregate shall be uniformly graded by weight as follows:

Sieve	Percent Passing
3/8 Inch	100
No. 4	95 - 100
No. 8	80 - 100
No. 16	50 - 85
No. 30	25 - 60
No. 50	10 - 30
No. 100	2 - 10

3. Water: Clear, apparently clean, and potable.
4. Admixtures And Miscellaneous:
 - a. Mineral:
 - 1) Fly Ash Pozzolan: Meet requirements of ASTM C618, Class F or C and with loss on ignition (LOI) of 3 percent maximum.
 - b. Chemical:
 - 1) No admixture shall contain calcium chloride nor shall calcium chloride be used as an admixture. All chemical admixtures used shall be from same manufacturer and compatible with each other.

2.2 ACCESSORIES

A. Evaporation Retardant:

1. Acceptable Products:
 - a. Confilm by BASF.
 - b. Sure Film J-74 by Dayton Superior.
 - c. Euco-Bar By Euclid Chemical Co.
 - d. E-Con by L & M Construction Chemicals.
 - e. Pro Film by Unitex.
 - f. U S Spec Monofilm ER by U S Mix Products.
 - g. Equal as approved by Architect before use. See Section 01 6200.

B. Bonding Agents:

1. Acceptable Products:
 - a. Acrylic Additive by Bonsal American.
 - b. Day Chem Ad Bond (J-40) by Dayton Superior.
 - c. Flex-Con by Euclid Chemical Co.
 - d. Larsen Weldcrete by Larsen Products Corp.
 - e. Everbond by L & M Construction Chemicals.
 - f. Acryl Set by BASF.
 - g. Sonocrete by Sonneborn.
 - h. Tamms Bond by TAMMS Industries.
 - i. U S Spec Multicoat by U S Mix Products.
 - j. Intralok by W R Meadows.
 - k. Equal as approved by Architect before use. See Section 01 6200.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Inserts, bolts, boxes, templates, pipes, conduits, and other accessories required by Divisions 22, 23, and 26 shall be installed and inspected before placing concrete.
- B. Install inserts, bolts, boxes, templates, pipes, conduits, and other accessories furnished under other Sections to be installed as part of work of this Section. Tie anchor bolts for hold-down anchors and columns securely to reinforcing steel.
- C. Remove water and debris from space to be placed.

3.2 INSTALLATION

- A. Special Techniques:
 - 1. Cold Weather Concreting Procedures:
 - a. General Requirements:
 - 1) Materials and equipment required for heating and protection of concrete shall be approved and available at Project site before beginning cold weather concreting.
 - 2) Forms, reinforcement, metallic embedments, and fillers shall be free from snow, ice, and frost. Surfaces that will be in contact with newly placed concrete, including sub-grade materials, shall be 35 deg F minimum at time of concrete placement.
 - 3) Thaw sub-grade 6 inches deep minimum before beginning concrete placement. If necessary, re-compact thawed material.
 - 4) Use no frozen materials or materials containing ice.
 - b. Requirements When Average 24 Hour Temperature, midnight to midnight, Is Below 40 deg F:
 - 1) Temperature of concrete as placed and maintained shall be 55 deg F minimum and 75 deg F maximum.
 - 2) Heat concrete for 72 hours minimum after placing if regular cement is used; for 48 hours if high early strength cement is used; or longer if determined necessary by Architect. During this period, maintain concrete surface temperature between 55 and 75 deg F.
 - 3) Vent flue gases from combustion heating units to outside of enclosure to prevent carbonation of the concrete surface.
 - 4) Prevent concrete from drying during heating period. Maintain housing, insulation, covering, and other protection 24 hours after heat is discontinued.
 - 5) After heating period, if temperature falls below 32 deg F, protect concrete from freezing until strength of 2000 psi minimum is achieved. Protect flatwork exposed to melting snow or rain during day and freezing during night from freezing until strength of 3500 psi minimum is achieved.
 - c. Requirements When Average 24 Hour Temperature, midnight to midnight, Is Above 40 deg F, but when temperature falls below 32 deg F:
 - 1) Protect concrete from freezing for 72 hours after placing, or until a strength of 2000 psi is achieved, whichever is longer. Protect flatwork exposed to melting snow or rain during day and freezing during night from freezing until strength of 3500 psi minimum is achieved.
 - d. Protect soil supporting concrete footings from freezing under any circumstances.
 - 2. Hot Weather Concreting Procedures:
 - a. Maximum concrete temperature allowed is 90 deg F in hot weather.
 - b. Cool aggregate and subgrades by sprinkling.
 - c. Avoid cement over 140 deg F.
 - d. Use cold mixing water or ice.
 - e. Use fog spray or evaporation retardant to lessen rapid evaporation from concrete surface.
- B. Tolerances:

1. Tolerances shall conform to requirements of ACI 117, except where specified differently.
 2. Local Flatness / Levelness of Interior Slabs:
 - a. Specified Overall Value of F_F28 / F_L20 and Minimum Local Value of F_F20 / F_L15 when tested in accordance with ASTM E1155.
- C. Placing:
1. General:
 - a. Place as soon after mixing as possible. Deposit as nearly as possible in final position. Placing of concrete shall be continuous until a panel or section is complete.
 - b. Compact concrete in forms by vibrating and other means where required. Thoroughly work in concrete around reinforcing bars.
 - c. Do not embed aluminum in concrete.
 - d. Do not use contaminated, deteriorated, or re-tempered concrete.
 - e. Avoid accumulation of hardened concrete.
 2. Equipment Bases: Coordinate with appropriate Sections for locations and dimensions.
 3. Bonding Fresh And Hardened Concrete:
 - a. Re-tighten forms.
 - b. Roughen surfaces.
 - c. Clean off foreign matter and laitance.
 - d. Wet but do not saturate.
 - e. Slush with neat cement grout or apply bonding agent.
 - f. Proceed with placing new concrete.
- D. Finishing:
1. Rough: Top of slabs and stairs to receive setting bed for ceramic or paver tile.
- E. Curing:
1. Interior Slabs:
 - a. Water cure as specified in Section 03 3913.

3.3 PROTECTION

- A. Protect concrete that has not received its initial set from precipitation to avoid excess water in mix and unsatisfactory surface finish.
- B. Do not allow materials resulting from construction activities, which will affect concrete or application of finish floor systems adversely, to come in contact with interior concrete slabs.

END OF SECTION

DIVISION 05: METALS

05 0000 METALS

05 0523 METAL FASTENINGS

END OF TABLE OF CONTENTS

SECTION 05 0523**METAL FASTENING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of structural wood-to-metal, and wood-to-wood bolts used on Project.
- B. Related Requirements:
 - 1. Section 03 1511: Cast-in-place and drilled-in anchor bolts.
 - 2. Furnishing and installing of structural bolts specified under Section concerned.
 - 3. Performance of welding specified under Section concerned.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A36 / A36M-08, 'Standard Specification for Carbon Structural Steel.'
 - b. ASTM A307-07b, 'Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.'
 - c. ASTM A325-09, 'Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.'

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Materials:
 - 1. Bolts And Threaded Fasteners:
 - a. Bolts: Conform to requirements of ASTM A307, Grade A.

PART 3 - EXECUTION**3.1 PERFORMANCE**

- A. Welding shall meet requirements of ANSI / AWS D1.1 and D1.3.

END OF SECTION

DIVISION 06: WOOD, PLASTICS, AND COMPOSITES

06 1000 ROUGH CARPENTRY

- 06 1011 WOOD FASTENINGS
- 06 1100 WOOD FRAMING
- 06 1636 WOOD PANEL PRODUCT SHEATHING

06 2000 FINISH CARPENTRY

- 06 2001 COMMON FINISH CARPENTRY REQUIREMENTS
- 06 2024 DOOR, FRAME, AND FINISH HARDWARE INSTALLATION

END OF TABLE OF CONTENTS

SECTION 06 1011**WOOD FASTENINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Quality of wood fastening methods and materials used for Rough Carpentry unless specified otherwise.
- B. Related Requirements:
1. Section 03 1511: Quality of Anchors and Inserts.
 2. Section 05 0523: Quality of bolts used for Rough Carpentry.
 3. Furnishing and installing of other fasteners are specified in individual Sections where installed.

1.2 REFERENCES

- A. Reference Standards;
1. ASTM International:
 - a. ASTM F667-05, 'Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.'

1.3 SUBMITTALS

- A. Action Submittals:
1. Product Data:
 - a. Manufacturer's literature on framing anchors and powder actuated fasteners.
 2. Shop Drawings:
 - a. Submit diameter and lengths of fasteners proposed for use on Project. If length or diameter of proposed fasteners differ from specified fasteners, also include technical and engineering data for proposed fasteners including, but not limited to:
 - 1) Adjusted fastener spacing where using proposed fasteners and,
 - 2) Adjusted number of fasteners necessary to provide connection capacity equivalent to specified fasteners.
 - b. Submit on powder-actuated fasteners other than those specified in Contract Documents showing design criteria equivalents at each application.
 - c. Show type, quantity, and installation location of framing anchors. Where necessary, reference Drawing details, etc, for installation locations.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Description:
1. Nail Terminology:
 - a. When following nail terms are used in relation to this Project, following lengths and diameters will be understood. Refer to nails of other dimensions by actual length and diameter, not by one of listed terms:

Nail Term	Length	Diameter
8d Box	2-1/2 inches	0.113 inch
8d Common	2-1/2 inches	0.131 inch
10d Box	3 inches	0.128 inch

10d Common	3 inches	0.148 inch
16d Box	3-1/2 inches	0.135 inch
16d Sinker	3-1/4 inches	0.148 inch
16d Common	3-1/2 inches	0.162 inch

B. Materials:**1. Fasteners:**

- a. Fasteners in contact with preservative treated wood shall be hot-dipped galvanized or G-185 coated.
- b. Nails:
 - 1) Meet requirements of ASTM F1667.
 - 2) Unless noted otherwise, nails listed on Drawings or in Specifications shall be common nail diameter, except 16d nails, which shall be box diameter.
- c. Wood Screws:
 - 1) SDS Screws:
 - a) Approved Products.
 - (1) SDS Screws by Simpson Strong Tie Co, Dublin, CA www.strongtie.com.
 - 2) All Other: Standard type and make for job requirements.
 - 2) Powder-Actuated Fasteners:
 - 1) Quality Standard: Hilti X-DNI 62P8.
 - 2) Manufacturers:
 - a) Hilti, Tulsa, OK www.us.hilti.com.
 - b) Redhead Division of ITW, Wood Dale, IL www.itw-redhead.com and Markham, ON www.itwconstruction.ca.
 - c) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.

2. Adhesives:

- a. Construction Mastics: Meet requirements of American Plywood Association Specification AFG-01 September 1974. Use phenol-resorcinol type for use on pressure treated wood products.

PART 3 - EXECUTION**3.1 ERECTION**

- A. Secure one Manufacturer approved fastener in each hole of framing anchor that bears on framing member unless approved otherwise in writing by Architect.
- B. Provide washers with bolt heads and with nuts bearing on wood.

END OF SECTION

SECTION 06 1100**WOOD FRAMING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install wood framing and blocking as described in Contract Documents.

1.2 REFERENCES

- A. Reference Standards:
1. National Institute of Standards and Technology (NIST), Technology Administration, U. S. Department of Commerce:
 - a. Voluntary Product Standard DOC PS 20-05, 'American Softwood Lumber Standard.'

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
1. Schedule pre-installation conference immediately before beginning framing work.
 2. Review items such as:
 - a. Equipment and gypsum board blocking in wood framed walls.
 - b. Door opening headers.
 - c. Rough opening requirements
 - d. Nails and nailing requirements.
 - e. Connections.

1.4 SUBMITTALS

- A. Informational Submittals:
1. Test And Evaluation Reports: Technical and engineering data on nails to be set by nailing guns for Architect's approval of types proposed to be used as equivalents to specified hand set nails and adjusted number and spacing of pneumatically-driven nails to provide equivalent connection capacity.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
1. Protect lumber and plywood and keep under cover in transit and at job site.
 2. Do not deliver material unduly long before it is required.
- B. Storage And Handling Requirements:
1. Store lumber and plywood on level racks and keep free of ground to avoid warping. Stack to insure proper ventilation and drainage.

1.6 MATERIALS

- A. Dimension Lumber:

1. Meet requirements of PS 20 and National Grading Rules for softwood dimension lumber.
2. Bear grade stamp of WWPA, SPIB, or other association recognized by American Lumber Standards Committee identifying species of lumber by grade mark or by Certificate of Inspection.
3. Lumber 2 inches or less in nominal thickness shall not exceed 19 percent in moisture content at time of fabrication and installation and be stamped 'S-DRY', 'K-D', or 'MC15.'
4. Lumber shall be S4S.
5. Preservative Treated Plates / Sills:
 - a. 2x4: Standard and better Douglas Fir, Southern Pine, or HemFir, or StrandGuard by iLevel by Weyerhaeuser Boise, ID www.ilevel.com. (LSL 1.3 E)
 - b. 2x6: And Wider: No. 2 or or MSR 1650f - 1.5e Douglas Fir, Southern Pine, HemFir, or StrandGuard by iLevel by Weyerhaeuser, Boise, ID www.ilevel.com. (LSL 1.3 E).

1.7 ACCESSORIES

- A. Blocking: Sound lumber without splits, warps, wane, loose knots, or knots larger than 1/2 inch.
- B. Sill Sealer: Closed-cell polyethylene foam, 1/4 inch thick by width of plate.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. General: Use preservative treated wood for wood members in contact with concrete or masonry, including wall, sill, and ledger plates, door and window subframes and bucks, etc.
- B. Interface With Other Work:
 1. Coordinate with other Sections for location of blocking required for installation of equipment and building specialties. Do not allow installation of gypsum board until required blocking is in place.
 2. Where manufactured items are to be installed in framing, provide rough openings of dimensions within tolerances required by manufacturers of such items. Confirm dimensions where not shown on Drawings.
- C. Tolerances:
 1. Walls:
 - a. 1/4 inch in 20 feet, non-cumulative in length of wall.
 - b. 1/8 inch in 10 feet with 1/4 inch maximum in height of wall.
 - c. Distances between parallel walls shall be 1/4 inch maximum along length and height of wall.
- D. Walls:
 1. Openings: Single, bearing stud supporting header and one adjacent (king) stud continuous between top and bottom plates, unless shown otherwise.
 2. Corners And Partition Intersections: Triple studs.
 3. Firestops:
 - a. Horizontal or vertical concealed spaces in walls, drop ceilings, and other features over 10 feet in length or height, and ceiling levels, and other junctures of horizontal to vertical concealed spaces.
 - b. Non-Structural Walls: Fasten with powder actuated fasteners.
 4. Posts And Columns: Unless shown otherwise, nail members of multiple member columns together with 16d at 6 inches on center from each side.
 5. Beams:
 - a. Built-Up Members:
 - 1) Stagger individual members of multiple span beams and girders so, over any one support, no more than half the members will have a joint. In all cases, however, joints shall occur over supports.
 - 2) Unless shown otherwise on Drawings, nail two-ply built-up members with 10d nails 12 inches on center top and bottom, staggered on opposite sides. Nail three-ply built-up

- members with 16d nails at 12 inches on center, top and bottom, staggered, on opposite sides. Set with crown edge up with full bearing at ends and intermediate supports.
- b. Wood shims are not acceptable under ends.
 - c. Do not notch framing members unless specifically shown in Drawing detail.
- E. Roof And Ceiling Framing:
1. Install structural blocking and bridging as necessary and as described in Contract Documents.
 2. Special Requirements:
 - a. Roof And Ceiling Joists: Lap joists 4 inches minimum and secure with code approved framing anchors.
 - b. Roof Rafters:
 - 1) Cut level at wall plate and provide at least 2-1/2 inches bearing where applicable. Spike securely to plate with three 10d nails.
 - 2) Attach to trusses or other end supports with framing anchors described in Contract Documents.
 - 3) Provide for bracing at bearing partitions.
- F. Accessory / Equipment Mounting And Gypsum Board Back Blocking (nailers):
1. Furnish and install blocking in wood framing required for hardware, specialties, equipment, accessories, and mechanical and electrical items, etc.
 2. Furnish and install back blocking in wood framing required for joints in gypsum wallboard.
 - a. Install back blocking between I-joist framing members with equivalent of Simpson Z2 clips attached with four 10d x 1-1/2 inch nails at each end, two into 'I' joist and two into blocking.
 - b. Attach back blocking at trusses, stick framing, or walls with two 10d nails in each end of each piece of blocking.
- G. Accessory / Equipment Mounting And Standing & Running Trim Blocking (nailers):
1. Furnish and install blocking in wood framing required for hardware, specialties, equipment, accessories, and mechanical and electrical items, etc.
 2. Attach blocking not installed with clips with two fasteners in each end of each piece of blocking.

END OF SECTION

SECTION 06 1636**WOOD PANEL PRODUCT SHEATHING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install wood panel product sheathing required for walls and areas of roofs if replacement is needed as described in Contract Documents.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Institute of Standards and Technology (NIST), Technology Administration, U. S. Department of Commerce:
 - a. Voluntary Product Standard DOC PS 1-07. 'Structural Plywood.'
 - b. Voluntary Product Standard DOC PS 2-04, 'Performance Standard for Wood-based Structural-Use Panels.'

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 06 1100.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect sheathing and keep under cover in transit and at job site.
- B. Do not deliver material unduly long before it is required.
- C. Store sheathing on level racks and keep free of ground. Stack to insure proper ventilation and drainage.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Performance:
 - 1. Design Criteria:
 - a. Meet requirements of PS 1, PS 2, PRP-108 (APA), or PRP-133 (TECO). Except where plywood is specifically indicated on Drawings, oriented strand board (OSB) is acceptable.
 - b. accordingly.
- B. Materials:
 - 1. Sheathing:
 - a. Sheathing shall bear grade stamp from American Plywood Association (APA) or equal grading organization.
 - b. Sheathing shall not exceed 18 percent moisture content when fabricated or more than 19 percent when installed in Project.

- c. Sheathing 23/32 inch thick and thicker used for single-layer subflooring shall be tongue and groove.
- d. Sheathing used for same purpose shall be of same thickness. In all cases, thickness specified is minimum required regardless of span rating.
- e. Minimum span ratings for given thicknesses shall be as follows:
(Match existing thickness at roof sheathing patches)

Thickness	Span Rating
3/8 inch	24 / 0
7/16 inch nominal	24 / 16
15/32 inch actual	32 / 16
1/2 inch nominal	32 / 16
19/32 inch actual	40 / 20
5/8 inch nominal	40 / 20
23/32 inch actual	48 / 24
3/4 inch nominal	48 / 24

2.2 ACCESSORIES

- A. Nails:
 - 1. As indicated on Drawings and if not on Drawings, install nails per Building Code.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Top of nail heads shall be flush with sheathing surface.
 - 2. Use of edge clips to provide spacing between sheathing panels is acceptable.
- B. Wall Sheathing:
 - 1. Spacing: Provide 1/8 inch space between sheets at end and edge joints.
 - 2. Edge Bearing And Blocking:
 - a. Panel edges shall bear on framing members and butt along their center lines.
 - b. Back block panel edges, which do not bear on framing members, with 2 inch nominal framing.
 - 3. Nail Spacing:
 - a. As indicated on Drawings.
 - b. Place nails not less than 3/8 inch in from edge.
 - 4. Thickness:
 - a. As indicated on Drawings.
 - 5. Do not install any piece of wall sheathing with shortest dimension of less than 12 inches.
- C. Roof Sheathing:
 - 1. Placing:
 - a. Lay face grain at right angles to supports.
 - b. Provide 1/8 inch space between sheets at end and side joints.
 - c. Stagger panel end joints.
 - d. Sheathing shall be continuous of two spans minimum.
 - 2. Nail Spacing:
 - a. As indicated on Drawings and if not on Drawings, install per Building Code.
 - b. Place nails at least 3/8 inch in from edge.
 - 3. Thickness:
 - a. As indicated on Drawings or match existing roof sheathing thickness.
 - 4. Do not install any piece of roof sheathing with shortest dimension of less than 24 inches unless support is provided under all edges.

3.2 PROTECTION

- A. Protect roof sheathing from moisture until roofing is installed.

END OF SECTION

SECTION 06 2001**COMMON FINISH CARPENTRY REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install sealants required for items installed under this Section, as described in Contract Documents.

- B. Products Installed But Not Furnished Under This Section:
 - 1. Selected Building Specialties.
 - 2. Selected Equipment.
 - 3. Miscellaneous as specified elsewhere.
 - 4. Door Plates for Hold/Release Devices.

- C. Related Requirements:
 - 1. Section 06 1100: Furring and blocking.
 - 2. Section 07 9213: Quality of sealants, submittal and installation requirements.
 - 3. Sections under 09 9000 heading: Back priming of work to be installed or subjected to moisture, and finishing of finish carpentry and architectural woodwork.
 - 4. Sections in Division 10: Furnishing of Specialties.
 - 5. Sections in Division 11: Furnishing of Equipment.
 - 6. Sections in Division 28: Electronic Safety and Security.

1.2 REFERENCES

- A. Reference Standards:
 - 1. Architectural Woodwork Institute:
 - a. AWI, 'Architectural Woodwork Quality Standards, 8th Edition, Version 1.0, 2003.'

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Glue: Waterproof and of best quality.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Site Verification of Conditions: Verify walls, ceilings, floors, and openings are plumb, straight, in-line, and square before installing Architectural Woodwork. Report conditions that are not in compliance to Architect before starting installation.

3.2 PREPARATION

- A. Install Architectural Woodwork after wall and ceiling painting is completed in areas where Architectural Woodwork is to be installed.

3.3 INSTALLATION

- A. Special Techniques: AWI Custom Grade is minimum acceptable standard, except where explicitly specified otherwise, for installation of architectural woodwork.
- B. General Architectural Woodwork Installation:
 - 1. Fabricate work in accordance with measurements taken on Project site.
 - 2. Scribe, miter, and join accurately and neatly to conform to details.
 - 3. Exposed surfaces shall be machine sanded, ready for finishing.
 - 4. Allow for free movement of panels.
 - 5. Countersink nails. Countersink screws and plug those exposed to view.
- C. Items Installed But Not Furnished Under This Section: Install in accordance with requirements specified in Section furnishing item.

END OF SECTION

SECTION 06 2024**DOOR, FRAME, AND FINISH HARDWARE INSTALLATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install sealants for caulking door frames as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
 - 1. Flush wood doors.
 - 2. Finish hardware.
 - 3. Coiling Counter Doors
- C. Related Requirements:
 - 1. Section 07 9213: Quality of sealants.
 - 2. Sections under 08 1000 heading: Furnishing of doors and metal frames.
 - 3. Sections Under 08 3000 Specialty doors and frames.
 - 4. Sections under 08 7000 heading: Furnishing of finish hardware.

1.2 REFERENCES

- A. Association Publications:
 - 1. Door and Hardware Institute (DHI) 14150 Newbrook Drive, Suite 200 Chantilly, VA www.dhi.org, *Installation Guide for Doors & Hardware' by Door & Hardware Institute.*

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Installer Report:
 - a. Report verifying correct operation and adjustment of installed hardware.
 - 2. Special Procedure Submittals:
 - a. Copy of 'Installation Guide for Doors & Hardware' by Door & Hardware Institute. Guide may be obtained from Door and Hardware Institute (DHI).

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Wood Doors:
 - a. Do not have doors delivered to building site until after taping compound are dry.
 - b. If doors are to be stored at job-site for more than one week, seal top and bottom edges if not factory sealed.
- B. Storage And Handling Requirements:
 - 1. Wood Doors:
 - a. Store flat on a level surface in a dry, well ventilated building.
 - 1) Cover to keep clean but allow air circulation
 - b. Handle with clean gloves and do not drag doors across one another or across other surfaces.
 - c. Do not subject doors to abnormal heat, dryness, or humidity or sudden changes therein
 - 1) Condition doors to average prevailing humidity of locality before hanging.
 - 2. Metal Frames:

- a. Protect metal frames from damage before and during installation.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Doors:
 1. When Project is completed, doors shall not bind, stick, or be mounted so as to cause future hardware difficulties.
 2. Do not impair utility or structural strength of door in fitting of door, applying hardware, or cutting and altering door louvers, panels, or other special details.
- B. Hardware:
 1. General:
 - a. Install using set of Manufacturer's installation, adjustment, and maintenance instructions submitted with hardware under Section 08 7101. Follow as closely as possible.
 2. Hardware for Wood Doors:
 - a. If doors are not factory-machined, use hardware templates furnished by Hardware Manufacturer when mounting hardware.
 - b. Set hinges flush with edge surface. Be sure that hinges are set in a straight line to prevent distortion.
 - c. Mount door latches high in strike plate opening so when door later settles, latch will not bind.

3.2 FIELD QUALITY CONTROL

- A. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
 1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.
 2. Door frames:
 - a. Door frames damaged by use of crowbar or other prying devices to set door frames shall be repaired or replaced at no additional cost to Owner.

3.3 CLOSEOUT ACTIVITIES

- A. Provide all warranties and submittals in Owner's Operations and Maintenance Manual.
- B. Ensure doors are left in operational condition.

END OF SECTION

DIVISION 07: THERMAL AND MOISTURE PROTECTION

07 2000 THERMAL PROTECTION

07 2116 BLANKET INSULATION

07 5000 MEMBRANE ROOFING

07 5100 THERMOPLASTIC POLYOLEFIN ROOFING

07 6000 FLASHING AND SHEET METAL

07 6210 GALVANIZED STEEL FLASHING AND TRIM

07 8000 SMOKE AND FIRE PROTECTION

07 8400 FIRESTOPPING

07 9000 JOINT PROTECTION

07 9213 ELASTOMERIC JOINT SEALANTS

END OF TABLE OF CONTENTS

SECTION 07 2116
BLANKET INSULATION

PART 1 - GENERAL**1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install faced thermal batt insulation at exterior walls as described in Contract Documents.

1.2 REFERENCES

- A. Reference Standards:
1. ASTM International:
 - a. ASTM C665-06, 'Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.'

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
1. Insulation:
 - a. Acceptable Manufacturers:
 - 1) Certaineed Corp, Valley Forge, PA www.certainteed.com.
 - 2) Graham Fiberglass Ltd, Erin, ON (519) 833-9645.
 - 3) Owens-Corning Canada Inc, Willowdale, ON www.owenscorning.com.
 - 4) Ottawa Fibre Inc, Gloucester, ON www.ofigroup.com.
 - 5) Roxull Inc, Milton, ON (800) 265-6878.
 - 6) Johns Manville Canada, North York, ON www.jm.com.
 - 7) Thermafiber, Wabash, IL www.thermafiber.com.
 - 8) Equal as approved by Architect before bidding. See Section 01 6200.
- B. Materials:
1. Thermal And Acoustic Insulation:
 - a. Faced Insulation:
 - 1) Kraft faced meeting requirements of ASTM C665, Type II, Class C.
 - 2) Foil faced meeting requirements of ASTM C665, Type III.
 - a) Class B: Enclosed insulation.
 - b. Unfaced Insulation: Meet requirements of ASTM C665, Type I.
 - c. Order insulation by 'R' factor rather than 'U' factor, rating, or thickness, either 16 or 24 inches wide according to framing spacing.
 - d. 'R' Factor Required:
 - 1) Wood or Metal Wall Stud Framing:

R11	3-1/2 inches deep
R19	5-1/2 inches deep
R26	7-1/2 inches deep

2.2 SOURCE QUALITY CONTROL

- A. Insulation shall be manufactured to be in compliance with IBC or other applicable building codes.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Leave no gaps in insulation envelope.
 - 2. If two layers of insulation are used to attain required 'R' factor, only layer towards interior of building shall have facing.
 - 3. Provide minimum clearance around recessed lighting fixtures as approved by local code.
- B. In Framing:
 - 1. Install insulation behind plumbing and wiring, around duct and vent line penetrations, and in similar places.
 - 2. Fit ends of batts snug against top and bottom plates.
 - 3. Where insulation is not enclosed by structure or drywall, support in place with wire or other suitable material and use only foil-faced insulation.

END OF SECTION

SECTION 07 5100**THERMOPLASTIC POLYOLEFIN ROOFING****PART 1 GENERAL****1.1 SUMMARY:**

- A. Includes But Not Limited To:
1. Provide all labor, material, tools, equipment, and supervision necessary to complete the installation of the roofing system, insulating board and flashing at mechanical units, vents and areas of roof to be patched as specified herein and as indicated on the drawings in accordance with the manufacturer's most current specifications and details.
 2. The roofing contractor shall be fully knowledgeable of all requirements of the contract documents and shall make themselves aware of all job site conditions that will affect their work.
 3. The roofing contractor shall confirm all given information and advise the building owner, prior to bid, of any conflicts that will affect their cost proposal.

1.3 SUBMITTALS:

- A. Action Submittals:
1. Shop drawings showing layout, details of construction and identification of materials.
 2. Sample of the manufacturer's Membrane System Warranty.
 3. Submit a letter of certification from the manufacturer which certifies the roofing contractor is authorized to install the manufacturer's roofing system and lists foremen who have received training from the manufacturer along with the dates training was received.
 4. Certification from the membrane manufacturer indicating the fasteners are capable of providing a static backout resistance of 10 inch pounds minimum is required.
 5. Certification from the membrane manufacturer indicating the membrane thickness over the reinforcing scrim (top ply membrane thickness) is nominal .15-mil or thicker.
 6. Certification of the manufacturer's warranty reserve.
Upon completion of the installed work, submit copies of the manufacturer's final inspection to the specifier prior to the issuance of the manufacturer's warranty.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials to the job site in the manufacturer's original, unopened containers or wrappings with the manufacturer's name, brand name and installation instructions intact and legible. Deliver in sufficient quantity to permit work to continue without interruption.
- B. Comply with the manufacturer's written instructions for proper material storage.
1. Store Sure-Weld membrane in the original undisturbed plastic wrap in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins. Sure-Weld membrane that has been exposed to the elements for approximately 7 days must be prepared with Carlisle Weathered Membrane Cleaner prior to hot air welding.
 2. Store curable materials (adhesives and sealants) between 60°F and 80°F in dry areas protected from water and direct sunlight. If exposed to lower temperature, restore to 60°F minimum temperature before using.
 3. Store materials containing solvents in dry, well ventilated spaces with proper fire and safety precautions. Keep lids on tight. Use before expiration of their shelf life.
- C. Insulation must be on pallets, off the ground and tightly covered with waterproof materials.
- D. Any materials which are found to be damaged shall be removed and replaced at the applicator's expense.

1.5 WORK SEQUENCE:

- A. Schedule and execute work to prevent leaks and excessive traffic on completed roof sections. Care should be exercised to provide protection for the interior of the building and to ensure water does not flow beneath any completed sections of the membrane system.
- B. Do not disrupt activities in occupied spaces.

1.6 USE OF THE PREMISES:

- A. Before beginning work, the roofing contractor must secure approval from the building owner's representative for the following:
 - 1. Areas permitted for personnel parking.
 - 2. Access to the site.
 - 3. Areas permitted for storage of materials and debris.
 - 4. Areas permitted for the location of cranes, hoists and chutes for loading and unloading materials to and from the roof.

1.7 EXISTING CONDITIONS:

- A. If discrepancies are discovered between the existing conditions and those noted on the drawings, immediately notify the owner's representative by phone and solicit the manufacturer's approval prior to commencing with the work. Necessary steps shall be taken to make the building watertight until the discrepancies are resolved.
- B. Take care and protect existing roofing material from damage during the construction. All damage discovered on existing roof shall be fixed and corrected to the satisfaction of the Owner and at no cost to the Owner.
- C. Roofing contractor should schedule a job site inspection to observe actual conditions and verify all dimensions on the roof. The job site inspection may occur on the day of the pre-bid meeting or before bids are due.

1.9 TEMPORARY FACILITIES AND CONTROLS:

- A. Building Site:
 - 1. The roofing contractor shall use reasonable care and responsibility to protect the building and site against damages. The contractor shall be responsible for the correction of any damage incurred as a result of the performance of the contract.
 - 2. The roofing contractor shall remove all debris from the job site in a timely and legally acceptable manner so as to not detract from the aesthetics or the functions of the building.
- B. Security:
 - 1. Obey the owner's requirements for personnel identification, inspection and other security measures.

1.10 JOB SITE PROTECTION:

- A. The roofing contractor shall adequately protect building, paved areas, service drives, lawn, shrubs, trees, etc. from damage while performing the required work. Provide canvas, boards and sheet metal (properly secured) as necessary for protection and remove protection material at completion. The contractor shall repair or be responsible for costs to repair all property damaged during the roofing application.

- B. During the roofing contractor's performance of the work, the building owner will continue to occupy the existing building. The contractor shall take precautions to prevent the spread of dust and debris, particularly where such material may sift into the building. The roofing contractor shall provide labor and materials to construct, maintain and remove necessary temporary enclosures to prevent dust or debris in the construction area(s) from entering the remainder of the building.
- C. Do not overload any portion of the building, either by use of or placement of equipment, storage of debris, or storage of materials.
- D. Protect against fire and flame spread. Maintain proper and adequate fire extinguishers.
- E. Take precautions to prevent drains from clogging during the roofing application. Remove debris at the completion of each day's work and clean drains, if required. At completion, test drains to ensure the system is free running and drains are watertight. Remove strainers and plug drains in areas **where work is in progress**. Install flags or other telltales on plugs. Remove plugs each night and screen drain.
- F. Store moisture susceptible materials above ground and protect with waterproof coverings.
- G. Remove all traces of piled bulk materials and return the job site to its original condition upon completion of the work.

1.11 SAFETY:

The roofing contractor shall be responsible for all means and methods as they relate to safety and shall comply with all applicable local, state and federal requirements that are safety related. **Safety shall be the responsibility of the roofing contractor.** All related personnel shall be instructed daily to be mindful of the full time requirement to maintain a safe environment for the facility's occupants including staff, visitors, customers and the occurrence of the general public on or near the site.

1.12 WORKMANSHIP:

- A. Applicators installing new roof, flashing and related work shall be factory trained and approved by the manufacturer they are representing.
- B. All work shall be of highest quality and in strict accordance with the manufacturer's published specifications and to the building owner's satisfaction.
- C. There shall be a supervisor on the job site at all times while work is in progress.

1.13 QUALITY ASSURANCE:

- A. The Sure-Weld Roofing System must achieve a UL Class A
- B. The specified roofing assembly must be rated by Factory Mutual Global (FMG) to meet or exceed the factored uplift pressures outlined in FMG Property Loss Prevention Data Sheet 1-28, and complies with FMG Property Loss Prevention Data Sheet 1-29 for enhancements at the perimeter and corners.
- C. The membrane must be manufactured by the material supplier. Manufacturer's supplying membrane made by others are not acceptable.
- D. Unless otherwise noted in this specification, the roofing contractor must strictly comply with the manufacturer's current specifications and details.
- E. The roofing system must be installed by an applicator authorized and trained by the manufacturer

in compliance with shop drawings as approved by the manufacturer. The roofing applicator shall be thoroughly experienced and upon request be able to provide evidence of having successful experience installing single-ply TPO roofing systems.

- F. Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified. Provide at least one thoroughly trained and experienced superintendent on the job at all times roofing work is in progress.
- G. There shall be no deviations made from this specification or the approved shop drawings without the prior written approval of the specifier. Any deviation from the manufacturer's installation procedures must be supported by a written certification on the manufacturer's letterhead and presented for the specifier's consideration.
- H. Roofing membrane meets CRRC (Cool Roof Rating Council) for reflectance and emittance. When tested in accordance with ASTM C1549, the Sure-Weld White material has an initial solar reflectance of 0.79 and a 3-year aged reflectance of 0.70. The material has also been tested for emittance in accordance with ASTM C1371; an initial emittance of .90 and a 3-year aged emittance of 0.86 were achieved.
- I. Upon completion of the installation, the applicator shall arrange for an inspection to be made by a non-sales technical representative of the membrane manufacturer in order to determine whether or not corrective work will be required before the warranty will be issued. Notify the building owner seventy-two (72) hours prior to the manufacturer's final inspection.

1.14 JOB CONDITIONS, CAUTIONS AND WARNINGS:

Refer to Carlisle's Sure-Weld Roofing System specification for General Job Site Considerations.

- A. Material Safety Data Sheets (MSDS) must be on location at all times during the transportation, storage and application of materials.
- B. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.
- C. When loading materials onto the roof, the Carlisle Authorized Roofing Applicator must comply with the requirements of the building owner to prevent overloading and possible disturbance to the building structure.
- D. Proceed with roofing work only when weather conditions are in compliance with the manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with the manufacturer's requirements and recommendations.
- E. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.
- F. Provide protection, such as 3/4 inch thick plywood, for all roof areas exposed to traffic during construction. Plywood must be smooth and free of fasteners and splinters.
- G. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.
- H. New roofing shall be complete and weathertight at the end of the work day.
- I. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the

roofing membrane.

1.15 WARRANTY:

- A. Provide manufacturer's 15 year Total System Warranty covering both labor and material with no dollar limitation. The maximum wind speed coverage shall be peak gusts of 90 mph measured at 10 meters above ground level. Certification is required with bid submittal indicating the manufacturer has reviewed and agreed to such wind coverage.

Note: For projects specified with warranties 20 year or longer and/or wind coverage specified greater than 72 mph, additional design enhancements are required. Refer to Carlisle published Sure-Weld Specifications

Note:

Warranty Length	Minimum Membrane Thickness
10 or 15 year	.045-mil Sure-Weld
20 year	.060-mil Sure-Weld
30 year	.080-mil Sure-Weld

- B. Warranty shall also cover leaks caused by accidental punctures: 16 man-hours per year for .080-mil Sure-Weld
- C. When white Sure-Weld membrane is specified, a Reflectivity Warranty Amendment is available indicating the membrane will meet the Energy Star program reflectivity guidelines for both new and aged membrane for a period of 10 years.
- D. Pro-rated System Warranties shall not be accepted.
- E. Evidence of the manufacturer's warranty reserve shall be included as part of the project submittals for the specifier's approval.

1.16 APPROVED INSTALLER:

- A. Patching and installation of roofing system shall be performed by J.J. Roofing, P.O. Box 5657, Riverside CA 92517, 951-784-7663. Contact Don Luginbill, don@jjroof.com.
- B. No other roofing installer shall be approved for the installation of the roofing system. The existing roof has a current warrantee provided by the manufacturer and J.J. Roofing. Installation of the roofing system will void the warrantee if another installer is used.

PART 2 PRODUCTS:**2.1 MANUFACTURER**

- A. All components of the specified roofing system shall be products of Carlisle SynTec or accepted by Carlisle SynTec as compatible. Carlisle Syntec, P.O. Box 7000, Carlisle, PA 17013, 800-4-SYNTEC, WWW.carlisesyntec.com.
- B. All products (including insulation, fasteners, fastening plates, prefabricated accessories and edgings) must be **manufactured and/or supplied** by the roofing system manufacturer and covered by the warranty.

2.2 MEMBRANE

Furnish Sure-Weld 060-mil thick white, reinforced TPO (Thermoplastic Polyolefin) membrane as needed to complete the roofing system. Membrane thickness over the reinforcing scrim (top-ply thickness) shall be nominal .015-mil or thicker. Membrane sheets in rolls 12', 10' or 8' wide by 100' long.

2.3 INSULATION/UNDERLAYMENT:

- A. When applicable, insulation shall be installed in multiple layers. The first and second layer of insulation shall be mechanically fastened to the substrate in accordance with the manufacturer's published specifications.
- B. Insulation shall be the following:
 - 1. **R-Tech FanFold Recover Board** – Closed-cell lightweight expanded polystyrene (EPS) with polymeric laminated faces which meets ASTM C 578 for use as a recover board. Recover Board shall be ½" thick to match existing. Field verify prior to ordering material.

2.4 ADHESIVES AND CLEANERS:

All products shall be furnished by Carlisle and specifically formulated for the intended purpose.

- A. **Sure-Weld Bonding Adhesive:** A high-strength, synthetic rubber adhesive used for bonding Sure-Weld membrane to various surfaces. The adhesive is applied to both the membrane and the substrate at a coverage rate of approximately 60 square feet per gallon per finished surface (includes coverage on both surfaces).
- B. **Low VOC Bonding Adhesive for TPO:** This product meets the <250 gpl VOC (volatile organic compound) content requirements of the OTC Model Rule for Single-Ply Roofing Adhesives. A high strength, solvent-based contact adhesive that allows bonding of TPO membrane to various porous and non-porous substrates. Apply at a rate of 60 ft² per gallon finished surface. Available in 5 gallon pails. This product does not comply with southern California counties with additional restrictions on solvents. See Carlisle's Product Data Sheet for a listing of the counties involved.
- C. **Low VOC Bonding Adhesive 1168:** This product meets the <250 gpl VOC (volatile organic compound) content requirements of the OTC Model Rule for Single Ply Roofing Adhesives. A high strength, solvent-based contact adhesive the allows bonding of TPO membrane to various porous and non-porous substrates. Apply at a rate of 60 ft² per gallon finished surface. Available in 5-gallon cans. This product complies with southern California counties with additional restrictions on solvents. See Carlisle's Product Data Sheet for a listing of the counties involved.
- D. **Cut-Edge Sealant:** A white or clear colored sealant used to seal cut edges of reinforced Sure-Weld membrane. A coverage rate of approximately 225 - 275 linear feet per squeeze bottle can be achieved when a 1/8" diameter bead is applied.

- E. **Water Cut-Off Mastic:** Used as a mastic to prevent moisture migration at drains, compression terminations and beneath conventional metal edging (at a coverage rate of approximately 10' per tube or 100' per gallon).
- F. **Universal Single-Ply Sealant:** A 100% solids, solvent free, voc free, one part polyether sealant that provides a weather tight seal to a variety of building materials. It is white in color and is used for general caulking such as above termination bars and metal counter flashings and at scuppers.
- G. **Thermoplastic One-Part Pourable Sealer:** A one-part, moisture curing, elastomeric polyether sealant used to fill TPO Molded Pourable Sealant Pockets. Packaged in 4, 2-liter foil pouches inside a reusable plastic bucket. 1 pouch will fill 2 TPO Molded Pourable Sealant Pockets.
- H. **Weathered Membrane Cleaner:** Used to prepare membrane for heat welding that has been exposed to the elements or to remove general construction dirt at an approximate coverage rate of 400 square feet per gallon (one surface).
- I. **TPO Primer:** A solvent-based primer used to prepare the surface of Sure-Weld Membrane prior to application of Pressure-Sensitive Coverstrip and TPO Pressure-Sensitive RUSS.
- J. **TPO Low VOC Primer::** A solvent-based, low solids primer used to prepare the surface of Sure-Weld Membrane prior to application of Pressure-Sensitive Coverstrip and TPO Pressure-Sensitive RUSS. This low VOC product is ideal for use in states where environmental issues are a concern.

2.5 FASTENERS AND PLATES:

To be used for mechanical attachment of insulation and to provide additional membrane securement: As required by site conditions and to match existing roofing fasteners.

- A. **HP- Fasteners:** a threaded, #14 fastener with a #3 phillips drive used with steel and wood roof decks.
- B. **HP-X Fasteners:** A heavy duty #15 threaded fastener with a #3 phillips drive used for membrane or insulation securement into steel, wood plank or minimum 15/32 inch thick plywood when increased pullout resistance is desired.
- C. **HP-Xtra Fastener:** an oversized diameter (.315) steel threaded fastener with a #3 phillips drive used in conjunction with Piranha Xtra Plates for membrane securement into steel or wood decks.
- D. **Pre-Assembled ASAP Fasteners:** A pre-assembled 3" diameter Plastic Plate and # 12 threaded fastener with a #3 drive used for insulation attachment into steel or wood decks. Installed using OMG Fastening Tools.
- E. **InsulFast Fasteners:** A threaded #12 fastener with #3 phillips drive used for insulation attachment into steel or wood decks.
- F. **CD-10 Fasteners:** A non-threaded, hammer driven fastener used with structural concrete roof decks rated 3,000 psi or greater.
- G. **HP 14-10 Fasteners:** A #14 threaded fastener with a #3 phillips drive used for minimum 3,000 psi concrete decks.
- H. **Polymer Gyptec Fasteners:** A non-penetrating, plastic fastener and corresponding 3" diameter plate used with lightweight deck substrates such as cementitious wood fiber, gypsum, and lightweight insulating concrete.
- I. **HP Purlin Fasteners:** Specifically designed for use with Carlisle's Metal Retrofit Roofing System

to secure membrane and RUSS to structural steel purlins. The self drilling point can penetrate 12-18 gauge steel with superior pullout resistance.

- J. **HP Term Bar Nail-Ins:** A 1-1/4" long expansion anchor with a zinc plated steel drive pin used for fastening the Carlisle Termination Bar or Seam Fastening Plates to concrete, brick, or block walls.
- K. **Piranha Plates:** A 2-3/8" diameter metal barbed fastening plate used with Carlisle HP-X or HP-14-10 Fasteners for membrane securement. This plate can be used for insulation securement.
- L. **Piranha Xtra Plates:** A 2-3/8" diameter metal barbed fastening plate with an oversized hole for use with Carlisle HP-Xtra Fasteners for membrane securement.
- M. **Insulation Fastening Plates:** a nominal 3 inch diameter plastic or metal plate used for insulation attachment.
- N. **Sure-Weld Pressure-Sensitive RUSS™** (Reinforced Universal Securement Strip): a 6" wide, nominal 45-mil thick reinforced TPO membrane with 3" wide Pressure Sensitive Tape laminated along one edge. The 6" wide Pressure-Sensitive RUSS is used horizontally at the base of walls, curbs, etc., in conjunction with 2" diameter Seam Fastening Plates below the TPO deck membrane for additional membrane securement.
 - 1. **6" wide Pressure-Sensitive RUSS** is used horizontally or vertically at the base of walls, curbs, etc., in conjunction with PiranhaFastening Plates below the TPO deck membrane for additional membrane securement.
 - 2. **10" wide Pressure-Sensitive RUSS** is for perimeter membrane securement.

2.6 METAL EDGING AND MEMBRANE TERMINATIONS:

As required by site conditions and to match existing roofing installation.

- A. **General:** All metal edging shall be tested and meet ANSI/SPRI ES-1 standards and comply with California Building Code.
- B. **SecurEdge 300:** a snap-on edge system consisting of a 24 gauge galvanized metal water dam and 24 gauge steel, Kynar 500 finish. Metal fascia color shall be as designated by the Owner's Representative.
- C. **SecurEdge 200:** a snap-on edge system consisting of a 24 gauge galvanized metal water dam and 24 gauge steel, Kynar 500 finish. Metal fascia color shall be as designated by the Owner's Representative.
- D. **SecurEdge One Edge:** A snap-on edge system consisting of a 24 gauge retainer bar, corrosion resistant fasteners and a 24 gauge or 0.040 aluminum Kynar finished fascia cover. A spring clip holds the fascia cover in place. Available in sizes up to 8" fascia height 12' long. Metal fascia color shall be designated by the Owner's Representative.
- E. **SecurWeld Drip Edge:** 4'x 10' coated metal sheets made from 24 gauge galvanized steel with a minimum .035" thick non-reinforced white Sure-Weld laminate. Sure-Weld membrane can be welded directly to the Sure-Weld Coated Metal in accordance with the manufacturer's detail.
- F. **SecurEdge Coping:** incorporates a 20 gauge anchor cleat with 4 pre-slotted holes, a concealed joint cover and 10 foot continuous sections of coping cap; can accommodate minimum 5" wide parapet walls. Metal coping cap color shall be as designated by the Owner's Representative.
- G. **SecurEdge One Coping:** A snap-on coping edge system consisting of a 24 gauge retainer bar

(face side only), corrosion resistant fasteners and a 24 gauge or 0.040 aluminum Kynar finished coping cover. The coping cover is secured by clipping on the retainer bar and fastened on the backside with corrosion resistant fasteners (with rubber washer). Available for wall thicknesses up to 30". Metal coping cap color shall be as designated by the Owner's Representative.

- H. **Termination Bar:** a 1" wide and .098" thick extruded aluminum bar pre-punched 6" on center; incorporates a sealant ledge to support Lap Sealant and provide increased stability for membrane terminations.

2.8 OTHER MATERIALS:

._Metal Flashing, if required, and miscellaneous items needed to fulfill the project requirements

PART 3 EXECUTION

3.1 GENERAL:

- A. Comply with the manufacturer's published instructions for the installation of the membrane roofing system including proper substrate preparation, jobsite considerations and weather restrictions.
- B. Position sheets to accommodate contours of the roof deck and shingle splices to avoid bucking water.

3.2 INSULATION PLACEMENT AND ATTACHMENT:

- A. Install insulation or membrane underlayment over the substrate with boards butted tightly together with no joints or gaps greater than 1/4 inch. Stagger joints both horizontally and vertically if multiple layers are provided.
- B. Secure insulation to the substrate with the required Carlisle fasteners and plates in accordance with manufacturers specifications.

3.3 MEMBRANE PLACEMENT AND ATTACHMENT:

- A. Unroll and position membrane. Provide and secure both perimeter and field membrane sheets in accordance with the manufacturer's most current specifications and details.
- B. Secure the membrane with the required Carlisle Fasteners and Plates spaced a maximum of 12 inches on center depending on project conditions (centered over the pre-printed marks approximately 1-1/2 inches from the edge of the membrane sheet).
- C. Install adjoining membrane sheets in the same manner in accordance with the manufacturer's specifications.

3.4 MEMBRANE HOT AIR WELDING PROCEDURES:

- A. Hot air weld the Sure-Weld membrane using an Automatic Hot Air Welding Machine or Hot Air Hand Welder in accordance with the manufacturer's specifications. At all splice intersections, roll the seam with a silicone roller immediately after welder crossed the membrane step-off to ensure a continuous hot air welded seam.

Note: When using .060-mil thick or thicker membrane, all splice intersections shall be overlaid with Sure-Weld non-reinforced flashing or TPO T-Joint covers.

- B. Probe all seams once the hot air welds have thoroughly cooled (approximately 30 minutes).
- C. Repair all seam deficiencies the same day they are discovered.

- D. Apply Cut Edge Sealant on all cut edges of reinforced membrane (where the scrim reinforcement is exposed) after seam probing is complete. Cut edge sealant is not required on vertical splices.

3.5 FLASHING:

- A. Flashing of parapets, curbs, expansion joints and other parts of the roof must be performed using Sure-Weld reinforced membrane. Sure-Weld non-reinforced membrane can be used for flashing pipe penetrations, Sealant Pockets, scuppers, as well as inside and outside corners when the use of pre-fabricated accessories is not feasible.
- B. Follow manufacturer's typical flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.

3.7 DAILY SEAL

- A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the work day, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.
- B. Complete an acceptable membrane seal in accordance with the manufacturer's requirements.

3.8 CLEAN UP

- A. Perform daily clean-up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.
- B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

END OF SECTION

SECTION 07 6210

GALVANIZED STEEL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
1. Furnish and install miscellaneous flashing, counterflashing, and hold-down clips as described in Contract Documents and not specified to be of other material.

1.2 REFERENCES

- A. Reference Standards:
1. ASTM International:
 - a. ASTM A653 / A653M-08, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.'
 - b. ASTM A792 / A792M-08, 'Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.'

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
1. Acceptable Manufacturers Of Metal:
 - a. CMG – Coated Metals Group, Denver, CO www.cmgmetals.com.
 - b. Englert Inc, Perth Amboy, NJ www.englertinc.com.
 - c. Fabral, Lancaster, PA www.fabral.com.
 - d. Firestone Metal Products, Anoka, MN www.unaclad.com.
 - e. MBCI, Houston, TX www.mbc.com.
 - f. Metal Sales Manufacturing Corp, Sellersburg, IN www.mtlsales.com.
 - g. Petersen Aluminum Corp, Elk Grove, IL www.pac-clad.com.
 - h. Ryerson, Chicago, IL www.ryerson.com.
 - i. Equal as approved by Architect. See Section 01 6200.
- B. Materials:
1. Sheet Metal:
 - a. Galvanized iron or steel meeting requirements of ASTM A653, G 90 or Galvalume steel meeting requirements of ASTM A792 AZ50, 50 ksi.
 - 1) 22 ga for hold-down clips.
 - 2) 24 ga for all other.
- C. Fabrication:
1. Form accurately to details.
 2. Profiles, bends, and intersections shall be even and true to line.
 3. Fold exposed edges 1/2 inch to provide stiffness.
- D. Finish:
1. Metal exposed to view shall have face coating of polyvinylidene Fluoride (PVF₂) Resin-base finish (Kynar 500 or Hylar 5000) containing 70 percent minimum PVF₂ in resin portion of formula.

- Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal. Reverse side coating shall be thermo-cured system consisting of corrosion inhibiting epoxy primer applied over properly pre-treated metal.
2. Color as selected by Architect from Manufacturer's standard colors.

2.2 ACCESSORIES

- A. Sealants: Rubber base type conforming to Fed Spec TC-S-00230.
- B. Fasteners:
 1. Of strength and type consistent with function.
 2. Nails: Hot-dipped galvanized.
 3. Screws, Bolts, And Accessory Fasteners: Galvanized or other acceptable corrosion resistant treatment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install with small, watertight seams.
- B. Slope to provide positive drainage.
- C. Provide sufficient hold down clips to insure true alignment and security against wind.
- D. Provide 4 inch minimum overlap.
- E. Allow sufficient tolerance for expansion and contraction.
- F. Insulate work to prevent electrolytic action.

3.2 CLEANING

- A. Leave metals clean and free of defects, stains, and damaged finish.

END OF SECTION

SECTION 07 8400**FIRESTOPPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install firestopping at all locations as required by the Building Code.
 2. Quality of firestopping materials and systems used for penetrations on Project, including submittal requirements.
- B. Related Requirements:
1. Furnishing and installing of penetration firestopping specified under Section installing work penetrating structure.

1.2 REFERENCES

- A. Definitions:
1. Annular space: Opening around a penetrating item.
 2. Exposed Penetration Firestopping: Products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
 3. F Rating: The time period that the through-penetration firestop system limits the spread of fire through the penetration when tested in accordance with ASTM E 814 or UL 1479.
 4. Fire-Resistant Joint System: An assemblage of specific materials or products that are designed, tested and fire-resistance rated in accordance with either ASTM E 1966 or UL 2079 to resist for a prescribed period of time the passage of fire through joints made in or between fire-resistance-rated assemblies.
 5. Firestopping: A process whereby certain materials, some of them specially manufactured, are used to resist (or stop) the spread of fire and its byproducts through openings made to accommodate penetrations in fire-rated walls, floors and floor/ceiling assemblies.
 6. Joint: The linear opening in or between adjacent fire-resistance-rated assemblies that is designed to allow independent movement of the building in any plane caused by thermal, seismic, wind or any other loading.
 7. Membrane Penetration: An opening made through one side (wall, floor or ceiling membrane) of an assembly.
 8. Membrane-Penetration Firestop: A material, device or construction installed to resist for a prescribed time period the passage of flame and heat through openings in a protective membrane in order to accommodate cables, cable trays, conduit, tubing, pipes or similar items.
 9. Penetration - An opening created in a membrane or assembly to accommodate penetrating items for electrical, mechanical, environmental, and communication systems.
 10. Penetration Firestop System:
 - a. A specific construction consisting of materials that protect the opening around the penetrating items to resist spread of fire and passage of smoke and other gases to resist passage of fire through penetrations for prescribed period of time. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any. Tested in accordance with ASTM E 814 or UL 1479.
 11. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - a. Fire-resistance-rated walls include, fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
 - b. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

12. Penetrations in Horizontal Assemblies: Penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - a. Horizontal assemblies include ceiling membranes of the following:
 - 1) F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2) T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
13. Penetrations in Smoke Barriers: Penetration firestopping with ratings determined per UL 1479.
 - a. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.
14. T Rating: The time period that the penetration firestop system, including the penetrating item, limits the maximum temperature rise to 325 deg F above its initial temperature through the penetration on the nonfire side when tested in accordance with ASTM E 814 or UL 1479.
15. Through Penetration: An opening that passes through an entire assembly.
16. Through-Penetration Firestop System: An assemblage of specific materials or products that are designed, tested and fire-resistance rated to resist for a prescribed period of time the spread of fire through penetrations. The F and T rating criteria for penetration firestop systems shall be in accordance with ASTM E 814 or UL 1479. See definitions of "F Rating" and "T Rating."
17. W-Rating: Penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

B. Reference Standards:

1. American Society For Testing And Materials:
 - a. ASTM E84-10, 'Standard Test Method for Surface Burning Characteristics of Building Materials.'
 - b. ASTM E814-09, 'Standard Test Method for Fire Tests of Penetration Firestop Systems.'
2. International Building Code (ICC):
 - a. Chapter 7 – Fire and Smoke Protection Features.
3. International Conference of Building Officials:
 - a. ICBO, 'Uniform Building Code (UBC), Volume 1, Administrative, Fire and Life Safety, and Field Inspection Provisions.'
4. Underwriter's Laboratories / American National Standards Institute:
 - a. UL / ANSI 1479-2003, 'Standard for Safety for Fire Tests of Through-Penetration Firestops.'
 - b. Fire Resistance Directory, current edition, contains listing of approved Penetration Firestop Systems.

1.3 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
 - a. Show each type of Penetration Firestop System to be used on Project with design approval reference number.
 - b. Identify locations where each type of Penetration Firestop System is to be installed.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

1. Each Penetration Firestop System shall be UL / ULC listed for that type of penetration occurring on Project.
2. Ratings shall be in accordance with ASTM E814, UL 1479, IBC Section 713, or UBC Standard No 43-6 as acceptable to local code authority.

B. Qualifications:

1. Installers:
 - a. Installer who is certified and licensed or qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products per specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
 - 1. Deliver firestopping materials to the Site in original, new unopened containers or packages bearing manufacturer's printed labels.
- B. Storage And Handling Requirements:
 - 1. Store and handle firestopping materials to prevent deterioration or damage due to moisture, temperature changes, contaminants or other causes.

1.6 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Temperature: Do not install firestopping materials when ambient or substrate temperatures are outside limits permitted by manufacturer of firestopping materials.
 - 2. Humidity and Moisture: Do not install the Work of this Section under conditions that are detrimental to the application, curing, and performance of the materials.
 - 3. Ventilation: Provide sufficient ventilation wherever firestopping materials are installed in enclosed spaces. Follow manufacturer's recommendations.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Acceptable Manufacturers:
 - a. Members of International Firestop Council www.firestop.org.
 - b. Equal as approved by Architect before installation.
- B. Materials:
 - 1. Sealant, packing material, or collar system required by Firestop Manufacturer for Firestop Penetration System to comply with listed design.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verification Of Conditions:
 - 1. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
 - 2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellents, and any other substances that may inhibit optimum adhesion.
 - 3. Do not commence Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean out openings, control, and expansion joints immediately before installation of through-penetration firestopping. Comply with recommendations of firestopping manufacturer and the following requirements:
 - 1. Remove foreign materials from surfaces of openings and joint substrates, and from penetrating items that could interfere with adhesion of firestopping.

2. Clean opening and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form release agents from concrete.
4. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

3.3 INSTALLATION

- A. General: Install firestopping in accordance with Manufacturer's instructions for installation of firestopping products.

3.4 PROTECTION

- A. Protect surfaces adjacent to through-penetration firestops with suitable covering to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or that would be caused by cleaning methods used to remove smears from firestopping materials.

3.5 CLEANING

- A. Clean off excess fill materials and sealants adjacent to penetrations by methods and cleaning materials recommended by manufacturers of firestopping products and of products in which penetrations occur.
- B. Protect firestopping during and after curing period from contact with contaminating substances, or damage resulting from adjacent Work.

END OF SECTION

SECTION 07 9213**ELASTOMERIC JOINT SEALANTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install sealants not specified to be furnished and installed under other Sections.
 2. Quality of sealants to be used on Project not specified elsewhere, including submittal, material, and installation requirements.
- B. Related Requirements:
1. Removing existing sealants specified in Sections where work required.
 2. Furnishing and installing of sealants is specified in Sections specifying work to receive new sealants.

1.2 REFERENCES

- A. Definitions:
1. Adhesive: An adhesive, as defined by The American Society for Testing and Materials (ASTM), is "a substance capable of holding materials together by surface attachment"
 2. Caulk: Caulks have a variety of definitions but are generally recognized as materials used in applications where only minor elastomeric properties are needed.
 3. Sealant. Sealants are generally used in applications where elastic properties are needed while adhesives are generally used in applications where bonding strength and rigidity are needed. With technology advancements both sealants and adhesives can be used interchangeably depending on the applications performance requirements.
- B. Association Publications:
1. American Architectural Manufacturers Association (AAMA):
 - a. "Voluntary Specifications and Test Methods for Sealants".
 2. ASM International:
 - a. "Adhesives and Sealants", Volume 3, ASM International Handbook Committee, May 1999.
 - b. Committee C24 on Building Seals and Sealants for various Specifications, Guides, Test Methods, and Practices related to sealant specifying and application.
 - c. Committee E6 on Building Performance for various Specifications, Guides, Test Methods, and Practices related to sealant use with air barriers, vapor retarders, and exterior enclosure systems and materials.
 3. The Adhesive and Sealing Council, Inc. (ASC) / Sealant, Waterproofing & Restoration Institute (SWR Institute):
 - a. "Sealants: The Professional's Guide".
 - b. "Joint Sealants", Whole Building Design Guide".
- C. Reference Standards:
1. ASTM International:
 - a. ASTM C920-08, 'Standard Specification for Elastomeric Joint Sealants.'
 - b. ASTM C1193-09, 'Standard Guide for Use of Joint Sealants.'

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Scheduling:
1. Ensure sealants are cured before covering with other materials.

1.4 SUBMITTALS

- A. Action Submittals:
1. Product Data:
 - a. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - b. Manufacturer's literature for each Product.
 - c. Schedule showing joints requiring sealants. Show also backing and primer to be used.
- B. Informational Submittals:
1. Certificates:
 - a. Manufacturer's Certificate:
 - 1) Certify products are suitable for intended use and products meet or exceed specified requirements.
 - 2) Certificate from Manufacturer indicating date of manufacture.
 2. Manufacturers' Instructions:
 - a. Manufacturer's installation recommendations for each Product.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
1. Deliver and keep in original containers until ready for use.
- B. Storage and Handling Requirements:
1. Handle to prevent inclusion of foreign matter, damage by water, or breakage.
 2. Store in a cool dry location, but never under 40 deg F.

1.6 FIELD CONDITIONS

- A. Ambient Conditions:
1. Do not install sealant during inclement weather or when such conditions are expected. Allow wet surfaces to dry.
 2. Follow Manufacturer's temperature recommendations for installing sealants.

1.7 WARRANTY

- A. Manufacturer Warranty:
1. Manufacturer's standard warranty covering sealant materials.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. Dow Corning Corp, Midland, MI www.dowcorning.com.

- b. GE Sealants & Adhesives, Huntersville, NC www.gesealants.com or G E Silicone Canada, Mississauga, ON (905) 858-6744 or (800) 668-4644.
 - c. Laticrete International Inc, Bethany, CT www.laticrete.com.
 - d. Sherwin-Williams, Cleveland, OH www.sherwin-williams.com.
 - e. Sika Corporation, Lyndhurst, NJ www.sikaconstruction.com or Sika Canada Inc, Pointe Claire, QC www.sika.ca.
 - f. Tremco, Beachwood, OH www.tremcosealants.com or Tremco Ltd, Toronto, ON (800) 363-3213.
 - g. Equal as approved by Architect.
- B. Materials:
- 1. General
 - a. Sealants provided shall meet Manufacturer's shelf-life requirements.
 - b. Sealants must adhere to and be compatible with specified substrates.
 - c. Primers, if required, shall not stain and shall be compatible with substrates.
 - d. Sealants shall be stable when exposed to UV, joint movements, and particular environment prevailing at project location.
 - e. Sealant shall be a formulation meeting the performance requirement of ASTM C 920.
 - 2. Sealants At Exterior Building Elements:
 - a. Wall penetrations.
 - b. Connections.
 - c. Other joints necessary to seal off building from outside air and moisture.
 - d. Approved Products.
 - 1) Dow Corning:
 - a) Primer: 1200 Prime Coat.
 - b) Sealant: 791 Silicone Weatherproofing Sealant.
 - 2) GE Sealants & Adhesives:
 - a) Primer: SS4044 Primer.
 - b) Sealant: Silpruf SCS 2000 Silicone Sealant.
 - 3) Tremco:
 - a) Primer:
 - (1) Metal surface: No. 20 primer.
 - (2) Porous surfaces: No. 23 primer.
 - b) Sealant: Spectrum 1 Silicone Sealant.
 - 3. Sealants At Exterior Sheet Metal And Miscellaneous:
 - a. Roof vents and flues.
 - b. Flashings.
 - c. Approved Products.
 - 1) 791 Silicone Weatherproofing Sealant or 790 Silicone Building Sealant by Dow Corning.
 - 2) Sikaflex 15LM Sealant by Sika Corp.
 - 3) Tremsil 600 Silicone Sealant by Tremco.
 - 4. Sealants At Exterior Concrete:
 - a. Approved Products.
 - 1) Joints between building foundations and exterior site concrete:
 - a) Dow Corning:
 - (1) Primer: 1200 Prime Coat.
 - (2) Sealant: 790 Silicone Building Sealant.
 - b) GE Sealants & Adhesives:
 - (1) Primer: SS4044 Primer.
 - (2) Sealant: Silpruf SCS 2000 Silicone Sealant.
 - 5. General Interior Sealants:
 - a. Both sides of interior door frames.
 - b. Inside perimeters of windows.
 - c. Miscellaneous gaps between substrates.
 - d. Approved Product.
 - 1) Tub, Tile, And Ceramic Silicone Sealant by Dow Corning.
 - 2) GE Silicone II XST - Kitchen & Bath with BioSeal by GE Sealants & Adhesives.
 - 3) Latasil Sealant by Laticrete.
 - 4) Pro-Select Kitchen And Bath Silicone Sealant by Sherwin Williams.
 - 5) Tremsil 200 Silicone Sealant by Tremco.

6. Sealants For Interior Joints Formed By:
 - a. Countertops and backsplash to wall.
 - b. Sinks and lavatories to countertops.
 - c. Termination joints in showers.
 - d. Joints between plumbing fixtures and other substrates.
 - e. Approved Products.
 - 1) Tub, Tile, And Ceramic Silicone Sealant by Dow Corning.
 - 2) GE Silicone II - Kitchen & Bath with BioSeal by GE Sealants & Adhesives.
 - 3) Latasil Silicone Sealant by Laticrete.
 - 4) Pro-Select Kitchen And Bath Silicone Sealant by Sherwin Williams.
 - 5) Tremsil 200 Silicone Sealant by Tremco.
7. Color: As selected by Architect from Manufacturer's standard colors.

2.2 ACCESSORIES

- A. Backing: Flexible closed cell, non-gassing polyurethane or polyolefin rod or bond breaker tape as recommended by Sealant Manufacturer for joints being sealed.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove existing sealants as necessary for installation of new sealant. Surfaces shall be clean, dry, and free of dust, oil, grease, dew, or frost.
- B. Apply primer, if required.
- C. Joint Backing:
 1. Prepare joints in accordance with ASTM C1193.
 2. Clean concrete joint surfaces to remove dirt, dust, oils, paints, curing agents and form release agents.
 3. Rod for open joints shall be at least 1-1/2 times width of open joint and of thickness to give solid backing. Backing shall fill up joint so depth of sealant bite is no more than 3/8 inch deep.
 4. Apply bond-breaker tape in shallow joints as recommended by Sealant Manufacturer.

3.2 APPLICATION

- A. Do not use damaged or deteriorated materials.
- B. Apply sealant with hand-caulking gun with nozzle of proper size to fit joints. Use sufficient pressure to insure full contact to both sides of joint to full depth of joint. Apply sealants in vertical joints from bottom to top.
- C. Tool joints immediately after application of sealant if required to achieve full bedding to substrate or to achieve smooth sealant surface. Tool joints in opposite direction from application direction, i.e., in vertical joints, from the top down. Do not 'wet tool' sealants.
- D. Depth of sealant bite shall be 1/4 inch minimum and 1/2 inch maximum, but never more than one half or less than one fourth joint width.
- E. Do not apply caulking at temperatures below 40 deg F.
- F. Caulk gaps between painted or coated substrates and unfinished or pre-finished substrates. Caulk gaps larger than 3/16 inch between painted or coated substrates.

3.3 CLEANING

- A. Clean adjacent materials, which have been soiled, immediately (before setting) as recommended by Manufacturer.

END OF SECTION

DIVISION 08: OPENINGS

08 0000 OPENINGS

08 0601 HARDWARE GROUP AND KEYING SCHEDULES

08 1000 DOORS AND FRAMES

08 1213 HOLLOW METAL FRAMES

08 1416 FLUSH WOOD DOORS

08 3000 SPECIALTY DOORS AND FRAMES

08 3313 COILING COUNTER DOOR

08 7000 HARDWARE

08 7101 COMMON FINISH HARDWARE REQUIREMENTS

08 7102 HANGING DEVICES

08 7103 SECURING DEVICES

08 7105 ACCESSORIES FOR PAIRS OF DOORS

08 7106 CLOSING DEVICES

08 7107 PROTECTIVE PLATES AND TRIM

08 7108 STOPS AND HOLDERS

08 7109 ACCESSORIES

END OF TABLE OF CONTENTS

SECTION 08 0601**HARDWARE GROUP AND KEYING SCHEDULES****PART 1 - HARDWARE GROUP SCHEDULE for FINISH HARDWARE****1.1 DEFINITIONS**

- A. Builders Hardware Manufacturer's Association (BHMA) Hardware Functions:
1. F-75 Passage Latch: Latch bolt operated by lever from either side at all times.
 2. F-76 Privacy Lock: Latch bolt operated by lever from either side. Outside lever locked by push button inside and unlocked by emergency key from outside or rotating lever from inside.
 3. F-81 Office Door Lock: Dead locking latch bolt operated by lever from either side, except when outside lever is locked by turn button in inside lever. When outside lever is locked, latch bolt is operated by key in outside lever or by rotating inside lever. Turn button must be manually rotated to unlock outside lever.
 4. F-84 Classroom Deadlock: Dead locking latch bolt operated by lever from either side, except when outside lever is locked, latch bolt is operated by key in outside lever or by rotating inside lever.
 5. F-86 Utility Space Door Lock: Dead locking latch bolt operated by key in outside lever or by rotating inside lever. Outside lever is always fixed.
 6. E-2152 Deadbolt: Dead bolt operated by key from outside and turn button from inside. Bolt automatically dead locks when fully thrown.

1.2 SINGLE INTERIOR DOORS:

- A. Group 1: Doors A/38, B/38
1. 3 each: Hinges.
 2. 1 each: Lockset Function F-84.
 3. 1 each: Closer.
 4. 1 each: Stop.
 5. 1 set: Smoke Gaskets.
 6. 1 each: Kick Plate.
 7. 1 each: Magnetic Door Hold-Open (see section 28 3134)
- B. Group 2: Door A/35A
1. 3 each: Hinges.
 2. 1 each: Lockset Function F-86.
 3. 1 each: Stop.
 4. 1 each: Kick Plate.
- C. Group 3: Door A/35
1. 3 each: Hinges.
 2. 1 each: Lockset Function F-86.
 3. 1 each: Closer.
 4. 1 each: Stop.
 5. 1 set: Smoke Gaskets.
 6. 1 each: Kick Plate.
 7. 1 each: Magnetic Door Hold-Open (see section 28 3134)

- D. Group 4: Door A/24B
 - 1. 3 each: Hinges.
 - 2. 1 each: Lockset Function F-81.
 - 3. 1 each: Closer.
 - 4. 1 each: Stop.
 - 5. 1 set: Smoke Gaskets.
 - 6. 1 each: Kick Plate.

1.3 DOUBLE INTERIOR DOORS:

- A. Group 5: Door A/26
 - 1. General:
 - a. 1 set: Meeting stiles
 - b. 1 set: Smoke Gaskets
 - c. 2 each: Magnetic Door Hold-Open (see section 28 3134)
 - 2. Inactive Leaf:
 - a. 3 each: Hinges
 - b. 1 each: Closer
 - c. 2 each: Flush Bolts
 - d. 1 each: Stop
 - 3. Active Leaf:
 - a. 3 each: Hinges.
 - b. 1 each: Lockset Function F-84.
 - c. 1 each: Closer.
 - d. 1 each: Stop.

- B. Group 6: Door A/49
 - 1. General:
 - a. 1 set: Smoke Gaskets
 - 2. Inactive Leaf:
 - a. 3 each: Hinges.
 - b. 1 each: Exit Device - Surface-mounted Vertical Rod.
 - c. 1 each: Kick Plate.
 - d. 1 each: Stop.
 - 3. Active Leaf:
 - a. 3 each: Hinges.
 - b. 1 each: Exit Device - Surface-mounted Vertical Rod.
 - c. 1 each: Kick Plate.
 - d. 1 each: Stop.

PART 2 - KEYING SCHEDULE for FINISH HARDWARE

- A. Provide interior keying system that includes Masterkey and Changekey levels. Coordinate all final keying with Owner's representative.

END OF SECTION

SECTION 08 1213**HOLLOW METAL FRAMES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Hollow metal frames at all doors listed in Door Schedule.
 - 2. Hollow metal frame at door A/49 Electrical Room #49. Replace existing frame if existing frame can not be modified to accommodate new panic hardware.
- B. Related Requirements:
 - 1. Section 06 2024: Installation.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American National Standards Institute / Steel Door Institute:
 - a. ANSI / SDI A250.8-2003, 'Standard Steel Doors and Frames.'
 - b. ANSI / SDI A250.11-2002, 'Recommended Erection Instructions for Steel Frames.'
 - 2. ASTM International:
 - a. ASTM A568 / A 568M-07a, 'Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.'
 - b. ASTM A653 / A653M-08, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.'

1.3 SUBMITTALS

- A. Informational Submittals: Copy of ANSI / SDI A250.11.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Suppliers:
- B. Manufacturers:
 - 1. Approved Manufacturers.
 - a. Any current member of Steel Door Institute.
- C. Manufacturers:
 - 1. Acceptable Manufacturers:
 - a. Steelcraft, Cincinnati, OH.
 - b. Any current member of Steel Door Institute.
 - c. Equal as approved by Architect before bidding. See Section 01 6200.
- D. Frames:
 - 1. Cold rolled furniture steel.
 - a. Interior Frames: 16 ga.
 - 2. Provide labeled frame to match fire rating of door.
 - 3. Finish:

- a. Use one of following systems:
 - 1) Prime surfaces with rust inhibiting primer.
 - 2) Galvanize.
 4. Anchors: 16 US ga minimum meeting UL or other code acceptable requirements for door rating involved.
- E. Fabrication:
1. General Requirements:
 - a. Frames shall be welded units. Provide temporary spreader on each welded frame.
 - b. Provide Manufacturer's gauge label for each item.
 - c. Make breaks, arises, and angles uniform, straight, and true. Accurately fit corners.
 2. Frame width dimensions:
 - a. Fabricate frame 1/8 inch wider than finished wall thickness as described in Contract Documents.
 3. Anchors:
 - a. Provide three jamb anchors minimum for each jamb. On hinge side, install one anchor at each hinge location. On strike side, install one anchor at strike level and anchors at same level as top and bottom hinges. Tack weld anchors on frames intended for installation in framed walls.
 - b. Frames installed before walls are constructed shall be provided with extended base anchors in addition to other specified anchors.
 - c. Anchor types and configurations shall meet wall conditions.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 - GENERAL**1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
1. Flush wood doors as indicated in Door Schedule.
 2. Install flush wood doors at Electrical Room #49 if existing doors can not accommodate the new panic hardware.
- B. Related Requirements:
1. Section 06 2024: Installation.
 2. Section 09 9324: Finishing of doors.
 3. Section 28 3134: Door Hold-Open Systems

1.2 REFERENCES

- A. Abbreviations And Acronyms:
1. AWS: Architectural Woodwork Standards (formerly AWI).
 2. FD: Fire-resistant core, fire-resistant materials assembled to stiles and rails according to methods prescribed by the testing agency to meet rigorous smoke, flame, and pressure tests.
 3. FD-5: Core with 2 layers on each side.
 4. ME: Matching edges, i.e., vertical edges same as decorative faces.
 5. PC: Particleboard core, solid core door with stiles and rails bonded to the core and abrasive planed flat prior to the application of the faces.
 6. PC-5: Core with 2 layers on each side.
- B. Association Publications:
1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
 - a. Architectural Woodwork Standards (AWS), 1st Edition, 2009.
- C. Definitions:
1. Adhesive, Type I (fully waterproof): Forms a bond that will retain practically all of its strength when occasionally subjected to a thorough wetting and drying; bond shall be of such quality that specimens will withstand shear and the two-cycle boil test specified in ANSI/HPVA HP (latest edition).
 2. Book-Match: Matching between adjacent veneer leaves on one panel face. Every other piece of veneer is turned over so that the adjacent leaves are "opened" as two pages in a book. The fibers of the wood, slanting in opposite directions in the adjacent leaves, create a characteristic light and dark effect when the surface is seen from an angle.
 3. Core: The material (typically, veneer, lumber, particleboard, medium-density fiberboard, or a combination of these) on which an exposed surface material (typically, veneer or HPDL) is applied.
 4. Core, Solid: The innermost layer or section in flush door construction. Typical constructions are as follows:
 - a. Core, Mineral: A fire-resistant core material generally used in wood doors requiring fire ratings of 3/4 hours or more.
 - b. Particleboard - A solid core of wood or other lignocellulose particles bonded together with a suitable binder, cured under heat, and pressed into a rigid panel in a flat-platen press.

5. Face Veneer: The outermost exposed wood veneer surface of a veneered wood door, panel, or other component exposed to view when the project is completed.
 6. Flitch: A hewn or sawn log made ready for veneer production or the actual veneer slices of one half log, kept in order, and used for the production of fine plywood panels.
 7. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade.
 - a. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
 - b. Premium Grade: The highest Grade available in both material and workmanship where the highest level of quality, materials, workmanship, and installation is required.
 8. Plain Slicing: Most commonly used for hardwood plywood. The log is cut in half, and one half is placed onto a carriage and moved up and down past a fixed knife to produce the veneers. Veneer is sliced parallel to the pith of the log and approximately tangent to the growth rings to achieve flat-cut veneer. Each piece is generally placed in a stack and kept in order. One half log, sliced this way, is called a "flitch."
 9. Running Match: Each panel face is assembled from as many veneer leaves as necessary. Any portion left over from one panel may be used to start the next.
 10. Stile-and-Rail Construction: A technique often used in the making of doors, wainscoting, and other decorative features for cabinets and furniture. The basic concept is to capture a panel within a frame, and in its most basic form it consists of five members: the panel and the four members that make up the frame. The vertical members of the frame are called stiles, while the horizontal members are known as rails.
- D. Reference Standards:
1. American National Standards Institute / Composite Panel Association:
 - a. ANSI A208.1-1999, 'Particleboard.'
 2. American National Standards Institute / Hardwood Plywood & Veneer Association:
 - a. ANSI / HPVA HP-1-2004 01-Jan-2004 'American National Standard for Hardwood and Decorative Plywood.'
 3. Underwriters Laboratories, Inc.
 - a. UL 9, 'Standard for Fire Tests of Window Assemblies' (Eighth Edition Jul 2, 2009).
 - b. UL 10B, 'Standard for Fire Tests of Door Assemblies' (Ten Edition Feb 7, 2008).

1.3 SUBMITTALS

- A. Action Submittals:
1. Shop Drawings: Schedule showing type of door at each location. Included shall be size, veneer, core type, fire rating, hardware prep, openings, blocking, etc.
- B. Closeout Submittals:
1. Operations And Maintenance: Include following in Operations And Maintenance Manual specified in Section 01 7800.
 - a. Manufacturer's product literature on doors and factory finish.
 - b. Maintenance and repair instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in clean truck and, in wet weather, under cover. Deliver to building site after plaster, cement, and taping compound are dry and after interior painting operations have been completed.
- B. Store doors in a space having controlled temperature and humidity range between 25 and 55 percent. Store flat on level surface in dry, well ventilated space. Cover to keep clean but allow air circulation. Do not subject doors to direct sunlight, abnormal heat, dryness, or humidity.
- C. Handle with clean gloves and do not drag doors across one another or across other surfaces.

- D. Assure that doors have been acclimated to the field conditions for a minimum of 72 hours before installation is commenced.

1.5 WARRANTY

- A. Manufacturer's standard full door warranty for lifetime of original installation
1. Warranty shall include finishing, hanging, and installing hardware if manufacturing defect was discovered after door was finished and installed.
 2. Warranty to include defects in materials including following:
 - a. Delaminating in any degree.
 - b. Warp or twist of 1/4 inch or more in door panel at time of one-year warranty inspection.
 - c. Telegraphing of core assembly: Variation of 1/100 inch or more in a 3 inch span.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers:
1. Approved Manufacturers.
 - a. Hailey Brothers, Inc. Buena Park, CA.
 - b. Manufacturers meeting the WI and NWMA Standards.
 - c. Equal as approved by Architect.
- B. Wood Doors:
1. For Transparent Finish:
 - a. Type: AWI PC-5ME or FD-5ME.
 - b. Grade: AWI Premium, except face veneer.
 - c. Face Veneer:
 - 1) Plain sliced Red Oak meeting requirements of AWI Grade A, 1/50 inch thick minimum immediately before finishing.
 - 2) Face veneers shall be running book matched.
 - d. Fully Type I: Adhere all glue lines with Type I adhesive, including veneer lay-up.
 2. For Opaque Finish:
 - a. Type: AWI PC-5.
 - b. Grade: AWI Economy.
 - c. Face Veneer: Paint grade Birch.
 - d. Adhere all glue lines with Type II adhesive minimum, including veneer lay-up.
 3. Core:
 - a. Fully bonded to stiles and rails and sanded as a unit before applying veneers.
 - b. Fire-Rated, AWI FD-3/4, 1, and 1-1/2:
 - 1) Mineral as standard with approved Manufacturer with inner blocking, 5 inches wide minimum, for closers, flush bolts, and exit devices.
 - a) Sizes of stiles and rails to be Manufacturer's standard meeting fire rating, and incorporating solid hardwood stile face.
 - b) Stiles for pairs of mineral core doors shall be of material and configuration meeting required fire rating without use of metal astragal or edge.
- C. Fabrication:
1. Doors shall be factory-machined. Coordinate with Section 08 1213 and Sections under 08 7000.

2.2 SOURCE QUALITY CONTROL

- A. Verification of Performance:
1. Doors shall have following information permanently affixed on top of door:
 - a. Manufacturer.

- b. Door designation or model.
 - c. Veneer species.
 - d. Factory finish
2. Conform to National Fire Protection Standards, NFPA-80, for fire-rated doors. Required fire-rated doors shall bear approved labels of UL, Warnock Hersey International, or other code acceptable agency. Machining for hardware shall be complete before application of label.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 08 3313**COILING COUNTER DOOR****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Coiling counter door.
- B. Related Requirements:
 - 1. Section 06 2024: Installation.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature or cut sheet.
 - b. Operating and maintenance instructions.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Acceptable Manufacturers:
 - a. Cookson Co, Phoenix, AZ www.cooksondoor.com.
 - b. Overhead Door Corp, Lewisville, TX www.overheaddoor.com.
 - c. Windsor Republic Doors, Little Rock, AR www.windsordoor.com.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Counter Door: Design Standard, Series CD10-SS as manufactured by The Cookson Company.
 - 1. Curtain: Interconnected strip, stainless steel slats, 22 gauge No. 10 (1-1/4" high by 3/8" deep). The finish on the door curtain shall be #4.
 - 2. Barrel And Counterbalance: Steel tubing of not less than 4" in diameter. Oil tempered torsion springs shall be capable of correctly counter balancing the weight of the curtain. The barrel shall be designed to limit the maximum deflection to .03" per foot of opening width. The finish on the barrel shall be one coat of bronze rust-inhibiting prime paint. It shall be designed to provide easy, long-term operation.
 - 3. Guides: Stainless steel angles and channel, 1-7/8" square. The guides shall receive a #4 finish.
 - 4. Hood: 24 ga stainless steel minimum. The finish on the hood shall be #4.
 - 5. Finish: No. 4 satin.
 - 6. Operation: Manual crank
 - 7. Locking: Provide securing device, concealed sliding bolt deadlock in the bottom bar operated by a thumb turn.

PART 3 - EXECUTION: Not Used**END OF SECTION**

SECTION 08 7101**COMMON FINISH HARDWARE REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. General requirements for finish hardware related to architectural wood.
- B. Related Requirements:
 - 1. Section 06 2024: Installation.
 - 2. Section 08 0601: Hardware Group Schedules.

1.2 REFERENCES

- A. Association Publications:
 - 1. Builders Hardware Manufacturers Association (BHMA), 355 Lexington Avenue, 15th Floor, New York, NY 10017-6603, Tel: 212-297-2122 Fax: 212-370-9047, www.buildershardware.com.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Hardware Templates:
 - a. Provide hardware templates to Sections 08 1213 within 14 days after Architect approves hardware schedule.
 - b. Supply necessary hardware installation templates to Section 06 2024.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's cut sheets.
 - b. Five copies of Manufacturer's installation, adjustment, and maintenance instructions for each piece of hardware. Include one set in Operations And Maintenance Manual and send one set with hardware when delivered.
 - c. Copy of hardware schedule.
 - d. Written copy of keying system explanation.
 - 2. Shop Drawings:
 - a. Submit hardware schedule indicating hardware to be supplied.
 - b. Schedule shall indicate details such as proper type of strikeplates, spindle lengths, hand, backset, and bevel of locks, hand and degree opening of closer, length of kickplates, length of rods and flushbolts, type of door stop, and other necessary information necessary to determine exact hardware requirements.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual:
 - a. Operations and Maintenance Data:
 - 1) Manufacturer's installation, adjustment, and maintenance instructions for each piece of hardware.
 - b. Record Documentation:

- 1) Manufacturers documentation:
 - a) Manufacturer's literature and/or cut sheets.
 - b) Include keying plan and bitting schedule.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 1. Suppliers:
 - a. Shall have two years minimum experience in providing, detailing, scheduling, and installing builders hardware and shall employ at least one full time DHI Architectural Hardware Consultant (AHC).

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
 1. Neatly and securely package hardware items by hardware group and identify for individual door with specified group number and set number used on Supplier's hardware schedule.
 2. Include fasteners and accessories necessary for installation and operation of finish hardware in same package.

PART 2 - PRODUCTS

2.1 FINISHES

- A. Hardware Finishes:
 1. Finishes for steel, brass, or bronze hardware items shall be US26D, Chromium plated, satin, except flat goods which may be US32D, stainless steel, satin.
 2. Materials other than steel, brass, or bronze shall be finished to match the appearance of US26D / 32D.

2.2 FASTENERS

- A. Fasteners shall be of suitable types, sizes and quantities to properly secure hardware. Fasteners shall be of same material and finish as hardware unless otherwise specified. Fasteners exposed to weather shall be non-ferrous or corrosion resisting steel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before ordering materials, examine documents to be assured that material to be ordered is appropriate for substrate to which it is to be secured and will function as intended.

END OF SECTION

SECTION 08 7102**HANGING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Hinges for flush wood.
- B. Related Requirements:
 - 1. Section 08 7101: Common Hardware Requirements.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Hager Companies, St Louis, MO www.hagerhinge.com.
 - b. Ives, New Haven, CT www.iveshardware.com.
 - c. McKinney, Scranton, PA www.mckinneyhinge.com.
 - d. PBB, Ontario, CA www.pbbinc.com.
 - e. Stanley, New Britain, CT www.stanleyworks.com.
 - f. Equal as approved by Architect; see Section 01 6200.
- B. Hinges:
 - 1. Sizes:
 - a. 1-3/4 inch doors in metal frames:
 - 1) Standard: 4-1/2 inches by 4-1/2 inches.
 - 2) Wide Throw: 4-1/2 inches by width required.
 - 2. Features:
 - a. Security stud and non-removable hinge.
 - 3. Hinges doors shall be solid brass, plated to achieve specified finish.
 - 4. Approved Products.
 - a. Interior: For reference - Type and Style
 - 1) Hager: BB 1279.
 - 2) Ives: 5BBI.
 - 3) McKinney: TA 2714.
 - 4) MacPro / McKinney: MPB79.
 - 5) PBB: BB81.
 - 6) Stanley: FBB 179.
 - 7) Equal as approved by Architect. See Section 01 6200.

PART 3 - EXECUTION: Not Used**END OF SECTION**

SECTION 08 7103**SECURING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Items for architectural wood doors:
 - a. Locksets and latchsets.
 - b. Flush bolts.
 - c. Cylinders.
 - d. Interior exit devices.
- B. Related Requirements:
 - 1. Section 08 7101: Common Hardware Requirements.

1.2 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Standard Key Delivery:
 - a. Include change keys with hardware.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Manufacturer List:
 - a. Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 - b. Hager, St Louis, MO www.hagerhinge.com.
 - c. Ives, New Haven, CT www.iveshardware.com.
 - d. Knape & Vogt, Grand Rapids, MI www.knapeandvogt.com.
 - e. Precision Hardware, Romulus, MI www.precisionhardware.com.
 - f. Rockwood, Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - g. Sargent, New Haven, CT www.sargentlock.com.
 - h. Schlage, Colorado Springs, CO www.schlage.com.
 - i. Von Duprin, Indianapolis, IN www.vonduprin.com.
 - j. Yale Commercial Locks, Lenoir City, TN www.yalecommercial.com.
 - k. Equal as approved by Architect. See Section 01 6200.
- B. General:
 - 1. Backsets shall be 2-3/4 inches.
 - 2. Furnish lead shields where required.
- C. Flush Bolts:
 - 1. Rod length: 12 inch minimum.
 - 2. Acceptable Products:
 - a. Manual Flushbolts:
 - 1) Hager 282D.
 - 2) Ives FB458.
 - 3) Rockwood 555.
 - b. Equal as approved by Architect before installation. See Section 01 6200.

3. Dust Proof Strike:
 - a. Acceptable Products:
 - 1) Hager 280X.
 - 2) Ives DP2.
 - 3) Rockwood 570.
 - 4) Equal as approved by Architect before installation. See Section 01 6200.
- D. Locksets:
 1. Lever Operated:
 - a. Approved Products.
 - 1) 7 Series by Sargent.
 - 2) AL Series by Schlage.
 - 3) 5300LN by Yale.
- E. Standard Cylinders:
 1. Provide cylinders for interior exit devices requiring cylinders.
- F. Exit Devices:
 1. Use operable lever trim.
 2. Provide labeled hardware where required by local code authority.
 3. Approved Products.
 - a. Apex Series by Precision.
 - b. 80 Series by Sargent.
 - c. 99 or 98 Series by Von Duprin.
 - d. 7100 Series by Yale.

PART 3 - EXECUTION

3.1 CLOSE-OUT ACTIVITIES

- A. Owner's Instructions:
 1. Before Final Acceptance Meeting, send master keys to Dennis Downs, EDA Project Manager.

END OF SECTION

SECTION 08 7105

ACCESSORIES FOR PAIRS OF DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Products Furnished But Not Installed Under This Section:
 - 1. Meeting Stiles.

- B. Related Requirements:
 - 1. Section 08 7101: Common Hardware Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 - b. Hager, St Louis, MO www.hagerhinge.com.
 - c. Ives, Wallingford, CT www.iveshardware.com.
 - d. National Guard Products - NGP, Memphis, TN www.ngpinc.com.
 - e. Pemko Manufacturing, Ventura, CA www.pemko.com.
 - f. Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - g. Equal as approved by Architect before bidding. See Section 01 6200.

- B. Meeting Stiles:
 - 1. Acceptable Products:
 - a. 136N by NGP.
 - b. 369AS by Pemko.
 - c. Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 08 7106**CLOSING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Closers for flush wood doors.
- B. Related Requirements:
 - 1. Section 08 7101: Common Hardware Requirements:

1.2 SUBMITTALS

- A. Closeout Submittals:
 - 1. Operations And Maintenance Data: Include final, executed copy of warranty in Operations and Maintenance Manual specified in Section 01 7800.

1.3 WARRANTY

- A. Manufacturer's standard warranty, 5 years minimum.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers:
 - 1. Approved Manufacturers.
 - a. 7900 Series by Dorma Architectural Hardware, Reamstown, PA www.dorma.com/usa.
 - b. 1461 Series by LCN Closers, Princeton, IL www.lcnclosers.com.
 - c. 8501 Series by Norton Door Controls, Charlotte, NC www.nortondoorcontrols.com.
 - d. 1431 Series by Sargent, New Haven, CT www.sargentlock.com.
 - e. Equal as approved by Architect. See Section 01 6200.
- B. Surface-Mounted Overhead Door Closers:
 - 1. Closers provided under this Section shall be from same Manufacturer.
 - 2. Provide parallel arms on closers unless door position in relation to adjacent wall requires otherwise. Provide covers.
 - 3. Closers shall allow for 180 degree opening and not be used as a stop.
 - 4. Closers shall have following features:
 - a. Adjustable sweep speed.
 - b. Adjustable backcheck.
 - c. Non-handed, non-sized.
 - d. Delayed action closing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount closers on stop side of door wherever conditions permit.
- B. Through-bolt hardware-to-door connections.

3.2 ADJUSTING

- A. Adjust closers to provide maximum opening force as required by governing code authority and proper backcheck and sweep speed.

END OF SECTION

SECTION 08 7107
PROTECTIVE PLATES AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Products Furnished But Not Installed Under This Section:
 - 1. Kick plates.

- B. Related Requirements:
 - 1. Section 08 7101: Common Hardware Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers:
 - 1. Acceptable Manufacturers:
 - a. Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 - b. Hager, St Louis, MO (800) 255-3590 or (314) 772-4400 www.hagerhinge.com.
 - c. Ives, Wallingford, CT www.iveshardware.com.
 - d. Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - e. Equal as approved by Architect before installation. See Section 01 6200.

- B. Protective Plates:
 - 1. Material: 0.050 inch thick Stainless Steel.
 - 2. Sizes:
 - a. Kick Plates: 10 inches high by width of door less 3/4 inch on each side.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 08 7108

STOPS AND HOLDERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Products Supplied But Not Installed Under This Section:
 - 1. Door stops.
- B. Related Sections:
 - 1. Section 08 7101: Common Hardware Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Corbin Russwin, Berlin, CT www.corbinrusswin.com.
 - b. Glynn-Johnson, Indianapolis, IN www.glynn-johnson.com.
 - c. Hager, St Louis, MO www.hagerhinge.com.
 - d. Ives, Wallingford, CT www.iveshardware.com.
 - e. Rockwood Manufacturing Co, Rockwood, PA www.rockwoodmfg.com.
 - f. Sargent, New Haven, CT (800) 906-6606 or (203) 562-2151 www.sargentlock.com.
 - g. Equal as approved by Architect. See Section 01 6200.
- B. Stops:
 - 1. Use wall type stops unless indicated otherwise on Door Schedule.
 - 2. Provide model appropriate for substrate. Wall stops may be either cast or wrought.
 - 3. Acceptable Products:

	Interior Wall	Floor Mount	Overhead.
a. Hager	236W	243F	---
b. Ives	WS407CCV	FS438	---
c. Rockwood	409	440 / 441	---
d. Corbin Russwin	---	---	DH5203 Series
e. Glynn Johnson	---	---	GJ 90S
f. Sargent	---	---	590S Series
g. Equal as approved by Architect.	See Section 01 6200.		

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work: When using overhead stops, coordinate installation with door closer and other door hardware.

END OF SECTION

SECTION 08 7109

ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Products Furnished But Not Installed Under This Section:
 - 1. Smoke gaskets.
- B. Related Requirements:
 - 1. Section 08 7101: Common Hardware Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers:
 - 1. Manufacturer List:
 - a. Hager, St Louis, MO www.hagerhinge.com.
 - b. NGP - National Guard Products, Memphis, TN www.ngpinc.com.
 - c. Pemko Manufacturing, Ventura, CA www.pemko.com.
 - d. Equal as approved by Architect. See Section 01 6200.
- B. Smoke Gaskets:
 - 1. Color as selected by Architect.
 - 2. Acceptable Products:
 - a. 726 by Hager.
 - b. 5050 by NGP.
 - c. PK55 by Pemko.
 - d. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install smoke gaskets in manner to give continuous air-tight fit.
 - 1. Install smoke gaskets in 'wipe seal' configuration.

END OF SECTION

DIVISION 09: FINISHES

09 0000 FINISHES

09 0503 FLOORING SUBSTRATE PREPARATION

09 2000 PLASTER AND GYPSUM BOARD

09 2236 LATH

09 2423 PORTLAND CEMENT PLASTER: STANDARD

09 2900 GYPSUM BOARD

09 3000 TILING

09 3014 QUARRY TILE

09 5000 CEILINGS

09 5113 ACOUSTICAL PANEL CEILINGS

09 6000 FLOORING

09 6516 RESILIENT SHEET FLOORING

09 7000 WALL FINISHES

09 7720 DECORATIVE FIBERGLASS REINFORCED WALL PANELS

09 9000 PAINTS AND COATINGS

09 9001 COMMON PAINTING AND COATING REQUIREMENTS

09 9114 EXTERIOR PAINTED STUCCO

09 9123 INTERIOR PAINTED GYPSUM BOARD

09 9124 INTERIOR PAINTED METAL

09 9125 INTERIOR PAINTED WOOD

09 9324 INTERIOR CLEAR-FINISHED HARDWOOD

09 9413 INTERIOR TEXTURED FINISHING

END OF TABLE OF CONTENTS

SECTION 09 0503**FLOORING SUBSTRATE PREPARATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Prepare and test floors to receive resilient flooring as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 03 3111: Installation tolerances for concrete slabs.
 - 2. Section 09 6000: Flooring

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM F 1869-04, 'Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.'

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Floor Inspection.
 - 2. Review condition of floor with regard to compliance with concrete installation tolerances and other work necessary to prepare floors for installation of carpet and resilient flooring.
 - 3. Submit results of slab vapor emission and pH tests.

1.4 SUBMITTALS

- A. Informational Submittals: Three copies of vapor emission and pH tests.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Provide storage space and protection for flooring and installation accessories.

1.6 FIELD CONDITIONS

- A. Ambient Conditions: Bring conditions inside building to levels normal at occupancy of building 24 hours prior to beginning slab testing. Maintain these conditions from beginning of slab testing until completion of tests. These conditions include minimum ambient temperature of 65 deg F, relative humidity between 10 and 65 percent, and minimum concrete slab temperature of 65 deg F.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Test Kit:
 - 1. Quality Standard.
 - a. Moisture / Alkali Test Kit Number 625 for calcium chloride and pH testing by Taylor Tools, a Division of Roofing Equipment Inc, Denver, CO www.taylorflooringtools.com.

PART 3 - EXECUTION

3.1 PROCEDURE

- A. Floor Preparation:
 - 1. Remove paint, sealer, grease, oil, silicone sealants, curing compounds, and other materials incompatible with carpet adhesive.
 - 2. Prior to installation, vacuum and damp mop floor areas to receive flooring.

3.2 FIELD QUALITY CONTROL

- A. Field Testing:
 - 1. Before installation, test new slab at patches for water vapor emissions in accordance with ASTM F 1869 except place moisture-testing kits as follows:
 - a. One test at all concrete patches.
 - 2. Perform a pH test in conjunction with each vapor emission test.

END OF SECTION

SECTION 09 2236**LATH****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install lath on surfaces to be plastered as described in Contract Documents.

1.2 REFERENCES

- A. Reference Standards:
1. ASTM International:
 - a. ASTM A641 / A641M-09, 'Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.'
 - b. ASTM C847-06, 'Standard Specification for Metal Lath.'
 - c. ASTM C1396 / C1396M-06a, 'Standard Specification for Gypsum Board.'

PRODUCTS**1.3 MATERIALS**

- A. Secondary Moisture Protection Barrier:
1. Acceptable Products:
 - a. Tyvek Stucco Wrap by duPont.
 - b. Equal as approved by Architect before bid. See Section 01 6200.
- B. Metal Lath:
1. Woven Wire Metal Lath:
 - a. Galvanized Woven Wire Fabric Lath (Stucco Netting) of 17 ga wire with 1-1/2 inch openings meeting requirements of ASTM C847.
 - b. Acceptable Products:
 - 1) Stucco-Rite by K-Lath, Fontana, CA www.klath.com.
 - 2) Equal as approved by Architect before installation. See Section 01 6200.
 2. Lathing Accessories:
 - a. Meet requirements of SPR R3-60 and be galvanized after fabrication unless specified differently.
 - b. Includes:
 - 1) Drip Screed: 24 ga.
 - 2) Corner Beads and Base or Parting Screeds: 26 ga.
 - 3) Attachment Clips: As approved by Lath Manufacturer.
 3. Attaching Devices:
 - a. Hanger Wire And Tie Wire: Meet requirements of ASTM A641.
 - b. Power-Driven Staples: Formed from galvanized (Type I Coating) steel wire with tensile strength from 80,000 to 110,000 psi and meeting governing codes.
 - c. Attachment Clips: As approved by Lath Manufacturer.

PART 2 - EXECUTION

2.1 PREPARATION

- A. Secondary Moisture Protection Barrier:
1. Install in accordance with Manufacturer's installation instructions.
 2. Repair damage such as holes and breaks before application of stucco.

2.2 INSTALLATION

- A. Woven Wire Metal Lath:
1. Install in accordance with requirements of ASTM C841.
 2. Secure lath to supports at intervals not to exceed 6 inches on center. Furr lath out 1/4 inch from substrate.
 3. Laps: 1/2 inch minimum at sides and one inch minimum at ends.

END OF SECTION

SECTION 09 2423

PORTLAND CEMENT PLASTER: Standard

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 1. Furnish and install Portland cement plaster (stucco) as described in Contract Documents at locations of removed exterior windows, vent locations and at new and remove exterior light fixtures.

1.2 REFERENCES

- A. Reference Standards:
 1. ASTM International:
 - a. ASTM C144-04, 'Standard Specification for Aggregate for Masonry Mortar.'
 - b. ASTM C150-07, 'Standard Specification for Portland Cement.'

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
 1. Store materials off ground and under watertight covers.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Materials:
 1. Water: Clean and suitable for drinking.
 2. Portland Cement: Meet requirements of ASTM C150.
 3. Sand: Current ASTM C144, except for aggregate gradation.

a. Aggregate Gradation:

Sieve	Percent Passing*
No. 4	100
No. 8	90 to 100
No. 16	60 to 90
No. 30	35 to 70
No. 60	10 to 30
No. 100	0 to 5

- b. *Aggregate shall have not more than 50 percent retained between any two consecutive sieves nor more than 25 percent between No. 60 and No. 100 sieves.
- 4. Bonding Agent:
 - a. Acceptable Products:
 - 1) Plaster-Weld by Larsen Products Corporation, Jessup, MD www.larsenproducts.com.
 - 2) Equal as approved by Architect before use. See Section 01 6200.
- 5. Latex Additive (Exterior Applications Only):
 - a. Multi-purpose latex additive for dry set mortars.
 - b. Acceptable Products:
 - 1) Planicrete by Mapei Corporation, Garland, TX www.mapei.com.

2) Equal approved by Architect before use. See Section 01 6200.

B. Mixes:

1. Mix Proportions:

	Portland Cement	Lime	Aggregate
Scratch Coat **	One Part	One Part	8 Parts
Brown Coat	One Part	One Part	9 Parts
Finish Coat	One Part	One Part	6 Parts

2. Mix materials dry until a uniform color is attained. Add water as necessary. Keep mixing machine clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:

1. See that substrate for system is properly installed.
2. Check lathing and furring for defects.
3. Do not apply plaster until such defects are corrected.

B. Do not apply Portland cement stucco to following surfaces

1. Gypsum Lath.
2. Wood Lath.
3. Fiber Insulation Lath.
4. Lime Stucco.
5. Gypsum Stucco.
6. Magnesite Stucco.

3.2 PREPARATION

A. Protection: Adequately protect finish materials against damage from operations of this Section.

3.3 APPLICATION

A. Tolerances:

1. Minimum thickness including finish coat:

BASE	Interior	Exterior
Metal Lath	7/8 inch	7/8 inch
Walls	5/8 inch	3/4 inch

2. Minimum Thickness Interior And Exterior (depending on substrate):

Scratch Coat	1/4 to 3/8 inch
Brown Coat	1/4 to 1/2 inch
Finish Coat	1/16 to 1/8 inch

B. Procedure

1. Scratch Coat:

- a. Attach grounds.
- b. Apply scratch coat of thickness required, curling plaster in back of lath to form keys. Allow to dry twenty-four hours.
- c. Before scratch coat sets, rake and cross-rake furrows 1/8 inch deep, 1/8 inch wide, and 1/2 to 3/4 inch apart.

2. Brown Coat:

- a. Apply brown coat to thickness required. Allow to dry twenty-four hours.
- b. Using screeds for guide, straighten surface with rod (straight edge).
- c. Fill in any hollows or voids and rod surface again.

- d. Level and compact surface with darby. Rake and cross-rake to receive finish coat. (See paragraph above under Scratch Coat).
- 3. Finish Coat:
 - a. Double back on surface immediately with sufficient material to bring finish coat to final thickness.
 - b. Float and fill all depressions (drawing-up).
 - c. Ensure texture matches existing.

3.4 CLEANING

- A. Maintain premises in neat condition. Leave floors broom clean. Clean plaster from stops, beads, trim, etc.

END OF SECTION

SECTION 09 2900**GYPSUM BOARD****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install gypsum board as described in Contract Documents, around electrical panels, switch gear, patching of holes in area of construction, ceilings and walls and as required except behind ceramic tile.
 2. Furnish and install acoustical sealants as described in Contract Documents.
- B. Related Requirements:
1. Section 09 9413: Textured finishing.

1.2 REFERENCES

- A. Definitions:
1. Accessories: Metal or plastic beads, trim, or molding used to protect or conceal corners, edges, or abutments of the gypsum board construction.
 2. Drywall Primer: Paint material specifically formulated to fill the pores and equalize the suction difference between gypsum board surface paper and the compound used on finished joints, angles, fastener heads, and accessories and over skim coatings.
 3. Skim Coat: Either a thin coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, over the entire surface.
 4. Texturing: Regular or irregular patterns typically produced by applying a mixture of joint compound and water, or proprietary texture materials including latex base texture paint, to a gypsum board surface previously coated with drywall primer.
- B. Reference Standards:
1. ASTM International:
 - a. ASTM C11-10, 'Standard Terminology Relating to Gypsum and Related Building Materials and Systems.'
 - b. ASTM C475/C475M-02(2007), 'Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.'
 - c. ASTM C840-08, 'Standard Specification for Application and Finishing of Gypsum Board.'
 - d. ASTM C1002-07, '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.'
 - e. ASTM C1047-10, 'Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.'
 - f. ASTM C1178/C1178M-08, 'Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.'
 - g. ASTM C1396/C1396M-09a, 'Standard Specification for Gypsum Board.'
 - h. ASTM E84-10, 'Standard Test Method for Surface Burning Characteristics of Building Materials.'
 - i. ASTM E90-09, 'Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.'
 - j. ASTM E119-10a, 'Standard Test Method for Fire Tests of Building Construction and Materials.'

- k. ASTM E413-04, 'Classification for Rating Sound Insulation.'
2. Gypsum Association:
 - a. GA-214-07e, 'Recommended Levels of Gypsum Board Finish.'
 - b. GA-216-07: 'Application and Finishing of Gypsum Panel Products.'
 - c. GA-600-09, 'Fire Reference Design Manual.'
 - d. GA-801-07, 'Handling and Storage of Gypsum Panel Products: A Guide for Distributors, Retailers, and Contractors.'
3. Underwriters Laboratories, Inc.
 - a. UL 263: 'Test Method for Fire Tests of Building Construction and Materials.'
 - b. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials; Tenth Edition September 10 2008.'

1.3 SUBMITTALS

- A. Informational Submittals:
 1. Test And Evaluation Reports:
 - a. Fire test results or assembly diagrams and numbers confirming products used will provide required fire ratings with installation configurations used.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. General:
 1. Following recommendations of GA-801 Guide for Handling and Storage of Gypsum Panel Products unless local, state or federal laws or agency rules differing from the recommendations shall take precedence.
- B. Delivery And Acceptance Requirements:
 1. Deliver materials in original packages, containers, or bundles bearing brand name, applicable standard designation, and Manufacturer's name.
- C. Storage And Handling Requirements:
 1. Store material under roof and keep dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack gypsum board flat to prevent sagging.

1.5 FIELD CONDITIONS

- A. Ambient Conditions:
 1. Comply with ASTM C840 or GA-216 requirements, whichever are more stringent:
 - a. Do not install interior products until installation areas are enclosed and conditioned.
 - 1) Temperature shall be 50 deg F and 95 deg F maximum day and night during entire joint operation and until execution of Certificate of Substantial Completion.
 - 2) Provide ventilation to eliminate excessive moisture.
 - 3) Avoid hot air drafts that will cause too rapid drying.
 - b. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
 1. Manufacturer Contact List:

- a. American Gypsum, Dallas, TX www.americangypsum.com.
- b. CertainTeed Gypsum, Inc; Tampa, FL www.certainteed.com.
- c. Georgia Pacific, Atlanta, GA www.gp.com.
- d. National Gypsum, Charlotte, NC www.nationalgypsum.com.
- e. Pabco Gypsum, Newark, CA www.pabco gypsum.com.
- f. United States Gypsum Co, Chicago, IL www.usg.com.

B. Materials:

1. Interior Gypsum Board:

a. General:

1) Size:

- a) Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2) Quality Standard:

- a) Core: Fire-resistant rated gypsum core.
- b) Complies with Type X requirements of ASTM C1396/C1396M (Section 5).
- c) Surface paper: Face paper suitable for painting.
- d) Long edges: Tapered edge.
- e) Overall thickness: 5/8 inch.

2.2 ACCESSORIES

A. Manufacturers:

1. Manufacturer Contact List:

- a. Kinetics Noise Control, Dublin, OH www.kineticsnoise.com.
- b. Magnum Products, Lenaxa, KS www.levelcoat.com.
- c. National Gypsum, Charlotte, NC www.nationalgypsum.com.
- d. Soundproofing Co, San Marcos, CA www.soundproofing.org.
- e. United States Gypsum Co, Chicago, IL www.usg.com.
- f. Westpac Materials Inc, Orange, CA www.westpacmaterials.com.
- g. Wm. Zinsser & Co, Somerset, NJ www.zinsser.com.

2. Corner And Edge Trim:

- a. Metal, paper-faced metal, paper-faced plastic, or solid vinyl meeting requirements of ASTM C1047. Surfaces to receive bedding cement treated for maximum bonding.
- b. Approved Suppliers.
 - 1) L.K.L. Associates, Inc., 134 North 1600 West, Orem, UT 84057-440. Contact Colten Christianson - Office 801-225-3830 – Cell 801-330-3297.
 - 2) The WINROC Corporation (Utah), 3255 South 900 West, Salt Lake City, UT 84119. Contact Lance Anast - Office 801-785-1831 – Cell 801-842-3301.
 - 3) L & W Supply Corp. (aka Capitol/Calply Building Materials), 657 W. 8th Ave., Midvale, UT 84047. Contact John Canick – Office 801-304-9500 - Cell 801-404-7037.

3. Joint Compound:

- a. Best grade or type recommended by Board Manufacturer and meeting requirements of ASTM C475/C475M.
 - 1) Use Taping Compound for first coat to embed tape and accessories.
 - 2) Use Taping Compound or All-Purpose Compound for subsequent coats except final coat.
 - 3) Use Finishing Compound for final coat and for skim coat.
 - 4) Approved Suppliers.
 - a) L.K.L. Associates, Inc., 134 North 1600 West, Orem, UT 84057-440. Contact Colten Christianson - Office 801-225-3830 – Cell 801-330-3297.
 - b) The WINROC Corporation (Utah), 3255 South 900 West, Salt Lake City, UT 84119. Contact Lance Anast - Office 801-785-1831 – Cell 801-842-3301.
 - c) L & W Supply Corp. (aka Capitol/Calply Building Materials), 657 W. 8th Ave., Midvale, UT 84047. Contact John Canick – Office 801-304-9500 - Cell 801-404-7037.

4. Joint Reinforcing:

- a. Paper reinforcing tape acceptable to Gypsum Board Manufacturer.
- b. Approved Suppliers.
 - 1) L.K.L. Associates, Inc., 134 North 1600 West, Orem, UT 84057-440. Contact Colten Christianson - Office 801-225-3830 – Cell 801-330-3297.
 - 2) The WINROC Corporation (Utah), 3255 South 900 West, Salt Lake City, UT 84119. Contact Lance Anast - Office 801-785-1831 – Cell 801-842-3301.
 - 3) L & W Supply Corp. (aka Capitol/Calply Building Materials), 657 W. 8th Ave., Midvale, UT 84047. Contact John Canick – Office 801-304-9500 - Cell 801-404-7037.
- 5. Fasteners:
 - a. Bugle head screws meeting requirements of ASTM C1002:
 - 1) Gypsum Board:
 - a) Type W: For fastening gypsum board to wood members, of length to penetrate wood framing 5/8 inch minimum.
 - b) Type S: For fastening gypsum board to steel framing and ceiling suspension members, of length to penetrate steel framing 3/8 inch minimum.
 - 2) Glass Mat Gypsum Tile Backer:
 - a) Wood Framing: 11 ga (0.1233 in) galvanized with 7/16 inch head, hot dipped. Screws: Type W or Type S Hi-Lo, bugle head, rust resistant.
- B. Primer / Surfacer On Surfaces To Receive Texturing:
 - 1. Acceptable Products:
 - a. Sheetrock First Coat by USG.
 - b. Prep Coat by Westpac Materials.
 - c. Level Coat by Magnum Products.
 - d. Equal as approved by Architect before bidding.
 - e. Approved Suppliers.
 - 1) L.K.L. Associates, Inc., 134 North 1600 West, Orem, UT 84057-440. Contact Colten Christianson - Office 801-225-3830 – Cell 801-330-3297.
 - 2) The WINROC Corporation (Utah), 3255 South 900 West, Salt Lake City, UT 84119. Contact Lance Anast - Office 801-785-1831 – Cell 801-842-3301.
 - 3) L & W Supply Corp. (aka Capitol/Calply Building Materials), 657 W. 8th Ave., Midvale, UT 84047. Contact John Canick – Office 801-304-9500 - Cell 801-404-7037.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 - 1. Examine substrate and verify framing is suitable for installation of gypsum board.
 - 2. Examine gypsum board before installation. Reject panels that are wet, moisture damaged, and mold damaged.
 - 3. Notify Architect of unsuitable conditions in writing.
 - a. Do not install board over unsuitable conditions.
 - 4. Commencement of Work by installer is considered acceptance of substrate.

3.2 INSTALLATION

- A. Interface With Other Work:
 - 1. Coordinate with Division 06 for location of backblocking for edges and ends of gypsum board and for blocking required for installation of equipment and building specialties.
 - 2. Do not install gypsum board until required blocking is in place.
- B. General: Install and finish as recommended in ASTM C840 or GA-216 unless specified otherwise in this Section.

C. Interior Gypsum Board:

1. General:
 - a. Install so trim and reinforcing tape are fully backed by gypsum board. No hollow spaces between pieces of gypsum board over 1/8 inch wide before taping are acceptable.
 - b. Rout out backside of gypsum board to accommodate items that extend beyond face of framing, but do not penetrate face of gypsum board, such as metal door frame mounting brackets, etc.
2. Single Layer Application:
 - a. Apply ceilings first using minimum of two men.
 - b. Use board of length to give minimum number of joints.
 - c. On walls over 108 inches high and on ceilings, apply board perpendicular to support.
 - d. Stagger end joints. End and edge joints of board applied on ceilings shall occur over framing members or be back blocked with 2x4 blocking. End joints of board horizontally applied on walls shall occur over framing members. Edge joints of board vertically applied on walls shall occur over framing members.
 - e. Butt edges in moderate contact. Do not force in place. Shim to level.
 - f. Leave facings true with joint, finishing flush. Vertical work shall be plumb and ceiling surfaces level.
 - g. Scribe work closely. Keep joints as far from openings as possible. If joints occur near an opening, apply board so vertical joints are centered over openings. No vertical joints shall occur within 8 inches of external corners or openings.
 - h. Install board tight against support with joints even and true. Tighten loose screws.
 - i. Caulk perimeter joints in sound insulated rooms with specified acoustical sealant.
3. Fastening:
 - a. Apply from center of board towards ends and edges.
 - b. Apply screws 3/8 inch minimum from ends and edges, one inch maximum from edges, and 1/2 inch maximum from ends.
 - c. Spacing:
 - 1) Ends: Screws not over 7 inches on center at edges where blocking or framing occurs.
 - 2) Wood Framed Walls And Ceilings: Screws 7 inches on center in panel field.
 - d. Set screw heads 1/32 inch below plane of board, but do not break face paper. If face is accidentally broken, apply additional screw 2 inches away.
 - e. Screws on adjacent ends or edges shall be opposite each other.
 - f. Drive screws with shank perpendicular to face of board.
4. Trim:
 - a. Corner Beads:
 - 1) Attach corner beads to outside corners.
 - a) Attach metal corner bead with staples spaced 4 inches on center maximum and flat taped over edges of corner bead. Also, apply screw through edge of corner bead where wood trim will overlay corner bead.
 - b) Set paper-faced trim in solid bed of taping compound.
 - b. Edge Trim: Apply where gypsum board abuts dissimilar material. Hold channel and 'L' trim back from exterior window and door frames 1/8 inch to allow for caulking.
5. Finishing:
 - a. General:
 - 1) Tape and finish joints and corners throughout building as specified below to correspond with final finish material to be applied to gypsum board. When sanding, do not raise nap of gypsum board face paper or paper-faced trim.
 - 2) First Coat:
 - a) Apply tape over center of joint in complete, uniform bed of specified taping compound and wipe with a joint knife leaving a thin coating of joint compound. If metal corner bead is used, apply reinforcing tape over flange of metal corner bead and trim so half of tape width is on flange and half is on gypsum board.
 - b) Completely fill gouges, dents, and fastener dimples.
 - c) Allow to dry and sand lightly if necessary to eliminate high spots or excessive compound.
 - 3) Second Coat:

- a) Apply coat of specified joint compound over embedded tape extending 3-1/2 inches on both sides of joint center. Use finishing compound only if applied coat is intended as final coat.
- b) Re-coat gouges, dents, and fastener dimples.
- c) Allow to dry and sand lightly to eliminate high spots or excessive compound.
- 4) Third Coat: Apply same as second coat except extend application 6 inches on both sides of joint center. Allow to dry and sand with fine sandpaper or wipe with damp sponge.
- 5) Fourth Coat: Apply same as second coat except extend application 9 inches on both sides of joint center. Allow to dry and sand with fine sandpaper or wipe with damp sponge.
- b. Finishing Levels: Finish panels to levels indicated below and according to ASTM C840, GA-216 or GA-214:
 - 1) Gypsum Board Surfaces to Receive and Painted Texturing, and Smooth Gypsum Board Surfaces:
 - a) GA-214-07e Level 4: 'All and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer.'
 - 2) Painted, Untextured Gypsum Board Surfaces, Except in Mechanical, Storage, And Utility Areas:
 - a) GA-214-07e Level 5: 'All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer.'

3.3 FIELD QUALITY CONTROL

A. Non-Conforming Work:

1. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - a. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - b. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.4 CLEANING

- A. Remove from site debris resulting from work of this Section including taping compound spills.

END OF SECTION

SECTION 09 3014**QUARRY TILE****PART 1 GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install quarry pavers, base and threshold at kitchen as described in Contract Documents.

1.2 RELATED SECTIONS

- A. Section 03 3000 - Concrete substrate.
- B. Section 07120 - Fluid applied waterproofing.
- C. Section 09 3013 - Scratch coat for ceramic wall tile.

1.3 REFERENCES

- A. ANSI A108.1 - Installation of Ceramic Tile Portland Cement Mortar.
- B. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.
- C. ANSI A108.10 - Installation of Grout in Tile Work.
- D. ANSI A108.13 - Installation of Waterproof Membranes for Thin-Set Tile and Stone.
- E. ANSI A118.4 - Latex Portland Cement Mortar.
- F. ANSI A118.7 - Polymer Modified Cement Grout.
- G. ANSI A118.10 - Waterproof membranes for Thin-Set Tile and Stone.
- H. ANSI A118.12 - Crack Isolation Membranes.
- I. TCNA - Handbook for Ceramic Tile Installation.
- J. TCNA - F111-11.

1.4 SUBMITTALS

- A.
- B. Action Submittals:
 - 1. Product Data: Manufacturer's data sheets on each product to be used, including:
 - a. Preparation instructions and recommendations.
 - b. Storage and handling requirements and recommendations.
 - c. Installation methods.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches square, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products of this section with minimum ten years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Mock-up shall be installed on a 4' x 4' board.
 2. Finish board to illustrate final installation.
 3. Do not proceed with work until workmanship, color, and sheen are approved by Architect.
 4. Refinish mock-up as required to produce acceptable work.
 5. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of Work.
 6. Obtain Architect's acceptance of mock-ups before start of final unit of Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter and other causes.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Environmental: Install mortar, set and grout tile when surfaces and ambient temperature is minimum 50 degrees F and maximum 90 degrees F. Consult with manufacturer for specific requirements.
- C. Protection: Protect adjacent work surfaces during tile work. Close rooms or spaces to traffic of all types until mortar and grout has set.
- D. Safety: Observe the manufacturer's safety instructions including those pertaining to ventilation.

1.8 WARRANTY

- A. Products shall be provided with the manufacturers standard warranty as follows:
 1. Installation Systems Limited Warranty:
 - a. Lifetime single source systems warranty is required.

1.9 EXTRA MATERIALS

- A. Supply an amount equal to 5 percent of each size, color, and surface finish of tile specified.

PART 2 PRODUCTS

2.1 MANUFACTURER TILE

- A. Acceptable Manufacturer: Subject to compliance with requirements herein, provide products from one of the following manufacturer, to be submitted within the first two weeks after the pre-construction meeting prior to application for architect approval.
 1. Acceptable Manufacturer: American Olean, 1645 South Sinclair St., Anaheim, CA 92806 - www.americanolean.com , Contact Scott Chouinard, 951-757-4919, scott.chouinard@daltile.com
 2. Acceptable Manufacturer: Daltile 3625 East Jurupa, Ontario, CA 91761, www.daltile.com , Contact Scott Chouinard, 951-757-4919, scott.chouinard@daltile.com

3. Equal as approved by Architect prior to bidding.
- 4.
- B. Unglazed Quarry Tile: (textured and untextured)
 1. Product: American Olean Quarry Tile, Daltile or Equal
 2. Size and Shape: 6" x 6" square
 3. Thickness: ½" thick
 4. Edge: cove base and rounded top edge
 5. Trim: Provide all edge trim for complete installation.
 6. Color: From all available colors by each manufacturer.
 - 7.

2.2 MANUFACTURER MEMBRANES, SETTING MATERIALS AND GROUT

- A. Acceptable Manufacturer: Subject to compliance with requirements herein, provide products from the following manufacturers, to be submitted within the first two weeks after the pre-construction meeting prior to application for architect approval.
 1. Acceptable Manufacturer: Custom Building Products, 13001 Seal Beach Blvd., Seal Beach, CA 90740 - www.custombuildingproducts.com, Contact Chris Vombaur, 909-213-0111, chrisv@cbpmail.net
 2. Equal as approved by Architect.

2.3 MATERIALS

- A. Skim Coat and Patching Underlayments: Where indicated on the drawings, and elsewhere as required to existing concrete slab providing a flat, level surface for direct receipt of tile and other floor coverings on dry, interior installations.
 1. Custom Building Products Skim Coat and Patching Cement Underlayment for fills up to 1/2 inch thick.
 2. Custom Building Products LevelQuik Rapid Setting Self-Leveling Underlayment for fills up to 1 inch thick.
 3. Equal as approved by Architect
 - 4.
- B. Waterproofing/Crack Isolation Membrane: Where indicated on the drawings, and elsewhere as required for thin-set tile installations complying with ANSI 118.10 for waterproof membranes.
 1. Custom Building Products 9240 Waterproofing and Crack Prevention Membrane.
 2. Equal as approved by Architect
- C. Epoxy Tile Adhesives:
 1. ANSI A118.3: Where indicated on the drawings, and elsewhere as required for setting tile as specified by ANSI A108.6 Chemical Resistant, Water-Cleanable Tile Setting and Grouting Epoxy, over substrates prepared accordingly.
 - a. Custom Building Products EMB-Lite 100 Percent Solids Epoxy Mortar.
 - b. Equal as approved by Architect.
- D. Grout: Where indicated on the drawings, and elsewhere as required for filling the joints between tiles.
 1. Tile grout requires a minimum "Tinsel Strength" after 28 days of 400 PSI.
 2. Chemical Resistant, Water-Cleanable Tile Setting and Grouting Epoxy; ANSI A118.3:
 - a. Custom Building Products CEG-Lite 2-Part 100 Percent Solids Epoxy Grout.
 - b. Color to be selected by Owner from all available colors.
 - c. Equal as approved by Architect.
- E. Threshold:
 1. Approved manufacturer: Schluter Systems, 194 Pleasant Ridge Road, Plattsburgh, NY, www.schluter.com, 1-800-472-4588.
 - a. RENO-U
 2. Equal as approved by Architect.

PART 3 EXECUTION**3.1 EXAMINATION**

- A. Examine surfaces, which are to receive tile. Surface must be sound, clean and dry prior to installation.
- B. Do not proceed with work until defects or conditions which would adversely affect quality, execution and permanence of finished tile work are corrected (ANSI A108.3).

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Condition of surface to receive tile.
 - 1. Assure that surfaces to receive tile are stable, flat, firm, dry, clean and free of oil, waxes and curing compounds.
 - 2. Deflection of substrate not to exceed 1/360th of the span 1/2 inch in 15 feet (4.6 m) in accordance with ANSI A108.01-2.3. Allow for live and impact load as well as dead load weight of tile and setting bed.
 - 3. Protect adjacent surfaces prior to beginning tile work.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Surface Preparation for Tile and Stone Work.
 - 1. General:
 - a. All supporting surfaces shall be structurally sound, solid, stable, level, plumb, and true to a tolerance in plane of 1/4 inch in 10 feet 0 inch for walls, 1/4 inch in 10 feet for floors when specified for thin-set method. They shall be clean and free of dust, oil, grease paint, tar, wax, curing compound, primer, sealer, form release agent, laitance, loosely bonded topping, loose particles or any deleterious substance and debris which may prevent or reduce adhesion.
 - b. Patch any deep abrasions to the existing mortar bed substrate prior to skim coating and installing the new crack isolation membrane.
 - 1)
- C. Install tile in accordance with appropriate ANSI A108 specifications and manufacturer's directions.
- D. Skim Coat and Patching Underlayment:
 - 1. Dampen existing concrete slab.
 - 2. Force material into all cracks and voids up to 1/2" thickness using a broad knife or trowel and finish flush with surface.
 - 3. For skim coating, use a smooth edged trowel to level the surface area. Only spot patching should be done on wood surfaces.
 - 4. If a leveling layer over 5 ft. in diameter is required, use the LevelQuik Self-Leveling Underlayment.
- E. Membrane:
 - 1. Pre-treat Penetrations:
 - a. Pack any gaps around pipes, lights or other penetrations with a compressible backer rod and suitable waterproof sealant. Apply a liberal coat of liquid around penetration

opening. Embed pieces of 6" (15 cm) wide fabric into liquid. Cover with a second layer of liquid. After curing, seal flashing with a waterproof sealant.

2. Expansion Joints:
 - a. Cracks in excess of 1/8" should be treated as expansion joints. Carry these types of joints through any subsequent finishing material. Clean the joint and install open or closed cell backer rod to the proper depth as outlined in EJ 171 in the Tile Council Handbook. Next, compress a sealant as specified by the architect into the joint, coating the sides and leaving it flush with the surface. After the sealant is dry, place bond breaker tape over joint. Apply a minimum 3/64" of liquid over the joint and substrate. Install the tile work onto the membrane but do not bridge the joint. After the tile work is set properly, fill the joint with any specified color sealant, following the architect's and manufacturer's instructions.
 3. Pre-treat Drains:
 - a. Drains should have a clamping ring with open weep holes for thin-set application. Cut a square of reinforcing fabric approximately 38" x 38". In the center of the fabric cut a hole that matches the diameter of the drain throat. Apply a liberal coat of liquid to the bottom flange. Drain should be fully supported without movement and even with plane of substrate.
 - b. Center the circular cutout over the drain throat and embed the fabric into the liquid making sure it does not obstruct the drainage hole. Then apply an additional coat of liquid. Wet coat thickness should be 20 - 30 mils thick.
 - c. After curing, apply a waterproof sealant bead where the fabric cutout meets the drain throat. Clamp upper flange onto membrane and tighten. Caulk with a silicone caulk around flange where membrane and upper flange make contact. A toilet flange can be handled in much the same manner.
 4. Membrane Application
 - a. Allow any pre-treated areas to dry to the touch. Apply a liberal coat of liquid with brush or roller over substrate including pre-treated areas. Lay reinforcing fabric into wet liquid and smooth out any wrinkles.
 - b. Press fabric with brush or roller until liquid bleeds through to surface. Lap seams approximately 2". Flash membrane up over pre-treated coves and corners so areas will have two layers of fabric. Apply another liberal coat of liquid over fabric to saturate it. Let top coat dry to the touch, approximately
 - c. 1 - 3 hours. Make another liberal application (20 - 30 mils thick) of liquid over entire surface to seal membrane.
 - d. When last coat has dried to the touch, inspect final surface for pinholes, voids, thin spots or other defects and use additional liquid to seal defects. Reinforcing fabric and third coat of liquid can be omitted over interior, vertical cement backerboard or drywall surfaces, however, pre-treatment is still required.
 - e. Single-Part General Waterproofing Application (Acceptable for Residential and Light Commercial Building Applications): For above instructions, reinforcing fabric and third coat of liquid can be omitted, however, pre-treatment is still required.
 - f.
- F. Setting Materials:
1. Use proper sized notch trowel to ensure 95% coverage under tiles.
 2. Using flat side of trowel, apply skim coat of mortar to the surface, apply additional mortar with notched side of trowel held at a 45° angle to the surface, combing in one direction. Press tile firmly into place in a perpendicular motion across ridges, moving back and forth. Perpendicular pressing flattens ridges and closes valleys allowing maximum coverage.
 3. Adjust tile promptly and beat in with block and rubber mallet. Thickness should not exceed 1/4" after tiles have been beaten in.
 4. Periodically pull up a tile and check the back to ensure complete coverage with the adhesive, do not trowel out more epoxy than can be covered in 10 minutes.
 5. If epoxy loses tack, remove and replace with fresh epoxy. If epoxy mortar gets on the face of the tile, clean with warm water and sponge before it sets.
 6. INSTALLATION TO CONFORM TO ANSI A108.5.

- 7.
- G. Expansion joints, control joints, insulation joints, etc., must be located in compliance with TCNA EJ171 and filled with appropriate materials.
 1. Joints must be carried through all layers of installation materials including tile, setting bed, mortar bed and reinforcing wire. Joints should be every 20 to 25 feet in both directions for interior installations. (Refer to TCA Handbook, EJ171 and ANSI AN-3.8 for details on placement, size and specifications of materials.)
- H. Install grout in accordance with Grout ANSI A108.10 specifications and manufacturer's directions.
- I. Grout:
 1. Tile must be firmly attached to a sound substrate with the mortar adequately cured per the mortar manufacturers recommended time, before grouting.
 2. Grout joints should be free of all loose debris, contaminants and excess mortar.
 3. Remove all grout from container and spread out in piles over the surface to be grouted as soon as mixing is completed.
 4. Apply grout using a hard epoxy rubber float, filling all joints full and even with surface of tile.
 5. It is important to achieve 100% fill coverage with no voids in the joints to prevent pin holes and slumping of the epoxy grout.
 6. Remove excess epoxy by holding the grout float at a 90° angle and pulling the float diagonally across the grout joints using it like a squeegee.
 7. Removing as much epoxy as possible will make final cleaning easier.
 8. Do not allow epoxy to set on face of tile and apply liberal amounts of clean, warm water to the grouted area.
 9. Using a grout sponge and as little pressure as possible, work in a circular motion across tiles to loosen epoxy film and to finish the joints smoothly.
 10. Change rinse water (and sponge if build-up occurs) frequently to aid in clean-up and minimize epoxy residue left behind.
 11. As a final step, clean film from tile by dragging a clean, microfiber towel flatly across the tiles.
 - 12.
- J. Proper curing of grout entails periodically misting the installation with clean, cool water for a period of 72 hours.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 09 5113**ACOUSTICAL PANEL CEILINGS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Acoustical ceiling panels.
 - 2. Exposed grid suspension system.
 - 3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
- B. Related Sections:
 - 1. Section 09 2900 - Gypsum Board
 - 2. Division 23 - HVAC
 - 3. Division 66 Sections - Electrical Work
- C. Alternates
 - 1. Alternates must be submitted 5 days prior to bidding. No alternates shall be accepted during construction.
 - 2. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers; Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 - 4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 - 6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 - 7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
 - 9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
 - 10. ASTM E 1264 Classification for Acoustical Ceiling Products.
 - 11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
 - 12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.
- B. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"
- C. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components
- D. International Code Council-Evaluation Services - Evaluation Report, ESR-1308, Fire- and Nonfire-Resistance-Rated Suspended Ceiling Framing Systems
- E. ASCE 7 Standard - American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
- F. CISCA Seismic Zones 3 & 4 - Ceilings and Interior Systems Construction Association Guidelines for Seismic Restraint for Direct Hung Suspended Ceiling Assemblies

1.4 SYSTEM DESCRIPTION

- Seismic Loads: Design and size components to withstand seismic loads in accordance with the 2010 California Building Code, Title 24 Section 808, Acoustical Ceiling Systems and , ASCE7-05 for Category D,E, and F.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
- B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
- C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.
- D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
- E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
 - a. Flame Spread: 25 or less
 - b. Smoke Developed: 50 or less
- C. Seismic Performance: Provide acoustical ceiling system that has been evaluated by an independent party and found to be compliant with the 2007 California Building Code, Title 24, ASCE7-05 for Seismic Category D, E, and F.
 1. Tested per International Code Council - Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components as evidenced by International Code Council Evaluation Report, ESR-1308.
- D. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.8 PROJECT CONDITIONS

- A. Space Enclosure:

All ceiling products and suspension systems must be installed and maintained in accordance with Armstrong written installation instructions for that product in effect at the time of installation and best industry practice. Prior to installation, the ceiling product must be kept clean and dry, in an environment that is between 32°F and 120°F and not subject to Abnormal Conditions.

Abnormal conditions include exposure to chemical fumes, vibrations, moisture from conditions such as building leaks or condensation, excessive humidity, or excessive dirt or dust buildup.

HumiGuard Plus Ceilings: Installation of the products shall be carried out where the temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry. The ceilings must be maintained to avoid excessive dirt or dust buildup that would provide a medium for microbial growth on ceiling panels. Microbial protection does not extend beyond the treated surface as received from the factory, and does not protect other materials that contact the treated surface such as supported insulation materials.

1.9 WARRANTY

- A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
 1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
 2. Grid System: Rusting and manufacturer's defects
 3. Acoustical Panels with BioBlock Plus or designated as inherently resistive to the growth of micro-organisms installed with Armstrong suspension systems: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.
- B. Warranty Period Humiguard:
 1. Acoustical panels: Ten (10) years from date of substantial completion.
 2. Grid: Ten (10) years from date of substantial completion.
 3. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is thirty (30) years from date of substantial completion.
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.10 MAINTENANCE

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
 1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 20.0 percent of amount installed.

2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 10.0 percent of amount installed.

Part 2-PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels:

1. Armstrong World Industries, Inc. – Sandra Stauffer 1.877.276.7876 Option 8 Ext. 6279
2. Equal as approved by Architect prior to bidding.

2.2.0 ACOUSTICAL CEILING UNITS

A. Acoustical Panels Type ACT-1:

1. Surface Texture: Medium
2. Composition: Mineral Fiber
3. Color: White
4. Size: 48in X 24in X 3/4in
5. Edge Profile: Square Lay-In for interface with Prelude XL 15/16" Exposed Tee.
6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.70.
7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 40
8. Articulation Class (AC): ASTM E 1111; Classified with UL label on product carton Not Applicable.
9. Emissions Testing: Section 01350 Protocol, < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"
10. Flame Spread: ASTM E 1264; Class A (UL)
11. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.85.
12. Dimensional Stability: HumiGuard Plus - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry.
13. Antimicrobial Protection: BioBlock Plus - Resistance against the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.
14. Acceptable Product: School Zone Fine Fissured, 1714 as manufactured by Armstrong World Industries.

2.3.0 SUSPENSION SYSTEMS

- A. Components: Main beams and cross tees In accordance with the International Building Code, Section 1621 for Category D, E and F as described in ESR-1308.
 1. Structural Classification: ASTM C 635, Heavy Duty.
 2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
 3. Represented Systems: Prelude XL 15/16" Exposed Tee System as manufactured by Armstrong World Industries.
- B. Attachment Devices: In accordance with the International Building Code, Section 1621 for Category D, E, and F.
- C. Wire for Hangers and Ties: In accordance with the International Building Code, Section 1621.
- D. Wall Moldings: In accordance with the International Building Code, Section 1621 for Category D, E, and F or method as described in ESR-1308.
 1. Nominal 7/8 inch x 7/8 inch hemmed, pre-finished angle molding (7800) (7802) (7803) (780036) (HD7801)
 2. Nominal 15/16 inch x 15/16 inch hemmed, pre-finished angle molding (7809)

3. Nominal 15/16 inch x 15/16 inch x 1/4 inch, pre-finished shadow molding (7877)
 4. Nominal 15/16 inch x 15/16 inch x 3/8 inch, pre-finished shadow molding (7878)
 5. Nominal 15/16 inch x 15/16 inch x 1/2 inch, pre-finished shadow molding (7897)
- E. Accessories:
1. BERC2 - 2 inch Beam End Retaining Clip, 0.034 inch thick, hot-dipped galvanized cold-rolled steel per ASTM A568 - used to join main beam or cross tee to wall molding.
 2. SJCG - Seismic Joint Clip, 5 inches x 1-1/2 inch, hot-dipped galvanized cold-rolled steel per ASTM A568. The two piece unit is designed to accommodate a seismic separation joint. The clip is compatible with 15/16 inch and 9/16 inch grid systems including Prelude, Suprafine, and Silhouette The SJCG is not suitable for use with Vector panel installations.
 3. SJMR15 - Seismic Joint Clip - Main Beam, 1 inch x 4 inches, commercial quality cold rolled hot dipped galvanized steel per ASTM A568, chemically cleansed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not proceed with installation until all wet work such as painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION (Category D,E,F)

- A. Install suspension system and panels in accordance with the 2007 California Building Code, Title 24, and ASCE7-05, except as noted in Section 4.4.3.1 of ESR-1308, and with the authorities having jurisdiction.
- B. ESR-1308, Section 4.4.3.1, Alternate Seismic Design Category D,E and F Installation:

Under this installation, the runners must be rated heavy-duty and have a minimum simple span uniform load of 16.35 pounds per lineal foot (238 N/m); maximum ceiling weight permitted is 4.0 pounds per square foot (19.5 kg/m²).

1. The BERC-2 clip is used to secure the main runners and cross runners on two adjacent walls to the structure and the two opposite walls to the perimeter trim, as detailed below. A nominal 7/8-inch (22 mm) wall molding is used in lieu of the 2-inch (51 mm) perimeter supporting closure angle required by Section 9.6.2.6.2.2 (b) of ASCE-7 for Seismic Design Categories D, E and F. Except for the use of the BERC-2 clip and the 7/8-inch (22 mm) wall molding and elimination of spreader bars, installation of the ceiling system must be as prescribed by the applicable code.
 2. The BERC-2 clip is attached to the wall molding by sliding the locking lances over the hem of the vertical leg of the wall molding. Clips installed on the walls where the runners are fixed are attached to the runner by a sheet metal screw through the horizontal slot in the clip into the web of the runner.
 3. Clips installed on the walls where the runners are not fixed to the runner allow the terminal runner end to move 3/4 inch (19.1 mm) in both directions. BERC-2 clips installed in this manner are an acceptable means of preventing runners from spreading in lieu of spacer bars required in CISCA 3-4, which is referenced in ASCE 7, Section 9.6.2.6.2.2, which is referenced in IBC Section 1621.
- C. The SJCG Seismic Separation Joint Clip is to be installed per the manufacturer's instructions, CS-3815.
- D. The SJMR15 Seismic Joint Clip Main Beam is to be installed per the manufacturer's instructions, CS-3955.

- E. The presence of a hanger wire within 3 inches of an expansion relief joint as called for in ASTM C636 shall be required in addition to the requirements of the International Building Code, Section 1621.2.5 and with the authorities having jurisdiction.
 - 1. Only applies when using Prelude XL Fire Guard 15/16 ½; Prelude Plus XL Fire Guard 15/16 ½; and Suprafine XL Fire Guard 9/16 ½ Exposed Tee Systems.
- F. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
- G. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 FIELD QUALITY CONTROL

- Suspended ceiling shall be subject to the special inspection requirements in Section 01 45 33 (01450) - Code-Required Special Inspections and Procedures.

3.5 ADJUSTING AND CLEANING

- A. Replace damaged and broken panels.
- B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.
 - 1. Ceiling Touch-Up Paint, (Item #5760, 8oz. bottles) (Item #5761, quart size cans), "global white" latex paint should be used to hide minor scratches and nicks in the surface and to cover field tegularized edges that are exposed to view.
- C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 6516**RESILIENT SHEET FLOORING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install flooring where indicated on Drawings, as described in Contract Documents.
- B. Related Sections:
 - 1. Section 09 0503: Floor Preparation

1.2 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's literature or cut sheet for each component of system.
 - 2. Maintenance instructions.
 - 3. Color and style selection.
 - 4. Sample 8" x 10".
 - 5. Shop Drawings with seam layout.
 - 6. Sustainable Design Submittal.
 - a. Document of verification of recycled content.
 - b. Document of verification of low VOC content.
 - 7. Samples of all available colors and styles.

1.3 DELIVERY, STORING & HANDLING

- A. Project Environmental Requirements:
 - 1. Store materials in clean dry and temperature-controlled environment at not less than 70 deg F for at least 24 hours before using.
 - 2. Do not apply in temperatures below 70 deg F.
 - 3. Remove rolls from shipping pallet immediately and store standing on end. Wrap open rolls tightly and face out to avoid material distortion.

1.4 WARRANTY

- A. Manufacturers one (1) year warranty against manufacturing defects and 10 year warranty as a result of normal foot traffic and wear.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Flooring:
 - 1. 0.013 inch minimum vinyl wear layer bonded to filled fibrous composition backing. Total thickness 0.100 inch minimum. Color and pattern to extend entirely through wear layer.
 - 2. Sheet Vinyl Flooring to meet ASTM F1303 as follows:
 - a. Type: 1
 - b. Grade: 1
 - c. Backing: Class B
 - d. Abrasion Resistance to ASTM D3884
 - e. Coefficient Friction: Surpass ADA guidelines based on ASTM C1028
 - 3. Approved Products:
 - a. Armstrong World Industries, Inc. Lancaster, PA 17604, 800-233.3823 www.armstrong.com.

4. Color & Pattern:
 - a. At areas of patching, material to match in color and pattern.
 - b. Selected by Owner from all available colors and styles.

- B. Adhesive: Water-resistant type. Best grade in accordance with Flooring Manufacturer's recommendations.

- C. Heat weld seams: PVC rod for heat weld seams.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspect surfaces for conditions not suitable for first class installation. Remedy cracks and minor irregularities in accordance with Manufacturer's recommendations. Do not start work until defects are corrected.

3.2 INSTALLATION

- A. Install flooring in manner to produce smooth, even finished surfaces tightly jointed and accurately aligned in accordance with Manufacturer's recommendations.
 1. Fit neatly against projections, piping, electrical service outlets, etc.
- B. Leave flooring level, free from buckles, cracks, and projecting edges.
- C. Install 6" continuous cove base with sheet flooring. Install edge trim to framing members.

3.3 PROTECTION AND MAINTENANCE

- A. Protect installed product from damage during construction by providing adequate protective covering such as Masonite or Homasote panels in order to protect vinyl from damage caused by ladders and construction traffic.
- B. Ensure initial maintenance is completed 48 hours after installation.
 1. Initial maintenance includes; dust and wet mop using a microfiber mop pad with Lonseal's pH neutral cleaner – Loncare. Let dry prior to applying 1 thin coat of Lonseal's base seal coat – Longprime and 2-4 coats of floor finish – Lonfinish (glossy) or Lonsatin (matte). Allow 30-45 minutes to dry in-between finish coats. Allow to dry completely (4 hours) before allowing traffic.

3.4 WASTE MANAGEMENT AND DISPOSAL

- A. Remove from site and dispose of packing material, excess/surplus material at appropriate recycling facilities.

3.5 ADJUSTING

- A. Inspect floors and make necessary adjustments within one month after mechanical heat or other heat has been supplied continuously in finished areas.

END OF SECTION

SECTION 09 7720**DECORATIVE FIBERGLASS REINFORCED WALL PANELS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes: Prefinished polyester glass reinforced plastic sheets and adhered to gypsum] wallboard.
1. Aluminum trim.
 2. PVC Wall base.

1.2 RELATED SECTIONS

- A. Section 09 2900 – Gypsum [Cementitious] substrate board.
- B. Section 06 1100 - Wood [Metal] Stud Framing
- C. Section 09 0000 - Painting & Transparent Finishes.
- D. Section 09 3014 – Quarry tile base.

1.3 REFERENCES

- A. American Society for Testing and Materials: Standard Specifications (ASTM)
1. ASTM D 256 - Izod Impact Strengths (ft #/in)
 2. ASTM D 570 - Water Absorption (%)
 3. ASTM D 638 - Tensile Strengths (psi) & Tensile Modulus (psi)
 4. ASTM D 790 - Flexural Strengths (psi) & Flexural Modulus (psi)
 5. ASTM D 2583- Barcol Hardness
 6. ASTM D 5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
 7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

- A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- C. Selection Samples: Submit manufacturer's standard color pattern selection samples representing manufacturer's full range of available colors and patterns.

- D. Samples for Verification: Submit appropriate section of panel for each finish selected indicating the color, texture, and pattern required.
 - 1. Submit complete with specified applied finish.
 - 2. For selected patterns show complete pattern repeat.
 - 3. Exposed Molding and Trim: Provide samples of each type, finish, and color.
- E. Manufacturers Material Safety Data Sheets (MSDS) for adhesives and sealants prior to their delivery to the site.

1.5 QUALITY ASSURANCE

- A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
 - 1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)
 - a. Wall Required Rating – Class [A] [C].
- B. Sanitary Standards: System components and finishes to comply with:
 - 1. United States Department of Agriculture (USDA) requirements for food preparation facilities, incidental contact.
 - 2. Food and Drug Administration (FDA) 1999 Food Code 6-101.11.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials factory packaged on strong pallets.
- B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (70°) for 48 hours prior to installation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work
- B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
 - 1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

1.8 WARRANTY

- A. Furnish one year guarantee against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. Marlite; 202 Harger Street, Dover, OH 44622. 800-377-1221 FAX (330) 343-4668 Email: info@marlite.com www.marlite.com.

- B. Equal as approved by Architect.
- C. Product:
 - 1. Standard RFP Panels.

2.2 PANELS

- A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
 - 1. Coating: Multi layer print, primer and finish coats.
 - 2. Dimensions:
 - a. Thickness – 0.090 inch (2.29mm) nominal
 - b. Width - 4'-0" (1.22m) nominal
 - c. Length – [10'-0" (3.0m)][8'-0" (2.4m)] [As indicated on the drawings] nominal
 - 3. Tolerance:
 - a. Length and Width: +/-1/8 inch (3.175mm)
 - b. Square - Not to exceed 1/8 inch for 8 foot (2.4m) panels or 5/32 inch (3.96mm) for 10 foot (2.4m) panels
- B. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
 - 1. Flexural Strength - 1.0×10^4 psi per ASTM D 790. (7.0 kilogram-force/square millimeter)
 - 2. Flexural Modulus - 3.1×10^5 psi per ASTM D 790. (217.9 kilogram-force/square millimeter)
 - 3. Tensile Strength - 7.0×10^3 psi per ASTM D 638. (4.9 kilogram-force/square millimeter)
 - 4. Tensile Modulus - 1.6×10^5 psi per ASTM D 638. (112.5 kilogram-force/square millimeter)
 - 5. Water Absorption - 0.72% per ASTM D 570.
 - 6. Barcol Hardness (scratch resistance) of 35 55 as per ASTM D 2583.
 - 7. Izod Impact Strength of 72 ft. lbs./in ASTM D 256
- C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.
- D. Front Finish: [As Indicated on the Drawings] [In accordance with preapproved sample. Information available from the Architect's Office] as selected by Architect and Owner.

Specifier Note: Marlite's FRP & Symmetrix with Sani-Coat Panels are available in several configurations, including Class C (III) Fire-rated, along with various surface textures for both FRP & Symmetrix with Sani-Coat. Symmetrix with Sani-Coat are available with standard surface grooving and customized groove layouts to match architectural specifications.

- a. Color: Selected by Owner from available colors.
- b. Surface Selected by Owner from available colors.
- c. Fire Rating: Class C (III) Fire Rating.
- d. Size: [Specifier to choose, or as indicated on drawings.] Marlite FRP standard sizes are;

1) 4' x 8' [1.2m x 2.4m] x .120"

2.3 MOLDINGS

Aluminum Trim: Heavy weight extruded aluminum 6063-T5 alloy prefinished at the factory.

- 1. Finish: Factory oven-baked finish.
- 2. Profiles :
 - a. F 550 Inside Corner

- b. F 561 Outside Corner
 - c. F 565 Division
 - d. F 570 Edge
 - e. A551 Inside Corner.
 - f. A560 Outside Corner
 - g. A565 Division
 - h. A570 Edge
3. Color: Selected by Owner from available colors.

- A. PVC: Extruded PVC Trim Profiles for .090 inch thick panels.
- 1. M 350 Inside Corner
 - 2. M 360 Outside Corner
 - 3. M 365 Division
 - 4. M 370 Edge
 - 5. Color: Selected by Owner from available colors.

- B. Outside Corner Guard:
- 1. F 560 Stainless Steel
 - a. Finish: #4 satin
 - 2. M 961 PVC
 - a. 199 White
 - b. 118 Natural Almond
 - c. 140 Ivory
 - d. 145 Silver
 - e. 151 Light Grey

2.4 ACCESSORIES

- A. Fasteners: Non-staining nylon drive rivets.
- 1. Match panel colors.
 - 2. Length to suit project conditions.
- B. Adhesive: adhesives complying with ASTM C 557.
- 1. Marlite C-551 FRP Adhesive - Water-resistant, non-flammable adhesive
- C. Sealant:
- 1. Marlite Brand - Color Match Sealant,

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
- 1. Verify that stud spacing does not exceed 24 inch (61cm) on-center.
- B. Repair defects prior to installation.
- 1. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

3.2 INSTALLATION

- A. Comply with manufacturer's recommended procedures and installation sequence.
- B. Cut sheets to meet supports allowing 1/8" inch (3 mm) clearance for every 8 foot (2.43m) of panel.
 - 1. Cut and drill with carbide tipped saw blades or drill bits, or cut with shears.
 - 2. Pre-drill fastener holes 1/8 inch (3.175mm) oversize with high speed drill bit.
 - a. Space at 8 inches (20.32cm) maximum on center at perimeter, approximately 1 inch from panel edge.
 - b. Space at in field in rows 16 inches (40.64cm) on center, with fasteners spaced at 12 inches (30.48 cm) maximum on center.
- C. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.
 - 1. Install panels with manufacturer's recommended gap for panel field and corner joints.
 - a. Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.
 - b. Drive fasteners for snug fit. Do not over-tighten.
- D. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.
 - 1. All moldings must provide for a minimum 1/8 inch (3.18mm) of panel expansion at joints and edges, to insure proper installation.
 - 2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.3 CLEANING

- A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.
- B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION

SECTION 09 9001

COMMON PAINTING AND COATING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
1. Common procedures and requirements for field-applied painting and coating.
- B. Related Requirements:
1. Section 09 2900: Priming of gypsum board before texturing.
 2. Section 09 9413: Textured finishing.

1.2 REFERENCES

- A. Definitions:
1. Gloss Levels:
 - a. Specified paint gloss level shall be defined as sheen rating of applied paint, in accordance with following terms and values, unless specified otherwise for a specific paint system.

Gloss Level '1'	Traditional matte finish - flat	0 to 5 units at 60 degrees to 10 units maximum at 85 degrees.
Gloss Level '2'	High side sheen flat - 'velvet-like' finish	10 units maximum at 60 degrees and 10 to 35 units at 85 degrees.
Gloss Level '3'	Traditional 'eggshell-like' finish	10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
Gloss Level '4'	'Satin-like' finish	20 to 35 units at 60 degrees and 35 units minimum at 85 degrees.
Gloss Level '5'	Traditional semi-gloss	35 to 70 units at 60 degrees.
Gloss Level '6'	Traditional gloss	70 to 85 units at 60 degrees.
Gloss Level '7'	High gloss	More than 85 units at 60 degrees.

2. Properly Painted Surface: Surface that is uniform in appearance, color, and sheen and free of foreign material, lumps, skins, runs, sags, holidays, misses, strike-through, and insufficient coverage. Surface free of drips, spatters, spills, and overspray caused by Paint Applicator. Compliance will be determined when viewed without magnification at a distance of 5 feet minimum under normal lighting conditions and from normal viewing position (MPI(a), PDCA P1.92).
 3. Damage Caused By Others: Damage caused by individuals other than those under direct control of Painting Applicator (MPI(a), PDCA P1.92).
 4. Latent Damage: Damage or conditions beyond control of Painting Applicator caused by conditions not apparent at time of initial painting or coating work.
- B. Reference Standards:
1. Master Painters Institute:
 - a. MPI(a), Jul 2007, 'Architectural Painting Specification Manual.'
 - b. MPI(r), Aug 2004, 'Maintenance Repainting Manual.'

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Include following information for each painting system, arranged in same order as in Project Manual.
 - 1) Manufacturer's cut sheet for each component of each system indicating ingredients and percentages by weight and by volume, environmental restrictions for application, and film thicknesses and spread rates.
 - 2) Copies of appropriate entries from MPI Approved Product List. Confirmation of colors selected and that each area to be painted or coated has color selected for it.
- B. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Manufacturer's substrate preparation instructions and application instruction for each painting system used on Project.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual:
 - a. Record Documentation:
 - 1) Manufacturer's documentation:
 - a) Manufacturer's cut sheet for each component of each system.
 - b) Schedule showing rooms and surfaces where each system was used.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Paint and painting materials shall be free of lead and mercury, and have VOC levels acceptable to local jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Deliver specified products in sealed, original containers with Manufacturer's original labels intact on each container.
 - 2. Deliver amount of materials necessary to meet Project requirements in single shipment.
- B. Storage And Handling Requirements:
 - 1. Store materials in single place.
 - 2. Keep storage area clean and rectify any damage to area at completion of work of this Section.
 - 3. Maintain storage area at 55 deg F minimum.

1.6 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Perform painting operations at temperature and humidity conditions recommended by Manufacturer for each operation and for each product.
 - 2. Apply painting systems at lighting level of 540 Lux (50 foot candles) minimum on surfaces to be painted. Inspection of painting work shall take place under same lighting conditions as application. If painting and coating work is applied under temporary lighting, deficiencies discovered upon installation of permanent lighting will be considered latent damage as defined in MPI Manual, PDCA P1-92.

PART 2 - PRODUCTS**2.1 SYSTEMS****A. Performance:****1. Design Criteria:****a. Color Levels:****1) Color Level II:**

- a) Number and placement of interior and exterior paint colors and gloss levels shall be as defined by Color Level II from MPI Manual, PDCA P3-93 as modified in following paragraph.
- b) No more than one paint color or gloss level will be selected for same substrate within designated interior rooms or exterior areas.

B. Materials:

1. Materials used for any painting system shall be from single manufacturer unless approved otherwise in writing by painting system manufacturers and by Architect. Include manufacturer approvals in Product Data submittal.
2. Linseed oil, shellac, turpentine, and other painting materials shall be pure, be compatible with other coating materials, bear identifying labels on containers, and be of highest quality of an approved manufacturer listed in MPI manuals. Tinting color shall be best grade of type recommended by Manufacturer of paint or stain used on Project.

PART 3 - EXECUTION**3.1 APPROVED APPLICATORS**

- A. Applicator shall have experience in application of specified products for five years minimum and be acceptable to Architect and Paint Manufacturer.

3.2 EXAMINATION**A. Verification Of Conditions:**

1. Directing applicator to begin painting and coating work will indicate that substrates to receive painting and coating materials have been previously inspected as part of work of other Sections and are complete and ready for application of painting and coating systems as specified in those Sections.

B. Pre-Installation Testing:

1. Before beginning work of this Section, examine, and test surfaces to be painted or coated for adhesion of painting and coating systems.
2. Report in writing to Architect of conditions that will adversely affect adhesion of painting and coating work.
3. Do not apply painting and coating systems until party responsible for adverse condition has corrected adverse condition.

C. Evaluation And Assessment:

1. Report defects in substrates that become apparent after application of primer or first finish coat to Architect in writing and do not proceed with further work on defective substrate until such defects are corrected by party responsible for defect.

3.3 PREPARATION

- A. Protection Of In-Place Conditions:

1. Protect other finish work and adjacent materials during painting. Do not splatter, drip, or paint surfaces not intended to be painted. These items will not be spelled out in detail but pay special attention to the following:
 - a. Do not paint finish copper, bronze, chromium plate, nickel, stainless steel, anodized aluminum, or monel metal except as explicitly specified.
- B. Surface Preparation:
 1. Prepare surfaces in accordance with MPI requirements and requirements of Manufacturer for each painting system specified, unless instructed differently in Contract Documents. Bring conflicts to attention of Architect in writing.
 2. Fill minor holes and cracks in wood surfaces to receive paint or stain.
 3. Surfaces to be painted shall be clean and free of loose dirt. Clean and dust surfaces before painting or finishing.
 4. Do no exterior painting while surface is damp, unless recommended by Manufacturer, nor during rainy or frosty weather. Interior surfaces shall be dry before painting. Moisture content of materials to be painted shall be within tolerances acceptable to Paint Manufacturer.
 5. Sand woodwork smooth in direction of grain leaving no sanding marks. Clean surfaces before proceeding with stain or first coat application.

3.4 APPLICATION

- A. Interface With Other Work:
 1. Coordinate with other trades for materials and systems that require painting before installation.
 2. Schedule painting and coating work to begin when work upon which painting and coating work is dependent has been completed. Schedule installation of pre-finished and non-painted items, which are to be installed on painted surfaces, after application of final finishes.
- B. Paint or finish complete all surfaces to be painted or coated as described in Contract Documents.
- C. Apply sealant in gaps 3/16 inch and smaller between two substrates that are both to be painted or coated. Sealants in other gaps furnished and installed under Section 07 9213.
- D. In multiple coat paint work, tint each succeeding coat with slightly lighter color, but approximating shade of final coat, so it is possible to check application of specified number of coats. Tint final coat to required color.
- E. Spread materials smoothly and evenly. Apply coats to not less than wet and dry film thicknesses and at spreading rates for specified products as recommended by Manufacturer.
- F. Touch up suction spots after application of first finish coat.
- G. Paint shall be thoroughly dry and surfaces clean before applying succeeding coats.
- H. Use fine sandpaper between coats as necessary to produce even, smooth surfaces.
- I. Make edges of paint adjoining other materials or colors clean, sharp, and without overlapping.
- J. Finished work shall be a 'Properly Painted Surface' as defined in this Section.

3.5 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 1. Correct deficiencies in workmanship as required to leave surfaces in conformance with 'Properly Painted Surface,' as defined in this Section.
 2. Correction of 'Latent Damage' and 'Damage Caused By Others,' as defined in this Section, is not included in work of this Section.

3.6 CLEANING

A. General:

1. As work proceeds and upon completion of work of any painting Section, remove paint spots from floors, walls, glass, or other surfaces and leave work clean, orderly, and in acceptable condition.

B. Waste Management:

1. Remove rags and waste used in painting operations from building each night. Take every precaution to avoid danger of fire.
2. Remove debris caused by work of paint Sections from premises.

END OF SECTION

ATTACHMENTS**PART 4 - PAINT COLOR SCHEDULE****A. Colors:****1. Interior:****a. Color Quality Standards.**

- 1) Interior Gypsum Board: Color (P1) to match adjacent walls as base color from the "Perfect Palette Series" by Dunn Edwards or equal as approved by Architect.
- 2) Interior Gypsum Board: Color for P2 as designated on plans for each room shall be selected by Owner from all available colors from the "Perfect Palette Series" by Dunn Edwards or equal as approved by Architect.

b. Finish #1: All interior drywall, low sheen, acrylic copolymer/100% acrylic. First coat: Inter-kote (IKPR00) new and existing drywall. Second and third coat: Suprema – Interior low sheen paint (SPMA40).**c. Finish #2: Interior Hardwood. First coat: Ultra-grip Premium UGPR00-Primer. Second and third coat: Evershield EVSH50 – Semi-gloss finish.****d. Finish #3: Metal door frames and window frames. First coat: Ultra-grip Premium UGPR00 – Primer. Second and third coat: Evershield EVSH50 – Semi-gloss finish.****2. Exterior:****a. Color Quality Standards.**

- 1) Exterior Stucco: Color to match adjacent material if painting is required to match existing finish by Dunn Edwards.

SECTION 09 9114**EXTERIOR PAINTED STUCCO****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new exterior stucco surfaces to match existing as described in Contract Documents. This section is required if existing exterior building is painted and finish shall match existing color.
 - 2. Preparing and painting following existing exterior stucco surfaces as described in Contract Documents.
 - a. Exterior stucco at exterior removed window location.
 - b. Exterior stucco at entrances where existing light fixture have been removed and/or new light fixture added as required.
- B. Related Requirements:
 - 1. Section 09 9001: Common Painting Requirements.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Approved Products and Manufacturers:
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
- B. Description:
 - 1. Stucco:
 - a. New Surfaces: Use MPI(a) EXT 3.1A Latex Finish system.
 - b. Previously Finished Surfaces: Use MPI(r) REX 3.1A Latex Finish system.
- C. Performance:
 - 1. Finish Requirements:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
 - c. Sound Existing Surfaces: MPI Custom Grade finish requirements.
 - d. Gloss / Sheen Level Required: Gloss Level 1.
- D. Materials:
 - 1. Finish Coats: MPI Product 10.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Except for steam cured products, cure cement type surfaces from 60 to 90 days in accordance with Paint Manufacturer's recommendations before painting.

3.2 APPLICATION

- A. General: See appropriate paragraphs of Section 09 9001.
- B. New Surfaces:
 - 1. On highly porous surfaces when weather is exceptionally hot and dry, it may be desirable to dampen surface before applying first coat of an emulsion paint.
 - 2. Roll after spraying if necessary to eliminate pinholing.
- C. Existing Painted Surfaces:
 - 1. Remove deteriorated and chalked existing paint down to sound substrate by scraping and or high-pressure spray. Feather edges of existing paint by sanding to be smooth with adjacent surfaces.
 - 2. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer.
 - 3. Fill cracks with masonry crack filler.
 - 4. Prime scraped and sanded areas.
 - 5. Apply finish coat as required for new work.

END OF SECTION

SECTION 09 9123**INTERIOR PAINTED GYPSUM BOARD****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing, priming, and finish painting new interior gypsum board surfaces as described in Contract Documents. Feather paint beyond area to avoid patching in appearance.
- B. Related Requirements:
 - 1. Section 09 9001: Common Painting Requirements.
 - 2. Section 09 9413: Textured finishes.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Approved Manufacturers and Products.
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
- B. Description:
 - 1. All Other Areas:
 - a. New Surfaces: Use MPI(a) INT 9.2B Latex Finish system.
 - b. Previously Finished Work: Use MPI(r) RIN 9.2B Latex Finish system.
- C. Performance:
 - 1. Design Criteria:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
 - c. Sound Existing Surfaces: MPI Custom Grade requirements.
 - d. Gloss / Sheen Required:
 - 1) Remaining Painted Surfaces: Gloss Level 3 (verify existing finish and match.)
- D. Materials:
 - 1. Primers
 - a. MPI Product 50.
 - 2. Finish Coats:
 - a. Painted Surfaces:
 - 1) MPI Product 141

PART 3 - EXECUTION**3.1 APPLICATION**

- A. General: See appropriate paragraphs of Section 09 9001.

B. New Surfaces:

1. Primer: Apply primer to be covered with other paint coats with roller only, or with spray gun and back-rolled.

C. Existing Painted Surfaces:

1. Remove deteriorated existing paint down to sound substrate by scraping or sanding. Feather edges of existing paint by sanding to be smooth with adjacent surfaces.
2. Clean surface with mild soap and water, or with tri-sodium phosphate (TSP). Wash surfaces that have been defaced with marking pens, crayons, lipstick, etc, with solvent recommended by Paint Manufacturer. Spot prime such surfaces.
3. Spackle and tape cracks. Sand to smooth finish and spot prime.
4. Sand or chemically etch existing painted surface as required to prepare surface to accept new paint.
5. Re-clean surface.
6. Apply primer coat.
7. Apply finish coats.

END OF SECTION

SECTION 09 9124**INTERIOR PAINTED METAL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new interior metal surfaces as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 9001: Common Painting Requirements

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Approved Products and Manufacturers.
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
- B. Description:
 - 1. Ferrous Metal:
 - a. New Surfaces: Use MPI(a) INT 5.1B Waterborne Light Industrial Finish system.
 - b. Previously Finished Surfaces: Use MPI(r) RIN 5.1B Waterborne Light Industrial Finish system.
- C. Performance:
 - 1. Design Requirements:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
 - c. Sound Existing Surfaces: MPI Custom Grade requirements.
 - d. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
 - 1. Primers:
 - a. Ferrous Metal: MPI Product 107.
 - 2. Finish Coats: MPI Product 153.

PART 3 - EXECUTION**3.1 APPLICATION**

- A. General:
 - 1. See appropriate paragraphs of Section 09 9001.
 - 2. Systems specified are in addition to prime coats furnished under other Sections.
- B. New Surfaces: Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.

END OF SECTION

SECTION 09 9125**INTERIOR PAINTED WOOD****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new and existing woodwork not requiring transparent finish, as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 9001: Common Painting Requirements.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Approved Products and Manufacturers.
 - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
- B. Description:
 - 1. Systems:
 - a. All Other:
 - 1) New Surfaces: Use MPI(a) INT 6.3T or U Latex Finish system.
 - 2) Previously Finished Surfaces: MPI(r) Rin 6.3U Latex Finish system.
- C. Performance:
 - 1. Design Criteria:
 - a. New Surfaces: MPI Premium Grade finish requirements.
 - b. Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
 - c. Sound Existing Surfaces: MPI Custom Grade finish requirements.
 - d. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
 - 1. Woodwork:
 - a. Primer Coat: MPI Products 39 or 45.
 - b. Finish Coats: MPI Product 153.

PART 3 - EXECUTION**3.1 APPLICATION**

- A. General: See appropriate paragraphs of Section 09 9001.
- B. Interface With Other Work:
 - 1. Where back-priming is required, apply one coat of primer.
- C. New Surfaces:
 - 1. Spot prime nail holes, cracks, and blemishes before and after puttying.

2. Apply stain blocker or other product recommended by Paint Manufacturer to knots before applying primer coat.
- D. Existing Painted Surfaces:
1. Remove deteriorated existing paint down to sound substrate by scraping and sanding. Feather edges of existing paint by sanding to be smooth with adjacent surfaces. Spot prime bare wood areas on woodwork.
 2. Wash surfaces that have been defaced with marking pens, crayons, lipstick, etc, with solvent recommended by Paint Manufacturer. Spot prime such surfaces.
 3. Apply finish coats.

END OF SECTION

SECTION 09 9324**INTERIOR CLEAR-FINISHED HARDWOOD****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and finishing of new interior clear finished hardwood as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 08 1416: 'Interior Flush Wood Doors'.
 - 2. Section 09 9001: Common Painting Requirements.

1.2 REFERENCES

- A. Association Publications:
 - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada, 46179 Westlake Drive, Suite 120, Potomac Falls, VA www.awinet.org.
 - a. Architectural Woodwork Standards (AWS), 1st Edition, 2009.
- B. Reference Standards:
 - 1. Kitchen Cabinet Manufacturers Association / American National Standards Institute:
 - a. ANSI/KCMA A161.1-2000 (R2005) 23-Jan-2001 'Recommended Performance and Construction Standards for Kitchen and Vanity Cabinets.'

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Samples:
 - a. Interior Hardwood for Transparent Finish:
 - 1) Requirements for samples are specified in Related Requirement Sections listed above.
 - b. Design Criteria:
 - 1) Sample will be used as performance standard for evaluating finish provided.
- B. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. Before beginning finish work, submit Finish Manufacturer's literature or certification that finish material meets requirements of ANSI / KCMA A161.1.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Materials:
 - 1. Stain: MPI 90.
 - 2. Clear Finish Coats:
 - a. Field Finished:
 - 1) Chemcraft International Inc:
 - a) First, Second, And Third Coats: 20 Sheen Opticlear Pre-Catalyzed Lacquer.
 - 2) ICI Dulux / Trinity:

- a) First Coat: ICE Vinyl Sanding Sealer.
 - b) Second And Third Coats: ICI Pre-Catalyzed Lacquer.
 - 3) Lilly / Valspar:
 - a) First, Second, And Third Coats: 20 Sheen Pre-Catalyzed Lacquer 587E208.
 - 4) Sherwin-Williams:
 - a) First Coat: T67F3 Vinyl Sealer.
 - b) Second And Third Coats: T77F38 Sherwood Pre-Catalyzed Lacquer DRE.
 - b. Mill Finished: Architectural Woodwork finished in a mill may use one coat of Vinyl Sealer and two coats of Conversion Varnish or three coats of Conversion Varnish from one of the approved Finish Manufacturers, as recommended by Finish Manufacturer.
 - c. Products meeting testing requirements for finishes of ANSI / KCMA A161.1 may be used upon approval of submission by Architect before use. See Section 01 6200.
3. Color:
- a. Design Criteria:
 - 1) Finish to match existing door finishes.

PART 3 - EXECUTION

3.1 APPLICATION

- A. General:
1. See appropriate paragraphs of Section 09 9001.
 2. Sand entire exposed surface of item to be finished lightly with 120 to 150 non-steared sandpaper and clean before applying dye or stain.
 3. Apply stain in accordance with Manufacturer's recommendations and as necessary to attain correct color.
 4. Scuff sand with 220 non-steared sandpaper between application of application stain and first finish coat.
 5. If wood is finished before installation, finish cut ends and other unfinished, exposed surfaces same as previously finished surfaces after installation of wood.
- B. Where back-priming is required, apply one coat of finish material.

END OF SECTION

SECTION 09 9413**INTERIOR TEXTURED FINISHING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and apply texturing on walls and ceilings as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 2900: Priming.
 - 2. Section 09 9123: Finish painting.

1.2 REFERENCES

- A. Definitions:
 - 1. Drywall Texture: Compound that is rolled, sprayed, or troweled onto the sheetrock after the taping and floating of joints is complete. It is the same material as the joint compound, but thinned down with water and applied to the wall surface (finish to match adjacent surfaces):
 - a. Orange Peel: Sprayed texture that leaves light to heavy splatter on walls. It resembles the peel of an orange. If done with a fine spray, it can be one of the lightest, least noticeable of the texture styles.
 - b. Skip Trowel - For this style, texture is applied to the walls with a trowel. Trowel marks may be left on the surface to give a rustic, hand crafted look.
 - c. Smooth - This is a smooth application of texture over the sheetrock wall. It feathers out the sheetrock joints, and creates an even, non-textured wall.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Samples: Provide minimum of three 24 inch square control samples on primed gypsum wallboard of 'light orange peel' texture to show possible variations.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. National Gypsum, Charlotte, NC www.nationalgypsum.com.
 - b. U S Gypsum Co, Chicago, IL www.usg.com.
- B. Performance:
 - 1. Design Criteria: 'Light orange peel.'
 - 2. Match existing if not "Light orange peel.'
- C. Materials:
 - 1. Quality Standards:
 - a. ProForm Perfect Spray EM/HF by National Gypsum.
 - b. Sheetrock Wall & Ceiling Texture by U S Gypsum.

PART 3 - EXECUTION

3.1 APPLICATION

- A. After gypsum board is taped, sanded, and primed, apply texture. Closely match samples accepted by Architect.

END OF SECTION

DIVISION 10: SPECIALTIES

10 2000 INTERIOR SPECIALTIES

10 1701 PLASTIC TOILET COMPARTMENTS
10 2813 COMMERCIAL TOILET ACCESSORIES

END OF TABLE OF CONTENTS

SECTION 10 1701**PLASTIC TOILET COMPARTMENTS****PART 1 GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install Solid Plastic (HDPE) toilet partition compartments and Urinal Screens as described in Contract Documents.
 2. Reinstall all toilet accessories to panels as previously installed. Install all toilet accessories at ADA required heights and locations.

1.2 RELATED SECTIONS

- A. Section 10 2813 - Toilet Accessories.

1.3 REFERENCES

- A. ADA Accessibility Guidelines for Buildings and Facilities.
- B. ASTM A666 – Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- C. ASTM International – ASTM B86-08, 'Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings'

1.4 SUBMITTALS

- A. Action Submittals:
1. Product Data: Color Selection
 2. Submit shop drawings showing layout, door swings, profiles, and product components, including anchorage and accessories
 3. Submit product data on panel construction, hardware, pilaster, door, fasteners and accessories.
 4. Submit two samples 4 x 4 inch in size illustrating panel finish, color, and sheen of selected color from available standard colors. Sample of actual specified plastic chip for color and texture verification.
 5. Submit maintenance data for installed products in accordance with Section 01780-Closeout Submittals.
- B. Closeout Submittals:
1. Operations And Maintenance Data: Include following in Operations And Maintenance Manual specified in Section 01 7800.
 - a. Manufacturer's literature or cut sheet.
 - b. Color selection

1.5 DELIVERY, STORAGE AND HANDLING

- A. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store materials indoors, in a supported vertical position, protected from weather conditions and construction activities.

1.6 PROJECT CONDITIONS

- A. Building enclosed, completely protected from outside weather with minimum inside temperature of 60°F.

1.7 WARRANTY

- A. Provide manufacturer's fifteen year warranty against corrosion, breakage and delamination of panels.

1.8 QUALITY ASSURANCE

- A. Components of toilet partitions shall be sourced from one single-source manufacturer who certifies that materials meet or exceed specifications.
- B. Installer shall have a history of completed jobs of similar size and scope and shall be qualified.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. The Mills Company, a subsidiary of Bradley Corporation, P.O. Box 309, Menomonee Falls, WI 53052-0309. Phone 800-BRADLEY (800-272-3539), FAX 262-251-5817.
<http://www.bradleycorp.com>
- B. Equal as Approved by Architect prior to bidding.

2.2 MANUFACTURED UNITS

- A. Overhead braced compartments, "Bradmar"—Series 400, "No Sight" feature, color to be selected from all available color options.
- B. Urinal screens, panels). *Color to be selected from all available color options.*

2.3 COMPONENTS

- A. Panels, doors and pilasters, 1 inch (25 mm) thick, constructed from high density polyethylene resins compounded under high pressure to form a single component, waterproof, non-absorbent,

with a self-lubricating surface that resists marks from graffiti. All plastic components shall be covered with a protective self-adhesive coating.

1. Edges: Rounded to a 3/16 inch radius.
 2. Doors and panels 55 inches high mounted 14 inches above finished floor, with aluminum heat sink fastened to bottom edge of doors and panels.
- B. Pilasters 82 inches high, [minimum 5 inches wide for integral hinges], same construction as panels and doors, supported by pilaster shoe anchored to floor.

2.4 ACCESSORIES

- A. One-piece pilaster shoes, 3 inch high type 304 stainless steel with #4 satin brushed finish, anchored in place with stainless steel screws.
- B. Head Rails: 1 x 1-1/2 inch anodized aluminum tube with anti-grip profile and cast socket wall brackets.
- C. Brackets: Continuous 54 inch long stainless steel single or double ear style.
- D. Fasteners, screws and bolts: Tamper proof stainless steel.
- E. Hardware: Extruded aluminum 6463-T alloy and chrome-plated non-ferrous cast metal.
 1. Hinge system integrated with doors and pilasters with no exposed metal parts. Hinge mechanism integrated into door and pilaster as a 1/2 inch diameter gravity cam unit with 3/16 inch stainless steel pin at door bottom and 1/2 inch nylon pin at top.
 2. Latches fabricated from extruded aluminum with a clear anodized satin finish for the housing and a black anodized finish for the slide bolt.
 3. Door strike and keeper, 6 inches long fabricated from extruded aluminum with clear anodized satin finish and wraparound flanges. Bumper is flexible vinyl.
 4. Coat hook with wall bumper, chrome-plated; one per compartment, mounted on door.
 5. Door pull and door stop for each out swinging door.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify field measurements are as shown on approved shop drawings.
- B. Verify correct spacing of plumbing fixtures.
- C. Verify Anchors are attached to blocking or framing.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installation of compartments.
- B. Anchor panel brackets to construction using anchors suitable for supporting substrate.
- C. Attach panels and pilasters to brackets. Locate head rail joints at pilaster centerlines.
- D. Attach clamp design head rail over pilaster and secure to front with screws.
- E. Installers must allow 24 hours for material to adjust to the site environment. Banding, stretch wrap and cardboard should be removed.
- F. Install panel or locate out-swinging doors to prevent their opening more than 105 degrees.
- G. Doors and hardware shall be thoroughly adjusted and left in proper working condition. Set doors in open or close position as required.

3.3 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).
- B. Adjust hinges to position doors in partially opened position when unlatched. Return out swinging doors to closed position. *(Note: Out swinging doors require wall or panel to limit door travel to maximum 105 degrees.)*
- C. Correct minor damage to installed products; remove and replace work that cannot be satisfactorily repaired.
- D. Doors and hardware shall be thoroughly adjusted and left in proper working condition. Set doors in open or close position as required.

3.4 CLEANING

- A. Remove packaging and construction debris, and legally dispose of off-site. The area shall be left broom clean.

3.5 SCHEDULE

(Where multiple units are specified a tracking schedule shall be necessary).

END OF SECTION

SECTION 10 2813

COMMERCIAL TOILET ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Products Supplied But Not Installed Under This Section
 - 1. Accessories for Rest Rooms. Prior to ordering material, verify the location of the new accessories and ensure there is blocking located behind the accessories at the required A.D.A. height. Do not damage exiting wall tile. If it is necessary to remove a tile to verify blocking, repair wall and replace wall tile to match color and pattern. Notify Owner if no blocking was found prior to commencing any work and get direction from Owner prior to installation.
- B. Related Sections
 - 1. Section 06 2001: Installation

1.2 SUBMITTALS

- A. Product Data - Manufacturer's literature or cut sheets
- B. Shop Drawings - Schedule showing items used, location where installed, and proper attaching devices for substrate.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

- A. Approved Products
 - 1. Rest Rooms -
 - c. Toilet paper dispenser
 - 1. Bobrick B - 2888 - One Each Toilet Stall
 - 2. Equal By Bradley or ASI.
 - 3. Equal as approved by Architect
 - d. Seat cover dispenser
 - 1. Bobrick B - 221 - One Each Toilet Stall.
 - 2. Equal By Bradley or ASI.
 - 3. Equal as approved by Architect
 - e. Waste Receptacle
 - 1. Bobrick B - 229 - One Each Toilet Room.
 - 2. Equal By Bradley or ASI.
 - 3. Equal as approved by Architect
 - f. Sanitary Napkin Dispenser
 - 1. Bobrick B - 47069 - One Each Toilet Stall in Women's Restrooms.
 - 2. Equal By Bradley or ASI.
 - 3. Equal as approved by Architect
 - g. Sanitary Napkin Disposal
 - 1. Bobrick B - 4354 - One Each Toilet Stall in Women's Restrooms.
 - 2. Equal By Bradley or ASI.
 - 3. Equal as approved by Architect
 - i. Grab Bars - Concealed mount 18 ga. Type 304 stainless steel, 1 1/2 inch diameter, non-slip finish, 42"W x 54"
 - 1. Bobrick B - 6897 - Men's Restroom
 - 2. Bobrick B - 6806x36" - One at Men's Restroom. Match existing.
 - 3. Bobrick B - 6806x42" - Four at Women's Restroom.
 - 4. Equal By Bradley or ASI.
 - 5. Equal as approved by Architect

2.2 MANUFACTURERS

- A. Bobrick Washroom Equipment Inc, North Hollywood, CA (800) 553-1600 or (818) 764-1000
www.bobrick.com
- B. Bradley Corp, Menomonee Falls, WI (414) 251-6000 www.bradleycorp.com
- C. American Specialties, Inc, Yonkers, NY www.americanspecialties.com

PART 3 EXECUTION

3.1 COORDINATION

- A. Prior to placing order for accessories contractor to coordinate with County of Riverside Facilities Management Department.

3.2 INSTALLATION

- A. Provide mounting devices proper for base structure.
- B. Where possible, mount like items in adjoining compartments back-to-back on same partition.
- C. Locate as follows
 - 1. Sanitary Napkin Disposal Containers - One at each water closet in Women's Rest Rooms.

END OF SECTION

DIVISION 11: EQUIPMENT

11 2000 COMMERCIAL EQUIPMENT

11 2420 COMMERCIAL KITCHEN AND PANTRY EQUIPMENT

11 3000 RESIDENTIAL EQUIPMENT

11 3123 RESIDENTIAL LAUNDRY APPLIANCES

END OF TABLE OF CONTENTS

SECTION 11 2420**COMMERCIAL KITCHEN AND PANTRY EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Install all commercial kitchen and pantry equipment to include seismic anchors.
 - 2. Ensure all gas, water, venting, etc. connections are installed prior to equipment installation.
- B. Related Requirements:
 - 1. Division 21: Fire Suppression System
 - 2. Division 22: Plumbing
 - 3. Division 23: Heating, Ventilating and Air Conditioning.
 - 4. Division 26: Electrical.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: Manufacturer's literature or cut sheet.
 - 2. Shop Drawings: Indicate all necessary connections, layouts, seismic leg anchor connections, etc.
- B. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Four copies of maintenance and operating instructions and parts list.
 - b. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - c. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature or cut sheet.
- C. Maintenance Materials Submittals:
 - 1. Tools: Any necessary tool needed for maintenance.

1.3 WARRANTY

- A. Manufacturer Warranty:
 - 1. Provide Manufacturer's standard five-year warranty.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturer:
 - 1. Approved Products. Refer to equipment schedule on plans.
- B. Materials:
 - 1. Refer to equipment schedule on plans.
- C. Supplier:

1. Murray's Hotel and Restaurant Supply Co., Colton, CA 909.3825.1012, John Webster.
2. Equal as approved by Owner. Supplier shall have been in business with commercial kitchen experience for the last five years.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Drawings:
1. Drawings show general arrangement of piping, equipment, and appurtenances, and shall be followed as closely as actual building construction and work of other Sections permits.
 2. Architectural, Structural, Mechanical and Plumbing Drawings shall be considered part of kitchen equipment work insofar as these Drawings furnish this Section with information as to design and construction of building. Architectural and Structural Drawings shall take precedence over other Drawings.

3.2 INSTALLATION

- A. Interface With Other Work:
1. Openings through walls and ceilings are to be provided under other Sections in their respective materials, but this Section shall assure they are properly located and shall do cutting and patching caused by neglect to do so.
 2. Install all equipment per manufacturer's instructions and all governing code and government agencies.

3.3 CLOSE-OUT ACTIVITIES

- A. Instruct Owner's operating personnel during start-up and testing.

END OF SECTION

SECTION 11 3123**RESIDENTIAL LAUNDRY APPLIANCES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install washer / dryer equipment as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3519: Dryer exhaust duct.
 - 2. Division 26: Electrical service and connections.

1.2 SUBMITTALS

- A. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Warranty.
 - b. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature packaged with equipment.

1.3 WARRANTY

- A. Manufacturer Warranty:
 - 1. Manufacturer's one year warranty

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Manufacturers Contact List:
 - 1. LG, Englewood Cliff, NJ www.lg.com.
- B. Materials:
 - 1. Free-Standing Washer:
 - a. Energy Star Model.
 - b. Front load Washer, Ultra large capacity.
 - c. Refer to equipment schedule on plans.
 - 2. Free-Standing Dryer:
 - a. Electric.
 - b. Front loading ultra large capacity.
 - c. Refer to equipment schedule on plans.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set laundry washer and dryer in place and squared to surrounding building and equipment.
- B. Connect dryer to exhaust duct.
- C. Make all connections and leave in operating order.

END OF SECTION

DIVISION 21: FIRE SUPPRESSION

21 1000 WATER-BASED FIRE SUPPRESSION SYSTEMS

21 1313 WET-PIPE SPRINKLER SYSTEMS

END OF TABLE OF CONTENTS

SECTION 21 1313**WET-PIPE SPRINKLER SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install complete wet-pipe fire sprinkler system at areas of remodel and modification to existing as required and as specified in Contract Documents.
 2. Furnish and install Firestop Penetration Systems for plumbing systems penetrations as described in Contract Documents.
- B. Related Requirements:
1. Section 07 8400: Quality of Penetration Firestop Systems to be used on Project and submittal requirements.

1.2 REFERENCES

- A. Reference Standards:
1. American National Standards Institute / American Society of Mechanical Engineers:
 - a. ANSI / ASME B1.20.1-1983 (R2001) 'Pipe Threads, General Purpose (Inch).'
 - b. ANSI / ASME B16.1-2005, 'Cast Iron Pipe Flanges and Flanged Fittings.'
 - c. ANSI / ASME B16.3-2006 30-Apr-2007 'Malleable Iron Threaded Fittings: Classes 150 and 300.'
 - d. ANSI / ASME B16.4-2006 30-Mar-2007 'Gray Iron Threaded Fittings, Classes 125 and 250.'
 - e. ANSI / ASME B16.5-2003 01-Dec-2003 'Pipe Flanges and Flanged Fittings.'
 2. American National Standards Institute / American Water Works Association:
 - a. ANSI / AWWA C606-06, 'AWWA Standard for Grooved and Shouldered Joints.'
 3. American National Standards Institute / American Welding Society:
 - a. ANSI / AWA B2.1 / B2.1M-2009, 'Specification for Welding Procedure and Performance Qualification, 5th Edition.'
 4. ASTM International:
 - a. ASTM A135 / A135M-06, 'Standard Specification for Electric-Resistance-Welded Steel Pipe.'
 - b. ASTM A234 / A234-07, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.'
 - c. ASTM A395 / A395M-99(2004), 'Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.'
 - d. ASTM A536-84(2004)e1, 'Standard Specification for Ductile Iron Castings.'
 - e. ASTM A795 / A795M-08, 'Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.'
 5. National Fire Protection Association / American National Standards Institute:
 - a. NFPA 13: Standard for the Installation of Sprinkler Systems, 2010 Edition.
 - b. NFPA 24 Installation of Private Fire Service Mains and their Appurtenances, 2010 Edition.
 - c. NFPA 25: Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, 2008 Edition.
 - d. NFPA 101: Life Safety Code, 2009 Edition.

1.3 SUBMITTALS

- A. Action Submittals:
1. Shop Drawings:
 - a. Size sprinkler system by one of following methods:
 - 1) Pipe schedule method in accordance with NFPA/ANSI 13.

- 2) Hydraulic calculation design method based on water supply evaluation performed at building site.
 - b. On submittals, refer to sprinkler heads by sprinkler identification or model number published in appropriate agency listing or approval. Trade names and other abbreviated designations are not acceptable.
 - c. Submittal Procedure:
 - 1) After award of Contract and before purchase of equipment, submit five sets of shop drawings with specifications and hydraulic calculations to Architect and two sets to local jurisdiction having authority for fire prevention for review. If pipe schedule method is used, submit copies of schedules in NFPA 13 used in sizing pipe.
 - 2) After integrating Architect's and Authority Having Jurisdiction's comments into drawings, licensed certified fire protection engineer of record who designed fire protection system shall stamp, sign, and date each sheet of shop drawings and first page of specifications and calculations.
 - 3) Submit stamped documents to Owner and to Authority Having Jurisdiction for fire prevention for final approval.
 - 4) After final approval, submit four copies of approved stamped documents to Architect.
 - 5) Failure of system to meet requirements of authority having jurisdiction and/or approved stamped construction documents shall be corrected at no additional cost to Owner.
- B. Closeout Submittals:**
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Maintenance and instructions.
 - a) List of system components used indicating name and model of each item.
 - b) Manufacturer's maintenance instructions for each component installed in Project.
 - c) Instructions shall include installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
 - b. Warranty Documentation:
 - 1) Include copies of required warranties.
 - c. Record Documentation:
 - 1) Include copies of approved shop drawings.
 - 2) Provide master index showing items included.
 - 3) Provide name, address, and phone number of Architect, General Contractor and Fire Protection subcontractor.
 - 4) Provide copy of 'Contractor's Material and Testing Certificate for Above Ground Piping' NFPA-13, Figure 24.1 (2011 edition).
 2. Inspection:
 - a. Provide Owner with latest version of NFPA 25.
- C. Maintenance Material Submittals;**
1. Extra Stock Materials:
 - a. Spare sprinkler heads in the quantity recommended by NFPA 13 selected in representative proportion to quantity used in Project and in accordance with NFPA 13 (Six spare sprinkler heads minimum). Do not include dry barrel Pendent and dry barrel Sidewall sprinkler heads.
 - b. Provide spare heads in cabinet with sprinkler head wrench for each type of head used. After approval of cabinet and contents, mount cabinet in convenient location in Riser Room.

1.4 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:**
1. Unless noted otherwise, system shall conform to:
 - a. NFPA / ANSI 13-2010 'Light & Ordinary Hazard Occupancies.'
 - b. NFPA / ANSI 24-2010 'Service Mains and Their Appurtenances, Private.'
 - c. NFPA / ANSI 25-2008 'Inspection, Testing, and Maintenance.'
 - d. NFPA / ANSI 101-2009 'Life Safety Code.'
 - e. Requirements of local water department and local authority having jurisdiction for fire protection.

- f. Underwriter's Laboratories Publication, 'Fire Protection Equipment Directory', current edition at time of Pre-Bid Meeting.
 - g. Applicable rules, regulations, laws, and ordinances.
- B. Qualifications:
- 1. Licensed fire protection engineer or fire protection system designer certified by NICET to level three minimum and engaged in design of fire protection systems. Engineer / designer shall:
 - a. Be responsible for overseeing preparation of shop drawings, hydraulic calculations where applicable, and system installation.
 - b. Make complete inspection of installation.
 - c. Provide corrected record drawings to Owner with letter of acceptance.
 - d. Certify that installation is in accordance with Contract Documents.
 - 2. Installer: Licensed by jurisdiction over installed fire protection systems for area of Project. Furnish verified list of similar projects installed during past five years minimum.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
- 1. Manufacturer Contact List:
 - a. Croker Corp, Elmsford, NY www.croker.com.
 - b. Gruvlock by Anvil International, Portsmouth, NH www.anvilintl.com.
 - c. HO Trerice Company, Oak Park, MI www.hotco.com.
 - d. Kennedy Valve, Elmira, NY www.kennedyvalve.com.
 - e. Milwaukee Valve Co, New Berlin, WI www.milwaukeevalve.com.
 - f. Mueller Company, Decatur, IL www.muellerflo.com.
 - g. Nibco Inc, Elkhart, IN www.nibco.com.
 - h. Notifier by Honeywell, Northford, CT www.notifier.com.
 - i. Potter Electric Signal Company, St. Louis, MO www.pottersignal.com.
 - j. Potter-Roemer, Cerritos, CA www.potterroemer.com.
 - k. Reliable Automatic Sprinkler Co, Mount Vernon, NY www.reliablesprinkler.com.
 - l. System Sensor, St Charles, IL www.systemsensor.com.
 - m. TYCO Fire & Building Products, Lansdale, PA www.tyco-fire.com.
 - n. Victaulic Company of America, Easton, PA www.victaulic.com.
 - o. Viking Corp, Hastings, MI www.vikingcorp.com.
- B. Description:
- 1. Re-route all fire sprinkler systems above existing and new electrical service equipment to include electrical panels and switch gear throughout building.
 - 2. Redirect fire-sprinkler heads in remodel areas to comply with Building Codes and assure full coverage.
- C. Performance:
- 1. Design Criteria:
 - a. Area of Application and Corresponding Design Density:
 - 1) Serving Area and Mechanical, Electrical, and Janitorial Areas:
 - a) Ordinary Hazard Group 1.
 - b) Design density = 0.15 gpm per sq ft over 1,500 sq ft.
 - 2) Storage Areas:
 - a) Ordinary Hazard Group 2.
 - b) Design density = 0.20 gpm per sq ft over 1,500 sq ft.
 - 3) All Other Areas:
 - a) Light Hazard.
 - b) Design density = 0.10 gpm per sq ft over 1,500 sq ft.
 - 4) Remote areas may be reduced within parameters indicated in NFPA 13 for use of quick response sprinklers throughout.

- b. Maximum Coverage per Sprinkler Head:
 - 1) Ordinary Hazard Areas: 130 sq ft.
 - 2) Light Hazard Areas: 225 sq ft.

D. Components:

- 1. General: Use only domestically manufactured cast iron pipe fittings, valves, sprinkler heads, and other components.
 - a. Pipe of foreign manufacture that meets ASTM Standards is acceptable.
 - b. Ductile iron fittings of foreign manufacture are acceptable.
- 2. Pipe:
 - a. Schedule 40 Welded Steel:
 - 1) Interior, Above Ground: Schedule 40 black welded steel meeting requirements of ASTM A135 or ASTM A795.
 - 2) Connections:
 - a) 2 inches And Smaller: Screwed, flanged, or roll grooved coupling system.
 - b) 2-1/2 inches And Larger: Flanged or roll grooved coupling system.
- 3. Fittings:
 - a. Usage:
 - 1) 2 inches And Smaller: Welded, screwed, flanged, or roll grooved coupling system. For use with schedule 40 carbon steel pipe.
 - 2) 2-1/2 inches And Larger: Welded, flanged, or roll grooved coupling system.
 - b. Types And Quality:
 - 1) Screwed:
 - a) Cast iron meeting requirements of ANSI B16.4 or ductile iron meeting requirements of ANSI B16.3 and ASTM A536, Grade 65-45-12.
 - b) Threaded fittings and pipe shall have threads cut to ANSI B1.20.1.
 - c) Do not extend pipe into fittings to reduce waterway.
 - d) Ream pipe after cutting to remove burrs and fins.
 - 2) Flanged: Steel meeting requirements of ANSI B16.5.
 - 3) Welded:
 - a) Carbon steel meeting requirements of ASTM A234.
 - b) Weld pipe using methods complying with AWS B2.1, level AR-3. Welding procedures and performance of welders shall comply with AWS B2.1, level AR3.
 - 4) Roll Grooved Pipe Coupling System:
 - a) Ductile iron meeting requirements of ASTM A395 and ASTM A536, and UL listed.
 - b) Grooved products used on Project shall be from same manufacturer. Grooving tools shall be as recommended by manufacturer of grooved products.
 - c) Approved Products:

	Gruvlok	Tyco (Grinnell)	Victaulic
Rigid Couplings	7401	772	Style 005
Flexible Couplings ¹	7000	705	Style 75
Flange Adaptors ²	7012	71	Style 744
Grooved Coupling Gaskets ³	'E' EPDM	Grade 'E' EPDM	'E' EPDM ⁴

¹ Use in locations where vibration attenuation and stress relief are required.
² Class 125 or 150.
³ Temperature rated 30 to 150 deg F. NSF-61 certified.
⁴ Grade 'A'

- c. The use of saddle or hole cut type mechanical tees are not approved.
- 4. Sprinkler Heads:
 - a. Concealed Pendant:
 - 1) Adjustable cover.
 - 2) UL listed and approved.
 - 3) Coordinate concealed cover finish with Architect.
 - 4) Acceptable Products:
 - a) Wet Pendant, Flat Profile:
 - (1) Reliable: F4FR.
 - (2) Victaulic: Model 3802.

- (3) Viking: Model VK462.
- (4) Tyco (Grinnell): Model RF11.
- (5) Equal as approved by Architect before bidding. See Section 01 6200.
- b) Dry Pendant:
 - (1) Flat Profile:
 - (a) Tyco (Grinnell): DS-C.
 - (b) Victaulic: V3618.
 - (2) Dome Profile:
 - (a) Reliable Model F3.
 - (b) Viking Model VK192.
 - (3) Equal as approved by Architect before bidding. See Section 01 6200.
- b. Pendant Sprinklers:
 - 1) UL listed and approved.
 - 2) Where guards or escutcheons are required, use chrome plated sprinkler guards and escutcheons that are listed, that are approved by Sprinkler Manufacturer for use with head, and that are supplied by Sprinkler Manufacturer.
 - 3) Acceptable Products:
 - a) Reliable: F1FR.
 - b) Tyco: TY-B.
 - c) Victaulic: Model V2704.
 - d) Viking: VK302.
 - e) Equal as approved by Architect before bidding.

2.2 ACCESSORIES

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Anvil International, Portsmouth, NH www.anvilintl.com.
 - b. Cooper B-Line, Highland, IL www.b-line.com.
 - c. Unistrut Construction, Itasca, IL www.unistrutconstruction.com.
- B. Hangers, Rods, And Clamps:
 - 1. Galvanized, unless specified otherwise, and UL approved for service intended.
 - 2. Class One Quality Standard:
 - a. Hangers and accessories shall be Anvil numbers specified or equals by Cooper B-Line.
 - b. Pipe Ring Hangers: Equal to Anvil Fig 69.
 - c. Riser Clamps: Equal to Anvil Fig. 261.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Acceptable Installers:
 - 1. Installers with a minimum of ten (10) years experience with similar scope.
 - 2. Equal approved by Architect bidding.

3.2 INSTALLATION

- A. Install sprinkler systems in accordance with requirements of latest editions of NFPA 13 and as specified below:
 - 1. Provide maintenance access to equipment
 - 2. Conceal sprinkler lines installed in occupied areas. Do not impede egress from Attic.
 - 3. Brace and support system to meet seismic zone requirements for building site.
 - 4. Do not use dropped, damaged, or used sprinkler heads.

- B. Flush system at full design flow rate for minimum five minutes. Route water to outside of building. Protect landscaping and other exterior elements from damage during flow tests.

3.3 FIELD QUALITY CONTROL

A. Field Tests:

1. Pressure Test:
 - a. Hydrostatically test system to 200 psi minimum for 2 hours as required by 'Contractor's Material And Testing certificate for Above Ground Piping' NFPA-13, Figure 24.1 (2010 Edition).
2. Water Flow Test:
 - a. Test to determine static and residual pressures and corresponding flow rate at point of connection to utility water main.
 - b. Adjust water flow test data for seasonal fluctuations and future growth as recommended by Water Utility and AHJ.
 - c. At point of connection to utility water main, combine inside and outside hose stream allowances.
3. Check piping in relation to insulation envelope to be certain piping and auxiliary drains are properly enclosed inside building insulation envelope. Report unsatisfactory conditions to Architect.
4. Tests shall be witnessed by Architect and representative of local jurisdiction over fire prevention.

3.4 CLOSE-OUT ACTIVITIES

A. Instruction of Owner:

1. Instruction Sessions:
 - a. Instruct Owner's personnel in operation and maintenance of system utilizing Operation And Maintenance Manual when so doing. Minimum instruction period shall be four hours.
 - b. Instruction sessions shall occur after Substantial Completion inspection when system is properly working and before final payment is made.

B. Training:

1. Installer required to provide Training from latest version of NFPA 25 with checklist and brief explanation of following inspections:
 - a. Weekly Inspection.
 - b. Monthly Inspection.
 - c. Quarterly Inspection.
 - d. Semi-Annual Inspection.
 - e. Annual Inspection.

END OF SECTION

DIVISION 22: PLUMBING

22 0000 PLUMBING

- 22 0501 COMMON PLUMBING REQUIREMENTS (15051CMW & 15101)
- 22 0529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT (15101)
- 22 0553 IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT (15075)
- 22 0719 PLUMBING PIPING INSULATION (15083)

22 1000 PLUMBING PIPES AND PUMPS

- 22 1116 DOMESTIC WATER PIPING (15141)
- 22 1313 FACILITY SANITARY SEWERS (15150)
- 22 1319 FACILITY SANITARY SEWER SPECIALTIES

22 3000 PLUMBING EQUIPMENT

- 22 3330 RESIDENTIAL ELECTRIC DOMESTIC WATER HEATERS

22 4000 PLUMBING FIXTURES

- 22 4216 COMMERCIAL LAVATORIES AND SINKS

END OF TABLE OF CONTENTS

SECTION 22 0501

COMMON PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
1. Common requirements and procedures for plumbing systems.
 2. Responsibility for proper operation of electrically powered equipment furnished under this Division
 3. Furnish and install sealants relating to installation of systems installed under this Division.
 4. Furnish and install Firestop Penetration Systems for plumbing systems penetrations as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
1. Sleeves, inserts, supports and equipment for plumbing systems installed under other Sections.
- C. Related Requirements:
1. Section 07 8400: Quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 2. Section 07 9213: Quality of sealants used at building exterior.
 3. Sections Under 09 9000 Heading: Painting of plumbing items requiring field painting.
 4. Division 26: Raceway and conduit, unless specified otherwise, and line voltage wiring.
 5. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
 6. Division 33: Piped utilities.

1.2 SUBMITTALS

- A. Action Submittals:
1. Product Data:
 - a. Manufacturer's catalog data for each manufactured item.
 - 1) Provide section in submittal for each type of item of equipment. Include Manufacturer's catalog data of each manufactured item and enough information to show compliance with Contract Document requirements. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
 - 2) Include name, address, and phone number of each supplier.
- B. Closeout Submittals:
1. Operation And Maintenance Manual Data:
 - a. Modify and add to requirements of Section 01 7800 as follows:
 - 1) At beginning of PLUMBING section of Operations And Maintenance Manual, provide master index showing items included.
 - 2) Provide name, address, and phone number of Architect, Architect's Mechanical Engineer, General Contractor, and Plumbing subcontractor.
 - 3) Provide operating instructions to include:
 - a) General description of each plumbing system.
 - b) Step by step procedure to follow in putting each piece of plumbing equipment into operation.
 - 4) Identify maintenance instructions by using same equipment identification used in Contract Drawings. Maintenance instructions shall include:
 - a) List of plumbing equipment used indicating name, model, serial number, and nameplate data of each item together with number and name associated with each system item.

- b) Manufacturer's maintenance instructions for each piece of plumbing equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance instructions.
- 5) Include copies of warranties required in individual Sections of Division 22.

1.3 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

1. Perform work in accordance with applicable provisions of Plumbing Codes applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.

B. Identification:

1. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:

1. Accept valves on site in shipping containers with labeling in place.
2. Provide temporary protective coating on cast iron and steel valves.
3. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

B. Storage And Handling Requirements:

1. In addition to requirements specified in Division 01, stored material shall be readily accessible for inspection by Architect until installed.
2. Store items subject to moisture damage in dry, heated spaces.

1.5 WARRANTY

A. Manufacturer Warranty:

1. Provide certificates of warranty for each piece of equipment made out in favor of Owner.

B. Special Warranty:

1. Guarantee plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
2. If plumbing sub-contractor with offices located more than 150 miles from Project site is used, provide service / warranty work agreement for warranty period with local plumbing sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

PART 2 - PRODUCTS

2.1 COMPONENTS

- A. Components shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.
- B. Pipe And Pipe Fittings:

1. Weld-O-Let and Screw-O-Let fittings are acceptable.
 2. Use domestic made pipe and pipe fittings on Project, except non-domestic made cast iron pipe and fittings by MATCO-NORCA are acceptable.
- C. Sleeves:
1. In Framing And Suspended Floor Slabs: Standard weight galvanized iron pipe, Schedule 40 PVC, or 14 ga galvanized sheet metal two sizes larger than bare pipe or insulation on insulated pipe.
 2. In Concrete: Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.
- D. Valves: Valves of same type shall be of same manufacturer.
- E. Components shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Drawings:
1. Plumbing Drawings show general arrangement of piping, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
 2. Consider Architectural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing Drawings.
 3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.
- B. Verification Of Conditions:
1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which plumbing work is dependent for efficiency and report work that requires correction.
 2. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.
 3. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.
 4. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

3.2 PREPARATION

- A. Demolition Requirements:
1. Contractor to field verify existing conditions prior to bidding to identify demolition and capping of existing waste, vents, hot and cold water and gas piping. Existing utilities in areas of remodel shall be removed and capped as required. Maintain utilities to fixtures that are to remain. Existing floor sinks/drains in the existing kitchen shall be removed. Provide shop drawings of the existing

- affected utilities and proposed demolition. Verify the existing sewer routing, required demolition and capping requirements and points of connection for new fixtures.
2. Remove all existing plumbing lines over electrical system to include, but not limited to, electrical panel and switch gear and re-route to apply to current codes and regulations.
- B. Changes Due To Equipment Selection:
1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings showing proposed installations.
 2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
 3. Provide additional motors, valves, controllers, fittings, and other equipment required for proper operation of systems resulting from selection of equipment.
 4. Be responsible for proper location of rough-in and connections provided under other Divisions.

3.3 INSTALLATION

- A. Interface With Other Work:
1. Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
 2. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and confirm that they are properly installed.
- B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.
- C. Locating Equipment:
1. Arrange pipes and equipment to permit ready access to valves, cocks, unions, traps, and to clear openings of doors and access panels.
 2. Adjust locations of pipes, equipment, and fixtures to accommodate work to interferences anticipated and encountered.
 3. Install plumbing work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
 4. Determine exact route and location of each pipe before fabrication.
 - a. Right-Of-Way:
 - 1) Lines that pitch shall have right-of-way over those that do not pitch. For example, plumbing drains shall normally have right-of-way.
 - 2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
 - b. Offsets, Transitions, and Changes in Direction:
 - 1) Make offsets, transitions, and changes in direction in pipes as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
 - 2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.
- D. Penetration Firestops:
1. Install Penetration Firestop System appropriate for penetration at plumbing systems penetrations through walls, ceilings, roofs, and top plates of walls.
- E. Sealants:
1. Seal openings through building exterior caused by penetrations of elements of plumbing systems.
 2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.
- F. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus:

1. Drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper installation of plumbing systems.
 2. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings:
 - a. Arrange so as to facilitate removal of tube bundles.
 - b. Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
 - 1) Make connections of dissimilar metals with di-electric unions.
 - 2) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
 - c. Do not use reducing bushings, bull head tees, close nipples, or running couplings. Street elbows are allowed only on potable water pipe 3/4 inch in diameter and smaller.
 - d. Install piping systems so they may be easily drained
 - e. Install piping to insure noiseless circulation.
 - f. Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
 3. Do not install piping in shear walls.
 4. Cut piping accurately to measurements established at site. Remove burr and cutting slag from pipes.
 5. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
 6. Make changes in direction with proper fittings.
 7. Expansion of Thermoplastic Pipe:
 - a. Provide for expansion in every 30 feet of straight run.
 - b. Provide 12 inch offset below roof line in each vent line penetrating roof.
 8. Expansion of PEX Pipe: Allow for expansion and contraction of PEX pipe as recommended by Pipe Manufacturer.
- G. Sleeves:
1. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete slabs on grade.
 2. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Seal sleeves with specified sealants. Follow Pipe Manufacturer's recommendations for PEX pipe penetrations through studs and floor slabs.
 3. Sleeves through floors shall extend 1/4 inch above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
 4. Sleeves through floors and foundation walls shall be watertight.
- H. Escutcheons:
1. Provide spring clamp plates where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.

3.4 REPAIR / RESTORATION

- A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it:
1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.
 2. Surface finishes shall exactly match existing finishes of same materials.

3.5 FIELD QUALITY CONTROL

- A. Field Tests:
1. Perform tests on plumbing piping systems. Furnish devices required for testing purposes.

B. Non-Conforming Work:

1. Replace material or workmanship proven defective with sound material at no additional cost to Owner.
2. Repeat tests on new material, if requested.

3.6 CLEANING**A. Remove dirt, grease, and other foreign matter from each length of piping before installation:**

1. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
2. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
3. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.

B. Clean exposed piping, equipment, and fixtures. Remove stickers from fixtures and adjust flush valves.**3.7 CLOSEOUT ACTIVITIES**

- A. Instruction of Owner:** Instruct building maintenance personnel Representative in operation and maintenance of plumbing systems utilizing Operation And Maintenance Manual when so doing. Conduct instruction period after Substantial Completion inspection when systems are properly working and before final payment is made.

3.8 PROTECTION

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.**

END OF SECTION

SECTION 22 0529**HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Common hanger and support requirements and procedures for plumbing systems.
- B. Related Requirements:
 - 1. Section 05 0523: Quality and requirements for welding.
 - 2. Section 07 8400: Quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 - 3. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.
 - 4. Slots and openings through walls and ceilings provided under other Divisions in their respective materials.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's catalog data for each manufactured item.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Anvil International, Portsmouth, NH www.anvilintl.com.
 - b. Cooper B-Line, Highland, IL www.b-line.com.
 - c. Unistrut, Wayne, MI www.tyco-unistrut.com.
 - d. Eagle Group www.eaglegrp.com.
 - e. J.R. Smith www.jrsmith.com.
 - f. Precision Plumbing Products www.pppinc.net
 - g. A.O. Smith www.hotwater.com
 - h. Bell & Gossett www.completewatersystems.com
 - i. Sloan www.sloanvalve.com
 - j. Jensen Precast www.jensenprecast.com
- B. Materials:
 - 1. Hangers, Rods, And Inserts
 - a. Galvanized and UL approved for service intended.
 - b. Support horizontal piping from hangers or on roller assemblies with channel supports, except where trapeze type hangers are explicitly shown on Drawings. Hangers shall have double nuts.
 - 1) Support uninsulated copper pipe 2 inches in diameter and smaller from swivel ring hanger, copper plated and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from swivel ring hanger.
 - a) Acceptable Products:
 - (1) Swivel Ring Hanger For Copper Pipe: Anvil Fig. CT-69.
 - (2) Swivel Ring Hanger For Other Pipe: Anvil Fig. 69.

- (3) Equals by Cooper B-Line.
- 2) Support uninsulated copper pipe 2-1/2 inches in diameter and larger from clevis hanger, copper plated hangers and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from clevis hanger.
 - a) Type Two Acceptable Products:
 - (1) Clevis Hanger For Copper Pipe: Anvil Fig. CT-65.
 - (2) Clevis Hanger For Other Pipe: Anvil Fig. 260.
 - (3) Equals by Cooper B-Line.
- 3) Support insulated pipes 2 inches in diameter and smaller with adjustable swivel ring hanger with insulation protection shield. Gauge and length of shield shall be in accordance with Anvil design data.
 - a) Acceptable Products:
 - (1) Swivel Ring Hanger: Anvil Fig. 69.
 - (2) Insulation Protection Shield: Anvil Fig. 167.
 - (3) Equals by Cooper B-Line.
- 4) Support insulated pipes 2-1/2 inches in diameter and larger with clevis hanger or roller assembly with an insulation protection shield. Gauge and length of shield shall be according to Anvil design data.
 - a) Acceptable Products:
 - (1) Clevis Hanger: Anvil Fig. 260.
 - (2) Roller Assembly: Anvil Fig. 171.
 - (3) Insulation Protection Shield: Anvil Fig. 167.
 - (4) Equals by Cooper B-Line.
- 5) Support uninsulated copper pipe 2 inches in diameter and smaller from swivel ring hanger, copper plated and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from swivel ring hanger.
 - a) Acceptable Products:
 - (1) Swivel Ring Hanger For Copper Pipe: Anvil Fig. CT-69.
 - (2) Swivel Ring Hanger For Other Pipe: Anvil Fig. 69.
 - (3) Equals by Cooper B-Line.
- 6) Support uninsulated copper pipe 2-1/2 inches in diameter and larger from clevis hanger, copper plated hangers and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from clevis hanger.
 - a) Acceptable Products:
 - (1) Clevis Hanger For Copper Pipe: Anvil Fig. CT-65.
 - (2) Clevis Hanger For Other Pipe: Anvil Fig. 260.
 - (3) Equals by Cooper B-Line.

c. Support rods for single pipe shall be in accordance with following table:

Rod Diameter	Pipe Size
3/8 inch	2 inches and smaller
1/2 inch	2-1/2 to 3-1/2 inches
5/8 inch	4 to 5 inches
3/4 inch	6 inches
7/8 inch	8 to 12 inches

d. Support rods for multiple pipe supported on steel angle trapeze hangers shall be in accordance with following table:

Rods		Number of Pipes per Hanger for Each Pipe Size						
Number	Diameter	2 Inch	2.5 Inch	3 Inch	4 Inch	5 Inch	6 Inch	8 Inch
2	3/8 Inch	Two	0	0	0	0	0	0
2	1/2 Inch	Three	Three	Two	0	0	0	0
2	5/8 Inch	Six	Four	Three	Two	0	0	0
2	5/8 Inch	Nine	Seven	Five	Three	Two	Two	0
2	5/8 Inch	Twelve	Nine	Seven	Five	Three	Two	Two

- 1) Size trapeze angles so bending stress is less than 10,000 psi.
- e. Riser Clamps For Vertical Piping:
 - 1) Acceptable Products:
 - a) Anvil Fig. 261.

- b) Equals by Cooper B-Line.
- f. Concrete Inserts:
 - 1) Individual Inserts:
 - a) Suitable for special nuts size 3/8 inch through 7/8 inch with yoke to receive concrete reinforcing rods, and with malleable iron lugs for attaching to forms.
 - b) Acceptable Products:
 - (1) Anvil Fig. 282.
 - (2) Equals by Cooper B-Line.
 - 2) Continuous Inserts:
 - a) Quality Standard: Equal to Unistrut P-3200 series.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Piping:
 - 1. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
 - a. Except for underground pipe, suspend piping from roof trusses or clamp to vertical walls using Unistrut and clamps. Do not hang pipe from other pipe, equipment, or ductwork. Laying of piping on any building element is not allowed.
 - b. Supports For Horizontal Piping:
 - 1) Support metal piping at 96 inches on center maximum for pipe 1-1/4 inches or larger and 72 inches on center maximum for pipe 1-1/8 inch or less.
 - 2) Support thermoplastic pipe at 48 inches on center maximum.
 - 3) Provide support at each elbow. Install additional support as required.
 - c. Supports for Vertical Piping:
 - 1) Place riser clamps at each floor or ceiling level.
 - 2) Securely support clamps by structural members, which in turn are supported directly from building structure.
 - 3) Provide clamps as necessary to brace pipe to wall.
 - d. Attach Unistrut to structural steel roof supporting structure. Spacing and support as described above.
 - e. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.

END OF SECTION

SECTION 22 0553**IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install identification of plumbing piping and equipment as described in Contract Documents.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Materials:
1. Paint:
 - a. One Coat Primer:
 - 1) 6-2 Quick Drying Latex Primer Sealer over fabric covers.
 - 2) 6-205 Metal Primer under dark color paint.
 - 3) 6-6 Metal Primer under light color paint.
 - b. Finish Coats: Two coats 53 Line Acrylic Enamel.
 - c. Performance Standard: Paints specified are from Pittsburgh Paint & Glass (PPG), Pittsburgh, PA www.pittsburghpaints.com or PPG Canada Inc, Mississauga, ON (800) 263-4350 or (905) 238-6441
 - d. Acceptable Products. See Section 01 6200.
 - 1) Paint of equal quality from following Manufacturers may be submitted for Architect's approval before use. Maintain specified colors, shades, and contrasts.
 - a) Benjamin Moore, Montvale, NJ www.benjaminmoore.com or Toronto, ON (800) 304-0304 or (416) 766-1176.
 - b) ICI Dulux, Cleveland, OH or ICI Paints Canada Inc, Concord, ON www.dulux.com.
 - c) Sherwin Williams, Cleveland, OH www.sherwin-williams.com.

PART 3 - EXECUTION**3.1 APPLICATION**

- A. Painting:
1. Only painted legends, directional arrows, and color bands are acceptable.
 2. Locate identifying legends, directional arrows, and color bands at following points on exposed piping of each piping system:
 - a. Adjacent to each item of equipment.
 - b. At point of entry and exit where piping goes through wall.
 - c. On each riser and junction.
 - d. Every 25 feet on long continuous lines.
 - e. Stenciled symbols shall be one inch high and black.

3.2 ATTACHMENTS

- A. Schedules:
1. Pipe Identification Schedule:

- a. Apply stenciled symbols as follows:

Pipe Use	Abbreviation
Domestic Cold Water	CW
Domestic Hot Water	HW
Gas	GAS

END OF SECTION

SECTION 22 0719

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install insulation on hot and cold water lines, fittings, valves, and accessories as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 22 1116: Domestic Water Piping.

PART 2 - PRODUCTS

2.1 COMPONENTS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Armacell, Mebane, NC www.armacell.com.
 - b. Childers Products Co, Eastlake, OH www.fosterproducts.com.
 - c. IMCOA, Youngsville, NC www.nomacokflex.com.
 - d. Johns-Manville, Denver, CO www.jm.com.
 - e. Knauf, Shelbyville, IN www.knauffiberglass.com.
 - f. Manson, Brossard, PQ, Canada www.isolationmanson.com.
 - g. Nomaco Inc, Yopungville, NC www.nomacokflex.com.
 - h. Owens-Corning, Toledo, OH www.owenscorning.com.
 - i. Speedline Corp, Solon, OH www.speedlinepvc.com.
- B. Materials:
 - 1. Above Grade Metal Piping:
 - a. Insulation For Piping:
 - 1) Snap-on glass fiber or melamine foam pipe insulation, or heavy density pipe insulation with factory vapor jacket.
 - 2) Insulation Thickness:

Service Water Temperature	Pipe Sizes		
	Up to 1-1/4 In	1-1/2 to 2 In	Over 2 In
170 - 180 Deg F	One In	1-1/2 In	2 In
140 - 160 Deg F	1/2 In	One In	1-1/2 In
45 - 130 Deg F	1/2 In	1/2 In	One In
 - 3) Performance Standards: Fiberglas ASJ by Owens-Corning.
 - 4) Acceptable Manufacturers:
 - a) Childers Products.
 - b) Knauf.
 - c) Manson.
 - d) Owens-Corning.
 - e) Johns-Manville.
 - f) Equal as approved by Architect before bidding.
 - b. Fitting, Valve, And Accessory Covers:
 - 1) PVC.
 - 2) Performance Standard: Zeston by Johns-Manville.
 - 3) Acceptable Manufacturers:

- a) Knauf.
 - b) Speedline.
 - c) Johns-Manville.
 - d) Equal as approved by Architect before bidding.
2. Below Grade Metal Piping:
- a. Insulation:
 - 1) 1/2 inch thick.
 - 2) Acceptable Products.
 - a) SS Tubolit by Armacell.
 - b) ImcoLock by Imcoa.
 - c) Nomalock or Therma-Cel by Nomaco.
 - b. Joint Sealant:
 - 1) Acceptable Products.
 - a) Armacell 520.
 - b) Nomaco K-Flex R-373.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Above Grade Piping:
1. Apply insulation to clean, dry piping with joints tightly butted.
 2. Install insulation in manner to facilitate removal for repairs. Place sections or blocks so least possible damage to insulation will result from inspection or repairs of piping or equipment.
 3. Piping up to 1-1/4 Inch Diameter: Adhere 'factory applied vapor barrier jacket lap' smoothly and securely at longitudinal laps with white vapor barrier adhesive. Adhere 3 inch wide self-sealing butt joint strips over end joints.
 4. Piping 1-1/2 Inch Diameter And Larger:
 - a. Use broken-joint construction in application of two-layer covering.
 - b. Fill cracks and depressions with insulating cement mixed to thick plastic paste. Apply by hand in several layers to make up total specified thickness. Final layer shall have smooth uniform finish before application of covering.
 - c. Apply PVC jacket.
 5. Fittings, Valves, And Accessories:
 - a. Do not apply insulation over flanged joints or victaulic couplings until piping has been brought up to operating temperature and flange bolts have been fully tightened. Insulate valves so wheel, stem, and packing nut are exposed.
 - b. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
 - c. Piping Up To 1-1/4 Inch Diameter: Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
 - 1) Alternate Method: Insulate fittings, valves, and accessories with one inch of insulating cement and vapor seal with two 1/8 inch wet coats of vapor barrier mastic reinforced with glass fabric extending 2 inches onto adjacent insulation.
 - d. Piping 1-1/2 inches To 2 Inches: Insulate with hydraulic setting insulating cement or equal, to thickness equal to adjoining pipe insulation. Apply final coat of fitting mastic over insulating cement.
 - e. Piping 2-1/2 inches And Larger: Insulate with segments of molded insulation securely wired in place and coated with skim coat of insulating cement. Apply fitting mastic, fitting tape and finish with final coat of fitting mastic.
 6. Pipe Hangers:
 - a. Do not allow pipes to come in contact with hangers.
 - b. Provide 16 ga by 6 inch long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.
 7. Protect insulation wherever leak from valve stem or other source might drip on insulated surface, with aluminum cover or shield rolled up at edges and sufficiently large in area and of shape that dripping will not splash on surrounding insulation.

- B. Below Grade Piping: Slip underground pipe insulation onto pipe and seal butt joints. Where slip-on technique is not possible, slit insulation, apply to pipe, and seal seams and joints.

END OF SECTION

SECTION 22 1116

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
1. Perform excavating and backfilling required by work of this Section.
 2. Furnish and install potable water piping complete with necessary valves, connections, and accessories inside building and connect with outside utility lines 5 feet from building perimeter as described in Contract Documents.
- B. Related Requirements:
1. Section 22 0501: Common Piping Requirements.
 2. Section 22 0583: Plumbing Piping Insulation.
 3. Section 31 2316: Criteria for performance of excavation.
 4. Section 31 2323: Criteria for performance of backfill.
 5. Section 33 1116: Domestic water piping from 5 feet from building perimeter to main.

1.2 REFERENCES

- A. Reference Standards:
1. ASTM International:
 - a. ASTM B88-03, 'Standard Specification for Seamless Copper Water Tube.'

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. Cash Acme, Cullman, AL www.cashacme.com
 - b. Cla-Val Company, Costa Mesa, CA www.cla-val.com.
 - c. Honeywell Inc, Minneapolis, MN www.honeywell.com.
 - d. Nibco Inc, Elkhart, IN www.nibco.com.
 - e. Sloan Valve Co, Franklin Park, IL www.sloanvalve.com.
 - f. Symmons Industries, Braintree, MA www.symmons.com.
 - g. Watts Regulator Co, Andover, MA www.wattsreg.com.
 - h. Wilkins Operation, Paso Robles, CA www.zurn.com.
- B. Materials
1. Pipe:
 - a. Copper:
 - 1) Above-Grade: Meet requirements of ASTM B88, Type L.
 - 2) Below-Grade:
 - a) Meet requirements of ASTM B88, Type K. 3/4 inch minimum under slabs.
 - b) 2 inches And Smaller: Annealed soft drawn.
 - c) 2-1/2 inches And Larger: Hard Drawn.
 - 3) Copper tube size (CTS) outside dimensions and Standard Dimension Ratio (SDR) of 9.
 - 4) Pressure rated for 160 psi at 73 deg F, 100 psi at 180 deg F, and 80 psi at 200 deg F.
 - 5) Marked with Manufacturer's name, design pressure and temperature ratings, and third party certification stamp for NSF-PW.

- 6) Manufactured by Engel or peroxide method (PEX-A) or by silane method (PEX-B).
 - 7) Approved Products.
 - a) Raupex by Rehau.
 - b) Wirsbo Aquapex by Uponor.
 - c) ViegaPEX by Viega.
2. Fittings:
- a. For Copper Pipe: Wrought copper.
 - b. For PEX Pipe:
 - 1) Approved Products.
 - a) Everloc by Rehau.
 - b) Propex by Uponor including EP flow-through multiport tees.
 - c) F877 bronze fitting with stainless steel press sleeve by Viega.
3. Connections For Copper Pipe:
- a. Above-Grade:
 - 1) Sweat copper type with 95/5 or 96/4 Tin-Antimony solder, Bridgit solder, or Silvabrite 100 solder. Use only lead-free solder.
 - 2) Viega ProPress System
 - b. Below Grade:
 - 1) Brazed using following type rods:
 - a) Copper to Copper Connections:
 - (1) AWS Classification BCuP-4 Copper Phosphorus (6 percent silver).
 - (2) AWS Classification BCuP-5 Copper Phosphorus (15 percent silver).
 - 2) Copper to Brass or Copper to Steel Connections: AWS Classification BA5-5 Silver (45 percent silver).
 - 3) Do not use rods containing Cadmium.
 - 4) Brazing Flux:
 - a) Approved Products:
 - (1) Stay-Silv white brazing flux by Harris Product Group.
 - (2) High quality silver solder flux by Handy & Harmon.
 - 5) Joints under slabs acceptable only if allowed by local codes.
4. Ball Valves:
- a. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below.
 - b. Valves shall be two-piece, full port for 150 PSI SWP.
 - 1) Operate with flow in either direction, suitable for throttling and tight shut-off. Full port, three-piece maintenance design.
 - 2) Body: Bronze, 150 psig wsp at 350 deg F and 400 psig wog.
 - 3) Seat: Bubble tight at 100 psig under water.
 - c. Quality Standard: Nibco T585 or S585.
 - 1) Equal by Conbraco 'Apollo,' Hammond, Milwaukee, or Watts.
5. Combination Pressure Reducing Valve / Strainer:
- a. Integral stainless steel strainer, or separate 'Y' strainer installed upstream of pressure reducing valve.
 - b. Built-in thermal expansion bypass check valve.
 - c. Quality Standard: Watts U5B.
 - 1) Equal by Cash Acme, Cla-Val Hi Capacity, Conbraco 36C, Honeywell-Braukmann, Spence Hi Capacity, Watts, or Wilkins.
6. Mixing Valve:
- a. Solid brass construction and CSA B125 certified.
 - b. Includes integral check valves and inlet screen. Features advanced paraffin-based actuation technology.
 - c. Flow of 11 GPM with maximum 10 psi pressure drop. Perform to minimum flow of 0.5 GPM in accordance with ASSE 1017-2003.
 - d. Set for 110 deg F Service.
 - e. Quality Standard: Powers LM492-10.
 - f. Acceptable Manufacturers: Leonard, Powers, Sloan, Symmons, and Watts.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Below Grade:
 - 1. Install piping under slabs without joints where possible.
 - 2. Insulate water piping buried within building perimeter.
 - 3. Bury water piping 6 inches minimum below bottom of slab and encase in 2 inches minimum of sand.
- B. Locate cold water lines a minimum of 6 inches from hot water line.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Before pipes are covered, test systems in presence of Architect at 125 psi hydrostatic pressure for 4 hours and show no leaks. Disconnect equipment not suitable for 125 psig pressure from piping system during test period.

3.3 CLEANING

- A. Sterilize potable water system with solution containing 200 parts per million minimum of available chlorine and maintaining pH of 7.5 minimum. Introduce chlorinating materials into system in manner approved by Architect. Allow sterilization solution to remain for 24 hours and open and close valves and faucets several times during that time.
- B. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.
- C. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.

END OF SECTION

SECTION 22 1313**FACILITY SANITARY SEWERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install soil, waste, and vent piping systems within building and connect with outside utility lines 5 feet out from building where applicable.
 2. Perform excavation and backfill required by work of this Section.
- B. Related Requirements:
1. Sections Under 07 3000 Heading: Furnishing and installing of roof jacks and pipe flashing at roof.
 2. Section 07 8400: Quality of firestopping material.
 3. Section 22 0501: Common Plumbing Requirements.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 03 3111.

1.3 REFERENCES

- A. Reference Standards:
1. ASTM International:
 - a. ASTM A74-09, 'Standard Specification for Cast Iron Soil Pipe and Fittings.'
 - b. ASTM A888-09, 'Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.'
 - c. ASTM C564-08, 'Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.'
 - d. ASTM D2235-04, 'Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.'
 - e. ASTM D2564-04e1, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.'
 - f. ASTM F656-08, 'Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.'
 2. Cast Iron Soil Pipe Institute:
 - a. CISPI Standard 301-04, 'Standard Specification for Hubless Cast Iron Soil Pipe End Fittings for Sanitary & Storm Drain, Waste, and Vent Piping Applications.'

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. American Brass & Iron (AB&I), Oakland, CA www.abifoundry.com.
 - b. Clamp-All Corp, Haverhill, MA www.clampall.com.
 - c. Anaco-Husky, Corona, CA www.anaco-husky.com.
 - d. Josam Co, Michigan City, IN www.josam.com.
 - e. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.

- f. MG Piping Products Co, Stanton, CA www.mgcoupling.com.
- g. Mifab Manufacturing Inc, Chicago, IL www.mifab.com.
- h. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
- i. Watts Drainage, Spindale, NC www.watts.com or Watts Industries, Burlington, ON, Canada www.wattscda.com.
- j. Zurn Cast Metal, Erie, PA, CT www.zurn.com.

B. Performance:

- 1. Design Criteria:
 - a. Minimum size of waste piping installed under floor slab on grade shall be 2 inches.

C. Materials:

- 1. Buried Piping:
 - a. Approved Types: Service weight, single-hub or no-hub type cast iron soil pipe meeting requirements of ASTM A74.
 - b. Joint Material:
 - 1) Single-Hub: Rubber gaskets meeting requirements of ASTM C564.
 - 2) No-Hub:
 - a) Approved Products.
 - b) SuperGrip 304 American Brass & Iron (AB&I).
 - c) Husky SD 4000 coupling by Anaco.
 - d) Neoprene gaskets with type 304 stainless steel clamp and 24 ga type 304 stainless steel housing by Clamp-All Corp.
 - e) MG Coupling by MG Piping Products.
- 2. Above Grade Piping And Vent Lines:
 - a. Approved Types:
 - 1) Service weight, single-hub or no-hub type cast iron soil pipe meeting requirements of ASTM A74.
 - 2) Vent lines 2-1/2 inches or smaller may be Schedule 40 galvanized steel.
 - b. Joint Material:
 - 1) Single-Hub: Rubber gaskets meeting requirements of ASTM C564.
 - 2) No-Hub Pipe: Neoprene gaskets with stainless steel cinch bands.
- 3. Fittings:
 - a. Cast Iron Pipe: Hub and spigot, except fittings for no-hub pipe shall be no-hub, and meet requirements of ASTM A74.
 - 1) Joint Material: Rubber gaskets meeting requirements of ASTM C564.
 - 2) Galvanized Pipe: Screwed Durham tarred drainage type.
 - b. Traps installed on cast iron bell and spigot pipe shall be service weight cast iron. Traps installed on threaded pipe shall be recess drainage pattern type.
 - c. P-Traps:
 - 1) Trap shall have clean out plug if installed in other than slab on grade.
 - 2) Acceptable Products.
 - a) 7220 deep seal cast iron by JR Smith
 - b) Zurn Z-1000 by Zurn Industries.
 - c) Equal as approved by Architect before installation.
- 4. Cleanouts:
 - a. Furnish wall cleanouts with chrome wall cover and screw.
 - b. Acceptable Products:
 - 1) Finish Floors:
 - a) Josam: 56010.
 - b) J. R. Smith: 4023.
 - c) Mifab: C1100C-R-1.
 - d) Wade: W-6000.
 - e) Watts: CO-200-R.
 - f) Zurn: Z-1402.
 - 2) Resilient Flooring:
 - a) Josam: 56010-12.
 - b) J. R. Smith: 4140.
 - c) Mifab: C1100C-T-1.
 - d) Wade: W-6000-T.

- e) Watts: CO-200-T.
- f) Zurn: Z-1400.
- 3) Finished Wall:
 - a) Josam: 58790.
 - b) J. R. Smith: 4530.
 - c) Mifab: C1460RD.
 - d) Wade: W8560E.
 - e) Watts: CO-460-RD.
 - f) Zurn: Z-1446.
- 4) Exposed Drain Lines:
 - a) Josam: 58910.
 - b) J. R. Smith: 4510.
 - c) Mifab: C1460.
 - d) Wade: W8560B.
 - e) Watts: CO-460.
 - f) Zurn: Z-1440.
- 5) General Purpose:
 - a) Josam: 58900.
 - b) J. R. Smith: 4400.
 - c) Mifab: C1300-MF
 - d) Wade: W8550E.
 - e) Watts: CO-380.
 - f) Zurn: Z-1440.
- 6) Equal as approved by Architect before installation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Excavate and backfill as specified in Sections 31 2316 and 31 2323 with following additional requirements:
 - 1. Runs shall be as close as possible to those shown on Drawings.
 - 2. Excavate to required depth and grade to obtain fall required. Grade soil and waste lines within building perimeter 1/4 inch fall in one foot in direction of flow.
 - 3. Bottom of trenches shall be hard. Tamp as required.
 - 4. Remove debris from trench before laying of pipe.
 - 5. Do not cut trenches near footings without consulting Architect.
- B. Metal Pipe And Fittings:
 - 1. Provide depression under bell of each joint to maintain even bearing of sewer pipe.
 - 2. Connect to street main as required by local authorities.
 - 3. Use jacks to make-up gasketed joints.
 - 4. Do not calk threaded work.
 - 5. Use torque wrench to obtain proper tension in cinch bands when using hubless cast iron pipe. Butt ends of pipe against centering flange of coupling.
- C. Install piping so cleanouts may be installed as follows:
 - 1. Where shown on Drawings and near bottom of each stack and riser.
 - 2. At every 135 degrees of accumulative change in direction for horizontal lines.
 - 3. Every 100 feet of horizontal run.
 - 4. Extend piping to accessible surface. Do not install piping so cleanouts must be installed in carpeted floors. In such locations, configure piping so wall type cleanouts may be used.
- D. Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have seal trap in connection with complete venting system so gasses pass freely to atmosphere with no pressure or syphon condition on water seal.

- E. Vent entire waste system to atmosphere. Join lines together in fewest practicable number before projecting above roof. Set back vent lines so they will not pierce roof near edge or valley. Vent line terminations shall be:
1. 6 inches minimum above roof and 12 inches minimum from any vertical surface.
 2. Same size as vent pipe.
 3. In areas where minimum design temperature is below 0 deg F or where frost or snow closure may be possible:
 - a. Vent line terminations shall be same size as vent pipe, except no smaller than 2 inches in diameter.
 - b. Vents shall terminate 10 inches minimum above roof or higher if required by local codes.
- F. Furnish and install firestopping at penetrations of fire-rated structures as required under Sections 07 8400 and 22 0501.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
1. Conduct tests for leaks and defective work. Notify Architect before testing.
 2. Metal Pipe System: After backfilling and compacting of trenches is complete but before placing floor slab, fill waste and vent system with water to roof level or 10 feet minimum, and show no leaks for two hours. Uncover pipe and correct leaks and defective work. Re-backfill and compact and re-test.

END OF SECTION

SECTION 22 1319

FACILITY SANITARY SEWER SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install miscellaneous sanitary sewer specialties as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 22 0501: Common Plumbing Requirements.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Josam Co, Michigan City, IN www.josam.com.
 - b. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - c. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - d. Watts Drainage, Spindale, NC www.watts.com
 - e. Zurn Cast Metal, Erie, PA www.zurn.com.
- B. Components:
 - 1. Drains And Drain Accessories:
 - a. Floor Drain FD-1:
 - 1) Approved types with deep seal trap and chrome plated strainer.
 - 2) Trap guard by Precision Plumbing Products. Provide model number to match floor drain.
 - 3) Approved Products.
 - a) Refer to plumbing fixture schedule
 - b) Equal as approved by Architect prior to bidding
 - b. Floor Drain FS-1:
 - 1) Approved types with shallow trap, chrome plated 5 inch diameter strainer, and 2-1/2 to 4 inch diameter by 4-1/4 inch high chrome plated funnel.
 - 2) Approved Products.
 - a) Josam: 49340-NB.
 - b) J. R. Smith: 3002.
 - 2. Grease Interceptor and sample box:
 - a. Grease interceptor Jensen #JP 1000G:
 - 1) Approved type with #200 sample box
 - 2) Interceptor shall have the capacity specified with two compartments.
 - 3) Interceptor shall be listed with the International Associations of Plumbing and Mechanical Officials (IAPMO)
 - 4) Equal as approved by Architect prior to bidding.
 - b. Component Requirements:
 - 1) Interceptor shall have two 24" diameter access openings: one over the inlet, one over the outlet.
 - 2) Have interceptor base and cover capable of supporting H-20 traffic loading, without the addition of a traffic slab.

- 3) Be precast concrete with a minimum compressive strength of 4000 PSI at twenty eight days:
 - 4) Be precast of one monolithic precast unit; seams of battery joints in the tank base shall not be acceptable.
- c. The interceptor shall be placed on level undisturbed soil or on approved compacted fill per manufactures specifications.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 22 3330

COMMERCIAL GAS DOMESTIC WATER HEATER AND
HOT WATER RECIRCULATING PUMP

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install electric water heater as specified in Contract Documents.
- B. Related Requirements:
 - 1. Section 22 0501: Common Plumbing Requirements.
 - 2. Section 22 1116: Domestic Water Piping.

1.2 WARRANTY

- A. Three-year non-prorated warranty on water heaters of 20 gallon capacity and larger.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. American Water Heater Co, Johnson City, TN www.americanwaterheater.com.
 - b. A O Smith Water Products Co, Ashland City, TN www.hotwater.com
 - c. Bradford-White Corp, Ambler, PA www.bradfordwhite.com.
 - d. Controlled Energy Corp, Waitsfield, VT www.cechot.com.
 - e. In-Sink-Erator, Racine, WI www.insinkerator.com
 - f. Rheem / Ruud Water Heater Div Rheem Manufacturing, Atlanta, GA www.rheem.com
 - g. State Industries Inc, Ashland City, TN www.stateind.com.
 - h. Bell and Gossett
 - i. Equal as approved by Architect prior to bidding.
- B. Materials:
 - 1. 71 Gallon water heater:
 - a. UL listed.
 - b. Gas water heater.
 - c. Thermostatic control with adjustable setting.
 - d. Approved Product.
 - 1) A.O. Smith: BTR 120 American: E1E2.5US013V.
 - 2) Equal as approved by Architect prior to bidding.
 - 2. Hot Water Recirculating Pump
 - a. UL Listed.
 - b. 120 Volt, single phase, in line
 - c. 10 GPM at 5' ahead
 - d. Controlled by time clock
 - 1) NBF - 12U
 - 2) Equal as approved by Architect

2.2 ACCESSORIES

- A. Anchoring Components:
 - 1. One inch by 18 ga galvanized steel straps.
 - 2. No. 10 by 2-1/2 inch screws.

- B. Thermal Expansion Absorbers:
 - 1. Bladder type for use with potable water systems.
 - 2. Acceptable Products.
 - a. Therm-X-Trol ST-12 by Amtrol Inc, West Warwick, RI www.amtrol.com.
 - b. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install temperature-pressure relief valve on hot water heater and pipe discharge to directly above funnel of floor drain.

- B. Anchor 20 gallon and larger water heaters to wall using anchoring straps and specified screws.

3.2 ADJUSTING

- A. Set discharge water temperature at 140 deg F.

END OF SECTION

SECTION 22 4216

COMMERCIAL HAND SINK

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install plumbing fixtures as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 07 9213: Sealants used between fixtures and other substrates.
 - 2. Section 22 0501: Common Mechanical Requirements.
 - 3. Section 22 1116: Domestic Water Piping.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Eagle Group Clayton, DE www.eaglegrp.com.
- B. Performance:
 - 1. Design Criteria:
 - a. Interior exposed pipe, valves, and fixture trim, including trim behind custom casework doors, shall be chrome plated.
- C. Components:
 - 1. Lavatories And Fittings:
 - a. Handicap Accessible Self Supporting Hand Sink:
 - 1) Size: 14 by 19 inches.
 - 2) Approved Products.
 - a) Eagle HAS-10-FDP
 - 3) Carrier / Support:
 - a) Approved Products.
 - (1) Josam: 17100.
 - (2) Jay R. Smith: 0700.)
 - b. Sink Fittings:
 - 1) Faucet and basket drain, p-trap, tailpiece, side mount wall bracket.
 - a) Approved Products.
 - 2) Supply pipes with stops:
 - a) Provide chrome plated quarter-turn brass ball valve, 12 inch long braided stainless steel riser, and chrome-plated steel flange.
 - b) Approved Products.
 - c) (1) McGuire: BV2165CC.
 - (2) Zurn: Z8804 LRQ-PC.
 - 3) Trap:
 - a) 17 ga tube 'P' trap, chrome plated.
 - 4) Safety Covers for Handicap Accessible Lavatories:
 - a) Provide protection on water supply pipes and on trap.
 - b) Approved Products.
 - (1) Trapwrap by Brocar Products Inc.

- (2) Pro Wrap by McGuire Products.
- (3) Handi Lav-Guard by TrueBro.

2. Miscellaneous Sinks And Fittings:

a. Floor Sink:

- 1) 12 inch square top, medium receptor cast iron body with flanged receptor, acid resistant coated interior, stainless steel grate. Aluminum dome strainer and 2 inch calked regular outlet connection.
- 2) Approved Products.
 - a) Jay R. Smith: 3002
 - b) Josam: 49340-A.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install each fixture with separate vent line. Do not circuit vent.
- B. Ensure provisions are made for proper support of fixtures and that rough-in piping is accurately set and protected from movement and damage.
- C. Seal wall-mounted fixtures around edges to wall and counter top fixtures to countertop with sealant specified in Section 07 9213.
- D. Unless otherwise noted, provide each individual fixture supply with chrome-plated stop valve with hand wheel.
- E. Install fixtures with accessible stop or control valve in each hot and cold water branch supply line.
- F. Self-Supporting sink: Install using carriers. Support carrier free of finished wall.

3.2 CLEANING

- A. Polish chrome finish at completion of Project.

END OF SECTION

DIVISION 23: HEATING, VENTILATING, AND AIR-CONDITIONING

23 0000 HEATING, VENTILATING, AND AIR-CONDITIONING

- 23 0501 COMMON HVAC REQUIREMENTS (15051CMW & 15101)
- 23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT (15075)
- 23 0713 DUCT INSULATION (15081)
- 23 0933 ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC (15915A)
- 23 0934 ENERGY MANAGEMENT AND CONTROL SYSTEM

23 1000 FACILITY FUEL SYSTEMS

- 23 1123 FACILITY NATURAL GAS PIPING (15196)

23 2000 HVAC PIPING AND PUMPS

- 23 2600 CONDENSATE DRAIN PIPING (15181)

23 3000 HVAC AIR DISTRIBUTION

- 23 3001 COMMON DUCT REQUIREMENTS (15801)
- 23 3114 LOW-PRESSURE METAL DUCTS (15812)
- 23 3300 AIR DUCT ACCESSORIES (15820)
- 23 3346 FLEXIBLE DUCTS (15815)
- 23 3400 HVAC FANS (15836)
- 23 3713 DIFFUSERS, REGISTERS, AND GRILLES (12851CM)

23 4000 HVAC AIR CLEANING DEVICES

- 23 4100 AIR FILTERS (15861)

23 5000 CENTRAL HEATING EQUIPMENT

- 23 5134 FLUES (15556A)

23 7000 CENTRAL HVAC EQUIPMENT

- 23 7413 PACKAGED, OUTDOOR, CENTRAL-STATION AIR HANDLING UNITS

END OF TABLE OF CONTENTS

SECTION 23 0501

COMMON HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
1. Common requirements and procedures for HVAC systems.
 2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
 3. Interface with Testing And Balancing Agency.
 4. Furnish and install sealants relating to installation of systems installed under this Division.
 5. Furnish and install Firestop Penetration Systems for HVAC system penetrations as described in Contract Documents.
 6. Furnish and install sound, vibration, and seismic control elements.
- B. Products Furnished But Not Installed Under This Section:
1. Sleeves, inserts, and equipment for mechanical systems installed under other Sections.
- C. Related Requirements:
1. Section 05 0523: Quality and requirements for welding.
 2. Section 07 8400: Quality of Penetration Firestop Systems to be used on Project and submittal requirements.
 3. Section 07 9213: Quality of sealants used at building exterior.
 4. Section 07 9219: Quality of acoustical sealants.
 5. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.
 6. Section 26 2913: Magnetic starters and thermal protective devices (heaters) not factory mounted integral part of mechanical equipment.
 7. Division 26: Raceway and conduit, unless specified otherwise, line voltage wiring, outlets, and disconnect switches.
 8. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.

1.2 SUBMITTALS

- A. Action Submittals:
1. Product Data:
 - a. Manufacturer's catalog data for each manufactured item.
 - 1) Provide section in submittal for each type of item of equipment. Include Manufacturer's catalog data of each manufactured item and enough information to show compliance with Contract Document requirements. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
 - 2) Include name, address, and phone number of each supplier.
 2. Shop Drawings:
 - a. Schematic control diagrams for each separate fan system, heating system, control panel, etc. Each diagram shall show locations of all control and operational components and devices. Mark correct operating settings for each control device on these diagrams.
 - b. Diagram for electrical control system showing wiring of related electrical control items such as firestats, fuses, interlocks, electrical switches, and relays. Include drawings showing electrical power requirements and connection locations.
 - c. Drawing of each temperature control panel identifying components in panels and their function.
 - d. Other shop drawings required by Division 23 trade Sections.

B. Closeout Submittals:**1. Operation And Maintenance Manual Data:****a. Modify and add to requirements of Section 01 7000 as follows:**

- 1) At beginning of HVAC section of Operations And Maintenance Manual, provide master index showing items included.
- 2) Provide name, address, and phone number of Architect, Architect's Mechanical Engineer, General Contractor, and HVAC, Sheet Metal, Refrigeration, and Temperature Control subcontractors.
- 3) Provide operating instructions to include:
 - a) General description of each HVAC system.
 - b) Step by step procedure to follow in putting each piece of HVAC equipment into operation.
 - c) Provide diagrams for electrical control system showing wiring of items such as smoke detectors, fuses, interlocks, electrical switches, and relays.
- 4) Identify maintenance instructions by using same equipment identification used in Contract Drawings. Maintenance instructions shall include:
 - a) List of HVAC equipment used indicating name, model, serial number, and nameplate data of each item together with number and name associated with each system item.
 - b) Manufacturer's maintenance instructions for each piece of HVAC equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
 - c) Summary list of mechanical equipment requiring lubrication showing name of equipment, location, and type and frequency of lubrication.
 - d) Manual for thermostat published by manufacturer.
- 5) Include copies of approved shop drawings and copies of warranties required in individual Sections of Division 23.

1.3 QUALITY ASSURANCE**A. Requirements of Regulatory Agencies:**

1. Perform work in accordance with applicable provisions of Gas Ordinances applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.

B. Identification:

1. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.

1.4 DELIVERY, STORAGE, AND HANDLING**A. Delivery: Accept valves on site in shipping containers with labeling in place.****B. Storage:**

1. In addition to requirements specified in Division 01:
 - a. Stored material shall be readily accessible for inspection by Architect until installed.
 - b. Store items subject to moisture damage, such as controls, in dry, heated spaces.
 - c. Provide temporary protective coating on cast iron and steel valves.
 - d. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Handling: Protect bearings during installation. Thoroughly grease steel shafts to prevent corrosion.

1.5 WARRANTY

- A. Guarantee HVAC systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
- B. Provide certificates of warranty for each piece of equipment made out in favor of Owner. Clearly record 'start-up' date of each piece of equipment on certificate.
- C. If HVAC sub-contractor with offices located more than 150 miles from Project site is used, provide service / warranty work agreement for warranty period with local HVAC sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

PART 2 - PRODUCTS**2.1 COMPONENTS**

- A. Components shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.
- B. Valves: Valves of same type shall be of same manufacturer.
- C. Pipe And Pipe Fittings: Use domestic made pipe and pipe fittings on Project. Weld-O-Let and Screw-O-Let fittings are acceptable.
- D. Sleeves:
 - 1. In Framing: Standard weight galvanized iron pipe, Schedule 40 PVC, or 14 ga galvanized sheet metal two sizes larger than bare pipe or insulation on insulated pipe.
 - 2. In Concrete And Masonry: Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Drawings:
 - 1. HVAC Drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
 - 2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over HVAC Drawings.
 - 3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.
- B. Verification Of Conditions:
 - 1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which mechanical work is dependent for efficiency and report work that requires correction.
 - 2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.
 - 3. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of

size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.

4. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.

3.2 PREPARATION

A. Changes Due To Equipment Selection:

1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings, if requested by Architect, showing proposed installations.
2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
3. Provide any additional motors, valves, controllers, fittings, and other additional equipment required for proper operation of system resulting from selection of equipment.
4. Be responsible for the proper location of roughing-in and connections provided under other Divisions.

3.3 INSTALLATION

A. Interface With Other Work:

1. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and see they are properly installed.
2. Electrical: Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
3. Testing And Balancing:
 - a. Put HVAC systems into full operation and continue their operation during each working day of testing and balancing.
 - b. Make changes in pulleys, belts, fan speeds, and dampers or add dampers as required for correct balance as recommended by Testing And Balancing Agency and at no additional cost to Owner.

- #### B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.

C. Locating Equipment:

1. Arrange pipes, ducts, and equipment to permit ready access to valves, cocks, unions, traps, filters, starters, motors, control components, and to clear openings of doors and access panels.
2. Adjust locations of pipes, ducts, switches, panels, and equipment to accommodate work to interferences anticipated and encountered.
3. Install HVAC work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
4. Determine exact route and location of each pipe and duct before fabrication.
 - a. Right-Of-Way:
 - 1) Lines that pitch shall have right-of-way over those that do not pitch. For example, steam, steam condensate, and drains shall normally have right-of-way.
 - 2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
 - b. Offsets, Transitions, and Changes in Direction:

- 1) Make offsets, transitions, and changes in direction in pipes and ducts as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
- 2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.

D. Piping:

1. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus.
 - a. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper erection of systems of piping in every respect.
 - b. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings.
 - 1) Arrange so as to facilitate removal of tube bundles.
 - 2) Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
 - a) Make connections of dissimilar metals with di-electric unions.
 - b) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
 - 3) Do not use reducing bushings, street elbows, bull head tees, close nipples, or running couplings.
 - 4) Install piping systems so they may be easily drained. Provide drain valves at low points and manual air vents at high points in hot water heating and cooling water piping.
 - 5) Install piping to insure noiseless circulation.
 - 6) Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
 - c. Do not install piping in shear walls.
2. Properly make adequate provisions for expansion, contraction, slope, and anchorage.
 - a. Cut piping accurately for fabrication to measurements established at site. Remove burr and cutting slag from pipes.
 - b. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
 - c. Make changes in direction with proper fittings.
 - d. Expansion of Thermoplastic Pipe:
 - 1) Provide for expansion in every 30 feet of straight run.
 - 2) Provide 12 inch offset below roof line in each vent line penetrating roof.
3. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade. Seal sleeves with specified sealants.
 - a. Sleeves through floors shall extend 1/4 inch above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
 - b. Sleeves through floors and foundation walls shall be watertight.
4. Provide spring clamp plates (escutcheons) where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.
5. Remove dirt, grease, and other foreign matter from each length of piping before installation.
 - a. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
 - b. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
 - c. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.

E. Penetration Firestops: Install Penetration Firestop System appropriate for penetration at HVAC system penetrations through walls, ceilings, roofs, and top plates of walls.

F. Sealants:

1. Seal openings through building exterior caused by penetrations of elements of HVAC systems.

2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.

3.4 REPAIR / RESTORATION

- A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
 1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.
 2. Surface finishes shall exactly match existing finishes of same materials.

3.5 FIELD QUALITY CONTROL

- A. Field Tests:
 1. Perform tests on HVAC piping systems. Furnish devices required for testing purposes.
 2. Replace material or workmanship proven defective with sound material at no additional cost to Owner. Repeat tests on new material, if requested.

3.6 SYSTEM START-UP

- A. Off-Season Start-up:
 1. If Substantial Completion inspection occurs during heating season, schedule spring start-up of cooling systems. If inspection occurs during cooling season, schedule autumn start-up for heating systems.
 2. Notify Owner seven days minimum before scheduled start-up.
 3. Time will be allowed to completely service, test, check, and off-season start systems. During allowed time, train Owner's representatives in operation and maintenance of system.
 4. At end of off-season start-up, furnish Owner with letter confirming that above work has been satisfactorily completed.
- B. Preparations that are to be completed before start up and operation include, but are not limited to, following:
 1. Dry out electric motors and other equipment to develop and properly maintain constant insulation resistance.
 2. Make adjustments to insure that:
 - a. Equipment alignments and clearances are adjusted to allowable tolerances.
 - b. Nuts and bolts and other types of anchors and fasteners are properly and securely fastened.
 - c. Packed, gasketed, and other types of joints are properly made up and are tight and free from leakage.
 - d. Miscellaneous alignments, tightenings, and adjustments are completed so systems are tight and free from leakage and equipment performs as intended.
 3. Motors and accessories are completely operable.
 4. Inspect and test electrical circuitry, connections, and voltages to be properly connected and free from shorts.
 5. Adjust drives for proper alignment and tension.
 6. Make certain filters in equipment for moving air are new and of specified type.
 7. Properly lubricate and run-in bearings in accordance with Manufacturer's directions and recommendations.

3.7 CLEANING

- A. Clean exposed piping, ductwork, and equipment.
- B. No more than one week before Final Inspection, flush out bearings and clean other lubricated surfaces with flushing oil. Provide best quality and grade of lubricant specified by Equipment Manufacturer.

- C. Replace filters in equipment for moving air with new filters of specified type no more than one week before Final Inspection.

3.8 CLOSEOUT ACTIVITIES

A. Instruction Of Owner:

- 1. Instruct building maintenance personnel and Stake Physical Facilities Representative in operation and maintenance of mechanical systems utilizing Operation And Maintenance Manual when so doing.
 - a. Minimum Instruction Periods:
 - 1) HVAC and Refrigeration: Four hours.
 - 2) Temperature Control: Four hours.
 - b. Conduct instruction periods after Substantial Completion inspection when systems are properly working and before final payment is made. None of these instructional periods shall overlap another.

3.9 PROTECTION

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.
- B. Do not operate pieces of equipment used for moving supply air without proper air filters installed properly in system.
- C. After start-up, continue necessary lubrication and be responsible for damage to bearings while equipment is being operated up to Substantial Completion.

END OF SECTION

SECTION 23 0553**IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY****A. Includes But Not Limited To:**

1. Furnish and install identification of HVAC equipment and piping as described in Contract Documents.

PART 2 - PRODUCTS**2.1 SYSTEMS****2.2 APPLICATION****A. Labels:**

1. Identify following items with specified labels fastened to equipment with screws:
 - a. Thermostats and control panels in mechanical spaces.
 - b. Rooftop Units.
 - c. Evaporative Cooling Units.
 - d. Accessible exhaust fans.
2. Engrave following data from Equipment Schedules on Drawings onto labels:
 - a. Equipment mark.
 - b. Area served.
 - c. Thermostat zone number, when different from equipment mark.
 - d. Panel and breaker from which unit is powered.

END OF SECTION

SECTION 23 0713**DUCT INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install thermal wrap duct insulation as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3113: Low-Pressure Metal Ducts.
 - 2. Section 23 3300: Acoustic duct liner.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
 - 1. Certaineed St Gobain, Valley Forge, PA www.certainteed.com.
 - 2. Johns-Manville, Denver, CO www.jm.com.
 - 3. Knauf Fiber Glass, Shelbyville, IN www.knauffiberglass.com
 - 4. Owens-Corning, Toledo, OH or Owens-Corning

2.2 MATERIALS

- A. Thermal Wrap Duct Insulation:
 - 1. 1-1/2 inch thick fiberglass with factory-laminated, reinforced aluminum foil scrim kraft facing and density of one lb/ per cu ft.
 - 2. Thermal Conductivity: 0.27 BTU in/HR SF deg F at 75 deg F maximum.
 - 3. Type One Acceptable Products:
 - a. Type 100 standard duct insulation by Certaineed St Gobain.
 - b. Microlite FSK by Johns-Manville.
 - c. Duct Wrap FSK by Knauf Fiber Glass.
 - d. FRK by Owens-Corning.
 - e. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Thermal Wrap Duct Insulation:
 - 1. Install insulation as follows:
 - a. On outside air ducts and combustion air ducts within building insulation envelope.
 - b. On other air ducts where indicated on Drawings.
 - 2. Wrap insulation tightly on ductwork with circumferential joints butted and longitudinal joints overlapped minimum 2 inches.
 - a. Do not compress insulation except in areas of structural interference. Minimum thickness at corners shall be one inch thick.

- b. Remove insulation from lap before stapling.
- c. Staple seams at approximately 16 inches on center with outward clenching staples.
- d. Seal seams with foil vapor barrier tape or vapor barrier mastic. Seal penetrations of facing to provide vapor tight system.

B. Insulate outside of ceiling diffusers, diffuser drops, and duct silencers same as ductwork.

END OF SECTION

SECTION 23 0933**ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install automatic temperature control system as described in Contract Documents.
 - 2. Furnish and install conductors and make connections to control devices, motors, and associated equipment.
 - 3. Assist in air test and balance procedure.
- B. Related Requirements:
 - 1. Section 23 0501: Common HVAC Requirements.
 - 2. Section 23 0593: Air test and balance.
 - 3. Division 26:
 - a. Furnishing and installing of raceway, conduit, and junction boxes, including pull wires, for temperature control system except as noted above.
 - b. Power wiring to magnetic starters, disconnect switches, and motors.
 - c. Motor starters and disconnect switches, unless integral with packaged equipment.

1.2 SUBMITTALS

- A. Informational Submittals:
 - 1. Qualification Statements: Submit document from Approved Distributor confirming contractor sponsorship.
- B. Closeout Submittals:
 - 1. Record Documentation:
 - a. Leave O&M Manual specified in Section 23 0501.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Honeywell Inc, Minneapolis, MN www.honeywell.com.
 - b. System Sensor, St Charles, IL www.systemsensor.com.
- B. Performance:
- C. Components:
 - 1. Thermostats And Sensors:
 - a. Thermostat
 - 1) Communicating Thermostat:
 - a) Low voltage type provided with automatic change-over feature for both heating and cooling stages, seven-day / 365 day program with two starts and stops per day

2. Duct Smoke Detectors:
 - a. Duct mounted smoke detector in systems with airflow greater than 2000 CFM.
 - b. Intelligent lowflow photoelectric duct smoke detector with flash scan.
 - c. Category Four Approved Product. See Section 01 6200 for definitions of Categories.
 3. Transformer:
 - a. 120 / 24 V, 50VA
 - b. 120 / 24 V, 75VA
 4. Conductors:
 - a. Color-coded and No. 16 and No. 12 AWG Type TWN, TFN, or THHN, stranded.
 - b. Thermostat Cable: 12, 8, or 4 conductor, 18AWG solid copper wire, insulated with high-density polyethylene. Conductors parallel enclosed in brown PVC jacket (22 AWG cable not allowed).
- D. Operation Sequences:
1. Programmable thermostat shall control unoccupied and occupied status of fan system based on adjustable seven day program and remote room sensor / push button. Fan shall run continuously in occupied mode and cycle in unoccupied mode.
 2. Adjustable heating and cooling set points shall control space temperature by activating either heating or cooling equipment. Programmable thermostat provides automatic change over between heating and cooling.
 3. Minimum outside air damper, spring return type, shall open in occupied mode and remain closed in unoccupied mode in zones using outside air.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work:
1. Calibrate room thermostats as required during air test and balance. Insulate sensor J-box with fiberglass insulation; expandable/ foam insulation is NOT acceptable
 2. Instruct air test and balance personnel in proper use and setting of control system components.
 3. Install low voltage electrical wiring in accordance with Division 26 of these Specifications.
- B. Safety Controls:
1. Interlock smoke detector for combination fire / smoke dampers so fire / smoke damper closes on detection of smoke.
 2. Fresh air dampers shall close on fan shut-down, power failure, open fan motor disconnect switch, and when thermostat is in UNOCCUPIED mode.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service:
1. Calibrate, adjust, and set controls for proper operation, operate systems, and be prepared to prove operation of any part of control system. This work is to be completed before pre-substantial completion inspection.
 2. Test each individual heating, cooling, and damper control for proper operation using control system.

3.3 ADJUSTING

- A. Program minimum of one day's operation into thermostat memory function.

3.4 CLOSEOUT ACTIVITIES

A. Instruction Of Owner:

1. Include as part of training required in Section 23 0501, following training:
 - a. Training shall be by personnel of installing company and utilize operator's manuals and as-built documentation.
 - b. Provide training for up to four hours total
 - c. Training shall include sequence of operation review, selection of displays, modification of schedules and setpoints, use of specified command display interface functions, troubleshooting of sensors, etc, as follows:
 - 1) Control System Overview:
 - a) Show access to system through thermostat. Demonstrate scheduling.
 - 2) Thermostat Programming From Keypad. Instructions on developing setpoints and schedules, and adjusting program and temperatures..
 - 3) Thermostat Operation:
 - a) Identify and explain use of buttons on thermostat.

END OF SECTION

Section 23 0934**ENERGY MANAGEMENT AND CONTROL SYSTEM****Part 1: General****1.1 SUMMARY:**

- A. Includes But Not Limited To:
 - 1. Provide all labor, material, tools, equipment and supervision necessary to complete the installation of the central plant controls and individual fan coils controls to entire existing mechanical system for complete installation. Provide material and labor necessary to locate the computer workstation for the control system at any location within the building as specified by the Owner. Refer to 'Exhibit "A"' at the end of this section for possible location and building floor plan.
 - 2. Products Furnished But Not Installed Under This Section
 - 3. Products Installed But Not Furnished Under This Section
 - 4. Products Not Furnished Or Installed But Integrated With The Work Of This Section

1.2 PRODUCTS NOT FURNISHED OR INSTALLED BUT INTEGRATED WITH THE WORK OF THIS SECTION:

- A. Existing - Heat Generation Equipment:
 - 1. Boiler Controls
- B. Existing - Refrigeration Equipment:
 - 1. Chiller Controls
- C. Existing - Rooftop Air Handling Equipment:
 - 1. Discharge Air Temperature Control
 - 2. Economizer Control
 - 3. Volume Control
- D. Existing - Unit Ventilators and Fan Coil Units:
 - 1. Setpoint Reset
 - 2. Day/Night Indexing
- E. Existing - Fan Coil Units:
 - 1. Cross-Flow Velocity Sensor
- F. Existing 15350 - Variable Frequency Drives

1.3 RELATED SECTIONS:

- A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are a part of this specification and shall be used in conjunction with this section as a part of the contract documents. Consult them for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 0 and Division 1.
- B. The following sections constitute related work:
 - 1. Division 23 – Mechanical
 - 2. Division 26 - Electrical

1.4 DESCRIPTION:

- A. General: The control system shall be as shown and consist of a high-speed, peer-to-peer network of DDC controllers and operator workstation(s) residing and communicating on a BACnet IP (Internet Protocol) network. The operator workstation(s) shall be a personal computer (PC) with a color monitor, mouse, keyboard, and printer. The PC will allow a user to interface with the network via multi-tasking dynamic color graphics. Each mechanical system, building floor plan, and control device will be depicted by point-and-click graphics. Systems using gateways to route proprietary devices and objects to BACnet are not acceptable.
- B. For Local Area Network installations provide access to the control system via the Internet. The owner shall provide a connection to the Internet via high-speed cable modem, ADSL, ISDN, T1 or through the facility ISP. The owner shall pay for all monthly Internet access fees and connection charges.
- C. The control system shall be supplied with a complete web enabled package. The system shall support unlimited users using standard web browsers such as Internet Explorer and Netscape. The web server software shall operate on standard industry PC servers. Proprietary servers or "black boxes" are not acceptable. Web browser software shall be manufactured by the control system manufacturer and shall have the same look and feel as the operating system. Third party web software is not acceptable.
- D. The system will provide for future expansion to include monitoring of the card access, fire alarm, and lighting control systems.

1.5 APPROVED CONTROL SYSTEM MANUFACTURERS:

- A. Delta Controls shall be the Design Standard. Other manufacturers may bid subject to meeting all requirements of the specification and receiving approval from the owner 7 days prior to bid. A comparison of the alternate system to the base bid system must be submitted 10 days prior to bid for review process. Include project references with contact information for at least three installations of the proposed system with the request for approval package.

B. The following are the approved Control System manufacturers:

Manufacturer	System
Siemens	BACnet version only
Johnson Controls	BACnet version only
Delta Controls	ORCAweb, ORCAview
Equal as approved by Owner and Architect prior to bidding.	

1. Only products from the corresponding manufacturer and product line listed shall be used.
2. The above list of manufacturers applies to operator workstation software, controller software, the custom application programming language, Building Controllers, Advanced Application Controllers, and Application Specific Controllers. All other products specified herein (e.g., sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

1.6 QUALITY ASSURANCE:

A. Contractor/Manufacturer Qualifications

1. The Installer shall have an established working relationship with the Control System Manufacturer, and be the authorized representative of the Manufacturer at bid time.
2. The Installer shall have successfully completed Control System Manufacturer's classes on the control system. The Installer shall present for review the certification of completed training, including the hours of instruction and course outlines upon request.
3. All products used in this installation shall be new, currently under manufacture, and shall be applied in standard off the shelf products. This installation shall not be used as a test site for any new products. Spare parts shall be available for at least 5 years after completion of this contract.

1.7 CODES AND STANDARDS:

A. All work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of the local, state, and federal authorities. Such codes, when more restrictive, shall take precedence over these specifications. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes:

1. National Electric Code (NEC)
2. California Building Code (CBC)
 - a) Section 608, Shutoff for Smoke Control
 - b) Section 403.3, Smoke Detection Group B Office Buildings and Group R, Division 1 Occupancies
 - c) Section 710.5, Wiring in Plenums

- d) Section 713.10, Smoke Dampers
 - e) Section 1106 Refrigeration Machinery Rooms
 - f) Section 1107, Refrigeration Machinery Room Ventilation
 - g) Section 1108, Refrigeration Machinery Room Equipment and Controls
 - h) Section 1120, Detection and Alarm Systems
- 3. California Mechanical Code (CMC)
 - 4. ASHRAE 135-2001
 - 5. FCC Regulation, Part 15- Governing Frequency Electromagnetic Interference
 - 6. Underwriters Laboratories UL916

1.8 SYSTEM PERFORMANCE:

- A. Performance Standards. The system shall conform to the following:
- 1. Graphic Display. The system shall display a graphic with 20 dynamic points/objects with all current data within 10 seconds.
 - 2. Graphic Refresh. The system shall update a graphic with 20 dynamic points/objects with all current data within 8 seconds
 - 3. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be less than 2 seconds. Analog objects should start to adjust within 2 seconds
 - 4. Object Scan. All changes of state and change of analog values will be transmitted over the high-speed Ethernet network such that any data used or displayed at a controller or workstation will have been current within the previous 2 seconds
 - 5. Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 45 seconds

1.9 WARRANTY:

- A. Warrant all work as follows:
- 1. Labor and materials for the control system specified shall be warranted free from defects for a period of 12 months after final completion and acceptance. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 8 hours during normal business hours.
 - 2. All work shall have a single warranty date, even when the Owner has received beneficial use due to an early system start-up. If the work specified is split into multiple contracts or a multi-phase contract, then each contract or phase shall have a a single warranty date from substantial completion.
 - 3. At the end of the final start-up, testing, and commissioning phase, if equipment and systems are operating satisfactorily to the owner, the owner shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this specification. The date of acceptance shall be the start of warranty.
 - 4. Operator workstation software, project-specific software, graphic software, database software, and firmware updates which resolve known software

deficiencies as identified by the Contractor shall be provided at no charge during the warranty period. Any upgrades or functional enhancements associated with the above mentioned items also can be provided during the warranty period for an additional charge to the Owner by purchasing an in-warranty technical support agreement from the Contractor. Written authorization by the Owner must, however, be granted prior to the installation of any of the above-mentioned items.

1.10 SUBMITTALS:

A. As-Built Plans:

1. Contractor shall submit field verified as-built plans identifying all components to existing system to include but not limited to hot and chilled water system, piping, fan coils, and thermostats locations and all related components prior to commencing any work for the proposed system.

B. Design Build Plans:

1. Contractor shall prepare and submit plans for the proposed new control system to include but not limited to the central plant and fan coils, control devices, conduit, wiring, equipment and locations as design build.

C. Demonstrations:

1. Contractor shall provide and submit a checklist and forms identifying all items requiring demonstrations and approval by the Owner and Architect prior to issuance of the notice of completion.
2. Provide course outline and materials prior to schedule of demonstrations. Submit five copies of all materials.

D. Product Data:

1. Five (5) copies of Manufacturer's literature and cut sheets on each component of system.
2. Five (5) copies of Manufacturer's written warranty. Provide one copy in Owner's Maintenance manual prior to pre-substantial completion meeting.
3. Five (5) copies of Manufacturer's illustrated step-by-step installation, operation and maintenance instructions.
4. Submittals must be specific to this project with respect to model number, capacities, performance, etc..., generic submittals will not be accepted.

E. Record Drawings:

1. Contractor shall maintain record drawings at the job site at all times and must be updated daily prior to end of day. Clearly and correctly, mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Owner and Architect. Submit completed Record Drawings Prior to Pre-Substantial Completion meeting.

F. Schedules:

1. Submit schedule identifying start and stop and duration for each phase. Phasing shall be coordinated with Facility's Operations and Facility Director's schedule. Do not commence work until the phasing schedule has been approved by Owner and Facility's Director.

Part 2: Products**2.1 MATERIALS:**

- A. All products used in this project installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of four years. This installation shall not be used as a test site for any new products. Spare parts shall be available for at least five years after completion of this contract.

2.2 COMMUNICATION:

- A. All control products provided for this project shall comprise a BACnet internetwork. Communication involving control components (i.e., all types of controllers and Operator Workstations) shall conform to ANSI/ASHRAE Standard 135-2001, BACnet.
- B. Each BACnet device shall operate on the BACnet Data Link/Physical layer protocol specified for that device as defined in this section.
- C. The Contractor shall provide all communication media, connectors, repeaters, bridges, hubs, switches, and routers necessary for the internetwork.
- D. All controllers shall have a communication port for connections with the Operator Workstations using the BACnet Data Link/ Physical layer protocol.
- E. A device on the internetwork shall be provided with a 56k-baud modem that will allow for remote Operator Workstation using the BACnet PTP Data Link/ Physical layer protocol. Remote Operator Workstation via this modem shall allow for communication with any and all controllers on this network as described in Paragraph F below.
- F. Communication services over the internetwork shall result in operator interface and value passing that is transparent to the internetwork architecture as follows:
 - 1 Connection of an Operator Workstation device to any one controller on the internetwork will allow the operator to interface with all other controllers as if that interface were directly connected to the other controllers. Data, status information, reports, system software, custom programs, etc., for all controllers shall be available for viewing and editing from any one controller on the internetwork.
 - 2 All database values (e.g., objects, software variables, custom program variables) of any one controller shall be readable by any other controller on the internetwork. This value passing shall be automatically performed by a controller when a reference to an object name not located in that controller is entered into the controller's database. An operator/installer shall not be required to set up any communication services to perform internetwork value passing.

- G. The time clocks in all controllers shall be automatically synchronized daily. An operator change to the time clock in any controller shall be automatically broadcast to all controllers on the network.
- H. The network shall have the following minimum capacity for future expansion:
1. Each Building Controller shall have routing capacity for 99 controllers.
 2. The Building Controller network shall have capacity for 1000 Building Controllers.
 3. The system shall have an overall capacity for 12,500 Building Controller, Advanced Application Controller, and Application Specific Controller input/output objects.

2.3 OPERATOR WORKSTATION:

- A. Operator Workstation. Furnish two PC-based workstations. Each of these workstations shall be able to access all information in the system. These workstations shall reside on the same Ethernet protocol network as the Building Controllers.
1. The workstations shall be installed at the locations specified by the Owner; on site or off site.
- B. Workstation information access shall use the BACnet protocol. Communication shall use the ISO 8802-3 (Ethernet) Data Link/ Physical layer protocol.
- C. Hardware. Each operator workstation and custom programming workstation shall consist of the following:
1. Personal Computer. Furnish IBM compatible PCs as shown. The CPU shall be a minimum of an Dual Core Intel Xeon W3503 2.40 Ghz 4M L3, 4.8 GT/s. A minimum of 4 gigabytes of RAM, one CD readable/writeable drive and a 380GB SATA hard disk with a minimum access time of 12 milliseconds shall be provided. A two-button mouse also will be provided. Furnish all required serial (USB), and network communication ports, and all cables for proper system operation. The PC shall have a minimum of a 20" SVGA LCD monitor (1024 x 768 resolution, 32 Bit color).
 2. Printers. Each workstation shall have on printer equivalent to a Lexmark Z22 color inkjet and associated cables or one laser printer
 3. BACnet Interoperability Building Blocks. The workstation shall support the following BIBBs:

Data Sharing	Alarm & Event	Scheduling	Trending	Device & Network Mgmt.
DS-RP-A,B	AE-N-A	SCHED-A	T-VMT-A	DM-DDB-A,B
DS-RPM-A	AE-ACK-A		T-ATR-A	DM-DOB-A,B
DS-WP-A	AE-ASUM-A			DM-DCC-A
DS-WPM-A	AE-ESUM-A			DM-TS-A
				DM-UTC-A
				DM-RD-A
				DM-BR-A
				NM-CE-A

D. System Software

1. **Operating System.** Furnish a concurrent multi-tasking operating system. The operating system also shall support the use of other common software applications that operate under Microsoft Windows. Examples include Microsoft Excel, Microsoft Word, Microsoft Access. Acceptable operating systems are Windows 7 and Windows 2008 Server.
2. **System Graphics.** The operator workstation software shall be a graphical user interface (GUI). The system shall allow display of up to 10 dynamic and animated graphic screens at once for comparison and monitoring of system status. Provide a method for the operator to easily move between graphic displays and change the size and location of graphic displays on the screen. The system graphics shall be able to be modified while on-line. An operator with the proper password level shall be able to add, delete, or change dynamic objects on a graphic. Dynamic objects shall include analog and binary values, dynamic text, static text, and animation files. Graphics shall have the ability to show animation by shifting image files based on the status of the object.
3. **Custom Graphics.** Custom graphic files shall be created with the use of a graphics generation package furnished with the system. The graphics generation package shall be a graphically based system that uses the mouse to create and modify graphics. The graphics generation package also shall provide the capability of capturing or converting graphics from other programs such as Visio or AutoCad
4. **Graphics Library.** Furnish a complete library of standard HVAC equipment graphics such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. This library also shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. The library shall be furnished in a file format compatible with the graphics generation package program. Graphics shall be created by drag-and-drop selection of graphic symbols and drag-and-link with BACnet objects with dynamic and interactive display fields.

5. **Multilingual.** Software shall be supported in the following languages English, Spanish, French, German, and Chinese.
 6. **Dynamic Data Exchange (DDE).** Software shall support dynamic data sharing with other Windows-based programs for third party add-on functionality e.g. preventative maintenance, tenant billing, etc.
- E. **System Applications.** Each workstation shall provide operator interface and off-line storage of system information. Provide the following applications at each workstation:
1. **System Database Save and Restore.** Each workstation shall store on the hard disk a copy of the current database of each Building Controller. This database shall be updated whenever an operator initiates a save command.
 2. **Manual Database Save and Restore.** A system operator with the proper password clearance shall be able to save the database from any system panel. The operator shall be able to clear a panel database via the network and may initiate a download of a specified database to any panel in the system from the network.
 3. **System Configuration.** The workstation software shall provide a method of configuring the system. This shall allow for future system changes or additions by users under proper password protection.
 4. **On-Line Help.** Provide a context-sensitive, on-line help system to assist the operator in operating and editing the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext.
 5. **Security.** Each operator shall be required to log on to the system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system supervisor shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the functions accessible to viewing and/or changing each system application.
 6. **System Diagnostics.** The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers.
 7. **Alarm Processing.** Any object in the system shall be configurable to alarm in and out of normal state. The operator shall be able to configure the alarm limits, alarm limit differentials, states, and reactions for each object in the system.
 8. **Alarm Messages.** Alarm messages shall use the English language descriptor for the object in alarm, in such a way that the operator will be able to recognize the

source, location, and nature of the alarm without relying upon acronyms or other mnemonics.

9. Alarm Reactions. The operator shall be able to determine (by object) what if any actions are to be taken during an alarm. Actions shall include logging, printing, starting programs, displaying messages, dialing out to remote stations, paging, providing audible annunciation.
 10. Trend Logs. The operator shall be able to define a custom trend log for any data object in the system. This definition shall include change-of-value digital, change-of-value analog, time interval, start time, and stop time. Trend data shall be sampled and stored on the Building Controller panel, and be archivable on the hard disk and be retrievable for use in spreadsheets and standard database programs.
 11. Alarm and Event Log. The operator shall be able to view all system alarms and change of states from any location in the system. Events shall be listed chronologically. An operator with the proper security level may acknowledge and clear alarms.
 12. Object and Property Status and Control. Provide a method for the operator to view, and edit if applicable, the status of any object and property in the system. The status shall be available by menu, on graphics, or through custom programs.
 13. Clock Synchronization. The real-time clocks in all building control panels and workstations shall be using the BACnet Time Synchronization service. The system also shall be able to automatically synchronize all system clocks daily from any operator-designated device in the system. The system shall automatically adjust for daylight savings and standard time, if applicable.
- F. Workstation Applications Editors. Each PC workstation shall support editing of all system applications. Provide editors for each application at the PC workstation. The applications shall be downloaded and executed at one or more of the controller panels.
1. Controller. Provide a full-screen editor for each type of application that shall allow the operator to view and change the configuration, name, control parameters, and setpoints for all controllers.
 2. Scheduling. An editor for the scheduling application shall be provided at each workstation. Provide a method of selecting the desired schedule and month. This shall consist of a monthly calendar for each schedule. Exception schedules and holidays shall be shown clearly on the calendar. Provide a method for allowing several related objects to follow a schedule. The start and stop times for each object shall be adjustable from this master schedule.

3. Custom Application Programming. Provide the tools to create, modify, and debug custom application programming. The operator shall be able to create, edit, and download custom programs at the same time that all other system applications are operating. *The system shall be fully operable while custom routines are edited, compiled, and downloaded.* The programming language shall have the following features:
 - a. The language shall be English language oriented, be based on the syntax of BASIC, FORTRAN, C, or PASCAL, and allow for free-form programming (i.e., not column-oriented or "fill in the blanks").
 - b. A full-screen character editor/programming environment shall be provided. The editor shall be cursor/mouse-driven and allow the user to insert, add, modify, and delete custom programming code. It also shall incorporate word processing features such as cut/paste and find/replace.
 - c. The programming language shall allow independently executing program modules to be developed. Each module shall be able to independently enable and disable other modules.
 - d. The editor/programming environment shall have a debugging/simulation capability that allows the user to step through the program and observe any intermediate values and/or results. The debugger also shall provide error messages for syntax and execution errors.
 - e. The programming language shall support conditional statements (IF/THEN/ELSE/ELSE-IF) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
 - f. The programming language shall support floating point arithmetic using the following operators: +, -, /, x, square root, and x-to-the-y-power. The following mathematical functions also shall be provided: natural log, log, trigonometric functions (sine, cosine, etc.), absolute value, and minimum/maximum value from a list of values.
 - g. The programming language shall have predefined variables that represent time of day, day of the week, month of the year, and the date. Other predefined variables shall provide elapsed time in seconds, minutes, hours, and days. These elapsed time variables shall be able to be reset by the language so that interval-timing functions can be stopped and started within a program. Values from all of the above variables shall be readable by the language so that they can be used in a program for such purposes as IF/THEN comparisons, calculations, etc.
 - h. The language shall be able to read the values of the variables and use them in programming statement logic, comparisons, and calculations.
 - i. The programs shall support online changes with the ability to read real time values without exiting the program. Sample programs and syntax help functions shall be resident in the program.

G. REPORT MANAGEMENT

1. The following reporting capability shall be provided at the operator workstation.
 2. Reporting:
 - a. Internal reports built into operator workstation software
 - b. External reporting via ODBC
 3. Internal Reports
 - a. User definable query reports (support advanced multiple property, multiple object).
 - b. Reports shall be scheduled for automatic generation by schedule or event.
 - c. Manual execution to printing/file.
 - d. Ability to save report in system report folder.
 - e. Query controller hierarchy.
 - f. Report to multiple destinations
 - i. Email
 - ii. Print
 - iii. File (text, csv, xml)
 - iv. Terminal
 4. Enterprise Interface
 - a. ODBC driver supporting common SQL statements (select, update, insert, where, order by, group by, etc.)
 - b. Allow integration to Enterprise software
 - c. Shall be capable of being used with third party software that supports ODBC connection such as: Microsoft Access, Excel, Crystal Reports, etc.
 - d. All queries shall be real time into live controller network.
 - e. Shall be able to both read and write using SQL.
- ## H. Web Browser Interface
1. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™ or Netscape Navigator™.
 2. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the BAS, shall not be acceptable.
 3. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

4. The Web browser client shall support at a minimum, the following functions:
 - a. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
5. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
6. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
7. Storage of the graphical screens shall be in the Server, without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
8. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.
9. User's shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
 - a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
10. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
11. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
12. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
13. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

I. SERVER FUNCTIONS AND HARDWARE

1. A central server, located per owner shall be provided. The server shall support all Network Area Controllers connected to the customer's network whether local

or remote. Local connections shall be via an Ethernet LAN. Remote connections can be via ISDN, ADSL, T1 or dial-up connection.

2. The server shall provide scheduling for all Area Controllers and their underlying field control devices.
 3. The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to Network Area Controllers. Systems not employing this prioritization shall not be accepted.
 4. The server shall provide central management of alarm data for all Network Area controllers supported by the server inclusive of the following:
 - a. View and acknowledge alarms
- J. Server Hardware Requirements: The server hardware platform shall have the following requirements:
- a. The computer shall be an Intel based computer, minimum 1.8 GHz with 4 GB RAM and 100 GB minimum hard drive. It shall include a 32x CD RW drive, 1, 10/100 Ethernet cards, 1024x768 True Color Video Card.
 - b. The server operating system shall be Microsoft XP Professional or Microsoft Windows 7.

2.4 CONTROLLER SOFTWARE:

- A. Furnish the following applications software for building and energy management. All software applications shall reside and operate in the system controllers. Editing of applications shall occur at the operator workstation
- B. System Security
 1. User access shall be secured using individual security passwords and user names.
 2. Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.
 3. User Log On/Log Off attempts shall be recorded.
- C. Scheduling. Provide the capability to schedule each object or group of objects in the system. Each schedule shall consist of the following:
 1. Weekly Schedule. Provide separate schedules for each day of the week. Each of these schedules should include the capability for start, stop and optimal start. Each schedule may consist of up to 10 events. When a group of objects are scheduled together, provide the capability to adjust the start and stop times for each member.

2. Holiday Schedules. Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.
- D. Alarm Reporting. The operator shall be able to determine the action to be taken in the event of an alarm. Alarms shall be routed to the appropriate workstations based on time and other conditions.
- E. Remote Communication. The system shall have the ability to dial out in the event of an alarm using BACnet Point-To-Point at a minimum of 56K baud. Receivers shall be BACnet workstations.
- F. Maintenance Management. The system shall monitor equipment status and generate maintenance messages based upon user-designated run-time, starts, and/or calendar date limits.
- G. Sequencing. Provide application software to properly sequence the start and stop of chillers, boilers, and pumps to minimize energy usage in the facility.
- H. PID Control. A PID (proportional-integral-derivative) algorithm with direct or reverse action and anti-windup shall be supplied. The algorithm shall calculate a time-varying analog value that is used to position an output or stage a series of outputs. The controlled variable, setpoint, and PID gains shall be user-selectable.
- I. Staggered Start. This application shall prevent all controlled equipment from simultaneously restarting after a power outage.
- J. Energy Calculations. Provide software to allow instantaneous power (e.g., kW) or flow rates (e.g., L/s [GPM]) to be accumulated and converted to energy usage data. Provide an algorithm that calculates a sliding-window kW demand value.
- K. Anti-Short Cycling. All binary output objects shall be protected from short cycling. This feature shall allow minimum on-time and off-time to be selected.
- L. On/Off Control with Differential. Provide an algorithm that allows a binary output to be cycled based on a controlled variable and setpoint. The algorithm shall be direct-acting or reverse-acting, and incorporate an adjustable differential.
- M. Run-time Totalization. Provide software to totalize run-times for all binary input objects. A high run-time alarm shall be assigned, if required, by the operator.

2.5 BUILDING CONTROLLERS:

- A. General. Provide an adequate number of Building Controllers to achieve the performance specified in the Part 1 Article on "System Performance." Each of these panels shall meet the following requirements.
1. The Energy Management and Control System shall be comprised of one or more independent, standalone, microprocessor-based Building Controllers to manage the global strategies described in the System Software section.
 2. The Building Controller shall have sufficient memory to support its operating system, database, and programming requirements.
 3. Data shall be shared between networked Building Controllers.
 4. The operating system of the Building Controller shall manage the input and output communication signals to allow distributed controllers to share real and virtual object information, and allow central monitoring and alarms.
 5. Controllers that perform scheduling shall have a real-time clock.
 6. The Building Controller shall communicate with other BACnet objects on the internetwork using the Read (Execute and Initiate) and Write (Execute and Initiate) Property services as defined in Clauses 15.5 and 15.8, respectively, of ASHRAE Standard 135-2001.
 7. BACnet Functional Groups. The Building Controller shall support the following BACnet functional groups: Clock, Event Initiation, COV Event Response, Files, Device Communication and Time Master.
- B. Communication
1. Each Building Controller shall support BACnet™ over Ethernet and BACnet™ over IP. The Building Controller shall be connected to the BACnet network using the ISO 8802-3 (Ethernet) Data Link/Physical layer protocol.
 2. Each Building Controller with a communications card shall perform BACnet routing if connected to a network of Custom Application and Application Specific Controllers.
 3. The controller shall provide a service communication port using BACnet Data Link/Physical layer protocol P-T-P for connection to a hand-held workstation/and/or modem.
 4. The Building Controller secondary communication network shall support BACnet MS/TP.
- C. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.

1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at 0°C to 40°C [32°F to 100°F] and 10 to 90% RH.
 2. Controllers used in conditioned space shall be mounted in dust-proof enclosures, and shall be rated for operation at 0°C to 50°C [32°F to 120°F].
- D. Building Controllers shall be fully peer to peer.
- E. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips — or to a termination card connected by a ribbon cable.
- F. Memory. The Building Controller shall have as a minimum standard SRAM of 256 KB, standard DRAM of 1MB and standard non-volatile 1 MB of flash memory in lieu of EPROM. Memory shall be user extendible through RAM chip sockets and SIMMs for future memory expansion.
- G. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. The Building Controller shall maintain all database information including BIOS and programming information in the event of a power loss for at least 72 hours. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m [3 ft].
- H. Inputs/Outputs.
1. Inputs. Controller input/output board shall support dry contact, 0-5 VDC and 0-10 VDC- voltage, 4-20 mA- current and thermistor-resistive signal types on an individual basis for connecting any status or sensing device. Analog resolution shall be 10-bit A to D.
 2. Outputs. Controller input/output board shall support built in HOA modules configured with manual-auto-off override switch. Output supported shall be 0-10 VDC. All HOA's shall be supervised.
 3. Diagnostics. Controller input/output board shall have red LEDs providing input status indication.
 4. Building Controller shall have the capability to create, delete and support the following BACnet Objects:
 - a. ANALOG INPUT, ANALOG OUTPUT AND ANALOG VALUE: These objects shall have the following writeable properties: Object Name; Object Value; Description; COV Increment; Out of Service and Units. In addition, these objects shall support the properties: Device type; Reliability; Min./Max. Values; Update Interval and Resolution.
 - b. BINARY INPUT, BINARY OUTPUT AND BINARY VALUE: These objects shall have the following writeable properties: Object Name; Object Value;

Description; Polarity; Default Value; Min On/Off and Out of Service. In addition, these objects shall support the properties: Device Type; Reliability; Active/Inactive Texts; Update Interval; Resolution; Change-of-State Time; Count Times and Time Reset.

- c. CALENDAR: This object shall have the following writeable properties: Object Name; Object Value; Description; and Date List.
- d. DEVICE: This object shall have the following writeable properties: Object Name; Description; Location; and UTC Offset.
- e. EVENT ENROLMENT: This object shall have the following writeable properties: Object Name; Object Value; Description; Out-of-Service; Event & Notify Types; Parameters; Property Ref; Enable; and Notification Class.
- f. FILE: This object shall have the following writeable properties: Object Name; Description; File Type; and File Access.
- g. LOOP (PID): This object shall have the following writeable properties: Object Name; Object Value; Description; Polarity; Output and Input Refs.; Input Value & Units; Setpoint Value; PID Values; Bias; Write Priority and COV Increment. In addition, this object shall support the properties: Reliability; Update Interval; Proportional Constant & Units; Derivative Constant & Units.
- h. NOTIFICATION CLASS: This object shall have the following writeable properties: Object Name; Object Value; Description; Priority and Ack Required.
- i. PROGRAM: This object shall have the following writeable properties: Object Name; Object Value and Description. In addition, this object shall support the property Reliability.
- j. SCHEDULE: This object shall have the following writeable properties: Object Name; Object Value and Description; Effective period; Schedule; Exception; Controlled Properties and Write Properties.
- k. TREND LOG: This object shall have the following writeable properties: Object Name; Description; Log Enable; Start/stop Times; Log Device Object Property; Log Interval; Stop When Full; Buffer Size; and Record Count.

2.6 ADVANCED APPLICATION CONTROLLERS:

- A. General. Provide an adequate number of Programmable Application Controllers to achieve the performance specified in the Part 1 Article on "System Performance." Each of these panels shall meet the following requirements.
 - 1. The Advanced Application Controller shall have sufficient memory to support its operating system, database, and programming requirements.
 - 2. Advanced Application Controllers shall be fully peer to peer.
 - 3. The operating system of the Controller shall manage the input and output communication signals to allow distributed controllers to share real and virtual object information, and allow central monitoring and alarms.
 - 4. All equipment that requires scheduling shall be scheduled in that equipments controller.

5. Both firmware and controller database shall be loadable over the network.
6. Advanced Application Controllers shall support the following BACnet Interoperability Building Blocks (BIBBs):

Data Sharing	Alarm & Event	Scheduling	Trending	Device & Network Mgmt.
DS-RP-B	AE-N-B	SCHED-B		DM-DDB-B
DS-RPM-B	AE-ACK-B			DM-DOB-B
DS-WP-B	AE-ASUM-B			DM-DCC-B
DS-WPM-B				DM-TS-B
				DM-UTC-B
				DM-RD-B

B. Communication.

1. Each Advanced Application Controller shall reside on a BACnet network using the MS/TP or Ethernet Data Link/ Physical layer protocol.
2. The controller shall provide a service communication port using BACnet Data Link/ Physical layer protocol for connection to portable operators' workstation and allow access to the entire network.

C. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.

1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at 0°C to 40°C [32°F to 100°F].
2. Controllers used in conditioned space shall be mounted in dust-proof enclosures, and shall be rated for operation at 0°C to 50°C [32°F to 120°F].

D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips — or to a termination card connected by a ribbon cable.

E. Memory. The Advanced Application Controller shall be non-volatile FLASH memory.

F. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m [3 ft].

2.7 APPLICATION SPECIFIC CONTROLLERS:

A. General. Application Specific Controllers (ASCs) are microprocessor-based DDC controllers which through hardware or firmware design are able to control a wide variety of equipment. They are fully user-programmable, and are not restricted to any one type of equipment.

1. Each ASC shall be capable of standalone operation and shall continue to provide control functions without being connected to the network
2. Each ASC will contain sufficient I/O capacity to control the target system.
3. Both firmware and controller database shall be loadable over the network
4. Application Specific Controllers shall be fully peer to peer
5. ASC's shall come with an integrated housing to allow for easy mounting and protection of the circuit board. Only wiring terminals shall be exposed.
6. Application Specific Controllers shall support the following BACnet Interoperability Building Blocks (BIBBs):

Data Sharing	Alarm & Event	Scheduling	Trending	Device & Network Mgmt.
DS-RP-B				DM-DDB-B
DS-WP-B				DM-DOB-B
				DM-DCC-B

B. Communication

1. The controller shall reside on a BACnet network using the MS/TP Data Link/ Physical layer protocol.
2. Each controller shall have a BACnet Data Link/ Physical layer compatible connection for a laptop computer or a portable operator's tool. This connection shall be extended to a space temperature sensor port where shown and allow access to the entire network.
3. Each controller shall have a secondary sub network for communicating sensors or I/O expansion modules

C. Environment. The hardware shall be suitable for the anticipated ambient conditions.

1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at -40°C to 65°C [-40°F to 150°F] and/or suitably installed in a heated or fan cooled enclosure

2. Controllers used in conditioned space shall be mounted in dust-proof enclosures, and shall be rated for operation at 0°C to 50°C [32°F to 120°F].
- D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips.
- E. Memory. The Application Specific Controller shall use non-volatile memory and maintain all BIOS and programming information in the event of a power loss.
- F. Immunity to power and noise. ASC shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 W at 1 m [3 ft].
- G. Transformer. Power supply for the ASC must be rated at minimum of 125% of ASC power consumption, and shall be fused or current limiting type.
- H. Input/Output. ASC shall support as a minimum, directly connected, a combination of analog outputs and binary outputs and universal software selectable analog or digital inputs. ASC inputs shall support 0-5 VDC-voltage, 4-20mA-current, thermistor-resistance and dry contacts. ASC outputs shall support 0-10 VDC-voltage, digital triac rated at 0.5 amps at 24 VAC
- I. System Object Capacity. The system size shall be expandable to at least twice the number of input/output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The Operator Workstations installed for this project shall not require any hardware additions or software revisions in order to expand the system.

2.8 AUXILIARY CONTROL DEVICES:

- A. Motorized control dampers, unless otherwise specified elsewhere, shall be furnished by the controls contractor.
- B. Electric damper/valve actuators.
 1. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
 2. Where required, for power-failure/safety applications, an internal mechanical, spring-return mechanism shall be built into the actuator housing.
 3. All non-spring-return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring-return actuators with more than 7 N·m [60 in-lb] torque capacity shall have a manual crank for this purpose.
- C. Control valves.

1. Control valves shall be two-way or three-way type for two-position or modulating service as shown.
2. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
 - a. Water Valves:
 - i. Two-way: 150% of total system (pump) head.
 - ii. Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.
 - b. Steam Valves: 150% of operating (inlet) pressure.
3. Water Valves:
 - a. Body and trim style and materials shall be per manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.
4. Steam Valves:
 - a. Body and trim materials shall be per manufacturer's recommendations for design conditions and service. Linear ports for modulating service.

D. Binary Temperature Devices

1. Low-limit thermostats. Low-limit thermostats shall be vapor pressure type with an element 6 m [20 ft] minimum length. Element shall respond to the lowest temperature sensed by any 30 cm [1 ft] section. The low-limit thermostat shall be manual reset only and be supplied as DPST.

E. Temperature sensors.

1. Temperature sensors shall be thermistors.
2. Space sensors shall be equipped with the following:
 - a. programmable buttons for setpoint adjustment and override
 - b. 3-value, 96-segment LCD display
 - c. Provide matched temperature sensors for differential temperature measurement.

F. Humidity sensors.

1. Duct and room sensors shall have a sensing range of 20% to 80%.
2. Duct sensors shall be provided with a sampling chamber.
3. Outdoor air humidity sensors shall have a sensing range of 20% to 95% RH. They shall be suitable for ambient conditions of -40°C to 75°C [-40°F to 170°F].
4. Humidity sensor's drift shall not exceed 3% of full scale per year.

G. Flow switches.

1. Flow-proving switches shall be either paddle or differential pressure type.

H. Pressure transducers

1. Transducer shall have linear output signal. Zero and span shall be field-adjustable.
 2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage
 3. Water pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Transducer shall be complete with 1 - 5vdc or 4 to 20 mA output, required mounting brackets, and block and bleed valves.
 4. Water differential pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (differential pressure) and maximum static pressure shall be 300 psi. Transducer shall be complete with 1 - 5vdc or 4 to 20 mA output, required mounting brackets, and five-valve manifold.
- I. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application, or as shown.

J. Pressure-Electric (PE) Switches

1. Shall be metal or neoprene diaphragm actuated, operating pressure rated 0–175 kPa [0–25 psig], with calibrated scale setpoint range of 14–125 kPa [2–18 psig] minimum, UL listed
2. Provide one- or two-stage switch action SPDT, DPST, or DPDT, as required by application.
3. Shall be open type (panel-mounted) or enclosed type for remote installation. Enclosed type shall be NEMA 1 unless otherwise specified
4. Shall have a permanent indicating gauge on each pneumatic signal line to PE switches.

K. Electro-pneumatic (E/P) transducers

1. Electronic/pneumatic transducer shall provide a proportional 20 to 100 kPa [3 to 15 psig] output signal from a 0 to 10 VDC analog control input.

L. Local control panels

1. All indoor control cabinets shall be fully enclosed NEMA 1 construction with [hinged door], key-lock latch, removable sub-panels. A single key shall be common to all field panels and sub-panels
2. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL Listed for 600 volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings
3. Provide 120v receptacle at each local panel location.

2.9 WIRING AND RACEWAYS:

- A. General: Provide copper wiring, plenum cable, and raceways as specified in the applicable sections of Division 26.
- B. All insulated wire to be copper conductors, UL labeled for 90C

Part 3: Execution**3.1 EXAMINATION:**

- A. The project site shall be thoroughly examined and the contractor shall prepare as-built plans of the existing hot and chilled water system, piping, fan coils, and thermostats and all related components. The contractor shall also prepare plans for the new control system for the plant and all fan coils as design build. Plans to include all control devices, conduit, wiring, equipment and locations. The control system shall replace the existing controls on the existing heating/cooling system serving the existing building. The plans and bid shall be prepared in two phases. Phase I shall be the plant (chillers, boiler, pumps, cooling towers and related components. Phase II shall be the fan coils, thermostats, control valves and related components. If Phase II is not installed at the existing pneumatic controls shall be maintained and integrated into the control system as required. All plans shall be prepared in AutoCad format and shall be provided to the owner. The contractor shall be responsible for all discrepancies, conflicts or omissions.
- B. The Contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be resolved before work is started
- C. The Contractor shall examine the site and specifications for other parts of the work. If head room or space conditions appear inadequate — or if any discrepancies occur between the Contractor's work, and the plans and the work of others — the

Contractor shall make any changes necessary to accommodate the Contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the Contractor to coordinate or resolve such discrepancies shall be made by — and at the expense of — this Contractor.

3.2 PROTECTION:

- A. The Contractor shall protect all work and material from damage by its work or employees, and shall be liable for all damage thus caused
- B. The Contractor shall be responsible for its work and equipment until finally inspected, tested, and accepted. The Contractor shall protect any material that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects

3.3 COORDINATION:

A. Site

- 1. Where the mechanical work will be installed in close proximity to, or will interfere with work of other trades, the Contractor shall assist in working out space conditions to make a satisfactory adjustment. If the Contractor installs its work before coordinating with other trades, so as to cause any interference with work of other trades, the Contractor shall make the necessary changes in its work to correct the condition without extra charge
- 2. Coordinate and schedule work with all other work in the same area, or with work which is dependent upon other work, to facilitate mutual progress.

B. Submittals. Refer to the "Submittals" Article in Part 1 of this specification for requirements

C. Test and Balance

- 1. The Contractor shall furnish all tools necessary to interface to the control system for test and balance purposes
- 2. The Contractor shall provide training in the use of these tools. This training will be planned for a minimum of 4 hours
- 3. In addition, the Contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
- 4. The tools used during the test and balance process will be returned at the completion of the testing and balancing

D. Life Safety

1. Duct smoke detectors required for air handler shutdown are supplied and installed under Division 26. The Division 26 Contractor shall interlock smoke detectors to air handlers for shutdown as described in Part 3: "Sequences of Operation".
2. Smoke dampers and actuators required for duct smoke isolation are provided under another Division 23 Section
3. Fire/smoke dampers and actuators required for fire rated walls are provided under another Division 23 Section. Control of these dampers shall be by Division 26.

E. Coordination with controls specified in other sections or divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the Contractor as follows:

1. All communication media and equipment shall be provided as specified in Part 2: "Communication" of this specification.
2. Each supplier of controls product is responsible for the configuration, programming, start-up, and testing of that product to meet the sequences of operation described in this section.
3. The Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this Section and those provided under other sections or divisions of this specification.

3.4 GENERAL WORKMANSHIP:

- A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment
- C. Install all equipment in readily accessible locations as defined by Chapter 1, Article 100, Part A of the National Electrical Code (NEC).
- D. All wiring shall be verified for its integrity to ensure continuity and freedom from shorts and grounds
- E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.5 FIELD QUALITY CONTROL:

- A. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this specification
- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship
- C. Contractor shall have work inspected by local and/or state/provincial authorities having jurisdiction over the work

3.6 EXISTING EQUIPMENT:

- A. Unless otherwise directed, the Contractor is not responsible for the repairs or replacement of existing energy equipment and systems, valves, dampers, or actuators. Should the Contractor find existing equipment which requires maintenance or replacement, the owner is to be notified immediately
- B. Temperature Sensor Wells: The Contractor may reuse any existing wells in piping for temperature sensors. These wells shall be modified as required for proper fit of new sensors
- C. Indicator Gauges: Where these devices remain and are not removed, they must be made operational and recalibrated to ensure reasonable accuracy. Maintain the operation of existing pneumatic transmitters and gauges.
- D. Room Thermostats: Existing shall be removed delivered to owner.
- E. Electronic Sensors and Transmitters: Unless specifically noted otherwise, remove and deliver to the Owner.
- F. Controllers and Auxiliary Electronic Devices: Deliver to the Owner.
- G. Pneumatic Controllers, Relays and Gauges: Deliver to Owner.
- H. Damper Actuators, Linkages and Appurtenances: Salvage, recondition, and reuse.
- I. Control Valves: Replace with new.
- J. Control Compressed Air System: Deliver to Owner and replace with new system.
- K. The mechanical system must remain in operation at all times. Coordinate shut down with Owner prior to doing any work. No modifications to the system shall cause the mechanical system to be shut down for more than 15 minutes or to fail to maintain space comfort condition during any such period. Perform cutover of controls that cannot meet these conditions outside of those hours
- L. The scheduling of fans through existing or temporary time-clocks or control system shall be maintained throughout the DDC system installation.

- M. Install control panels as required.
- N. Modify existing starter control circuits, if necessary, to provide Hand/Off/Auto control of each starter controlled.
- O. Patch holes and finish to match existing

3.7 WIRING:

- A. All control and interlock wiring shall comply with national and local electrical codes and Division 26 of this specification. Where the requirements of this section differ with those in Division 26, the requirements of this section shall take precedence.
- B. All NEC Class 1 (line voltage) wiring shall be UL Listed in approved raceway per NEC and Division 26 requirement.
- C. All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.)

3.8 ACTUATORS:

- A. Mount and link control damper actuators per manufacturer's instructions.
 - 1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage
 - 2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
 - 3. Provide all mounting hardware and linkages for actuator installation.
- B. Electric/Electronic
 - 1. Dampers: Actuators shall be direct-mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° available for tightening the damper seals. Actuators shall be mounted following manufacturer's recommendations
 - 2. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

3.9 IDENTIFICATION OF HARDWARE AND WIRING:

- A. All wiring and cabling, including that within factory-fabricated panels, shall be labelled at each end within 5 cm [2"] of termination with the DDC address or termination number.

- B. Permanently label or code each point/object of field terminal strips to show the instrument or item served.
- C. Identify control panels with minimum 1 cm [$\frac{1}{2}$ "] letters on laminated plastic nameplates.
- D. Identify all other control components with permanent labels. All plug-in components shall be labelled such that removal of the component does not remove the label.
- E. Identify room sensors relating to terminal box or valves with nameplates.

3.10 CONTROLLERS:

- A. Provide a separate controller for each AHU or other HVAC system.
- B. Building Controllers and Advanced Application Controllers shall be selected to provide a minimum of 15% spare I/O point/object capacity for each point/object type found at each location. If input /objects are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point/object used.
 - 1. Future use of spare capacity shall require providing the field device, field wiring, point/object database definition, and custom software. No additional controller boards or point/object modules shall be required to implement use of these spare points

3.11 PROGRAMMING:

- A. Provide sufficient internal memory for the specified sequences of operation and trend logging. There shall be a minimum of 25% of available memory free for future use.
- B. Point/object Naming: System point/object names shall be modular in design, allowing easy operator interface without the use of a written point/object index. Use the following naming convention:

AAABBBCCDDDEEE where:

AAA is used to designate the location of the point/object within the building such as mechanical room, wing, or level, or the building itself in a multi-building environment.

BBB is used to designate the mechanical system with which the point/object is associated (e.g., A01, HTG, CLG, LTG).

CCC represents the equipment or material referenced (e.g., SAF for supply air fan , EXF for exhaust fan, RAF for return air fan).

D or DD or DDD may be used for clarification or for identification if more than one of CCC exists (e.g., SAF10, EXF121).

EE represents the action or state of the equipment or medium (e.g., T for temperature, RH for humidity, CO for control, S for status, D for damper control, I for current).

C. Software Programming

1. Provide programming for the system and adhere to the sequences of operation provided. The Contractor also shall provide all other system programming necessary for the operation of the system, but not specified in this document. Imbed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation. Use the appropriate technique based on the following programming types:
 - a. Text-based:
 - i. must provide actions for all possible situations
 - ii. must be modular and structured
 - iii. must be commented
 - b. Graphic-based
 - i. must provide actions for all possible situations
 - ii. must be documented
 - c. Parameter-based
 - i. must provide actions for all possible situations
 - ii. must be documented

D. Operator Interface

- 1 Standard Graphics. Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point/object information on the graphic displays shall dynamically update. Show on each graphic all input and output points/objects for the system. Also show relevant calculated points/objects such as setpoints
- 2 Show terminal equipment information on a "graphic" summary table. Provide dynamic information for each point/object show
- 3 The Contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all Operator Workstation software and their functions as described in this section. This includes any operating system software, the Operator Workstation database, and any third-party software installation and integration required for successful operation of the operator interface

3.12 CONTROL SYSTEM CHECKOUT AND TESTING:

- A. Start-up Testing: All testing listed in this article shall be performed by the Contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the Owner's Representative is notified of the system demonstration.

1. The Contractor shall furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification
2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight
3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures per manufacturers' recommendations
4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct
5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The Contractor shall check all control valves and automatic dampers to ensure proper action and closure. The Contractor shall make any necessary adjustments to valve stem and damper blade travel
6. Verify that the system operation adheres to the Sequences of Operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimum Start/Stop routines.
7. Alarms and Interlocks
 - a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm
 - b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
 - c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action

3.13 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE:

A. Demonstration

1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed its own tests
2. The tests described in this section are to be performed in addition to the tests that the Contractor performs as a necessary part of the installation, startup, and debugging process and as specified in the "Control System Checkout and Testing" Article in Part 3 of this specification. The owner shall be notified at least 10 days in advance of the start of the testing procedures.

3. The demonstration process shall follow that approved in Part 1: "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration
4. The Contractor shall provide at least two persons equipped with two-way communication, and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point/object and system. Any test equipment required to prove the proper operation shall be provided by and operated by the Contractor.
5. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.
6. Demonstrate compliance with Part 1: "System Performance
7. Demonstrate compliance with Sequences of Operation through all modes of operation
8. Demonstrate complete operation of Operator Workstation
9. Additionally, the following items shall be demonstrated:
 - a) DDC Loop Response. The Contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in setpoint, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the setpoint, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.
 - b) Demand limiting. The Contractor shall supply a trend data output showing the action of the demand-limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting setpoint, and the status of shed-able equipment outputs.
 - c) Optimum Start/Stop. The Contractor shall supply a trend data output showing the capability of the algorithm. The hour-by-hour trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas
 - d) Interface to the building fire alarm system (if applicable).
 - e) Operational logs for each system that indicate all setpoints, operating points, valve positions, mode, and equipment status shall be submitted to the Architect. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and disk formats.

- f) Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The Contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

B. Acceptance

1. All tests described in this specification shall have been performed to the satisfaction of the Owner prior to the acceptance of the control system as meeting the requirements of Completion.
2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1: "Submittals."

3.14 CLEANING:

A. General

1. The Contractor shall clean up all debris resulting from its activities daily. The Contractor shall remove all cartons, containers, crates, etc., under its control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.
2. At the completion of work in any area, the Contractor shall clean all of its work, equipment, etc., keeping it free from dust, dirt, and debris, etc.
3. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.15 TRAINING:

A. General

1. Provide a minimum of one onsite training class 8 hours in length during the construction period for personnel designated by the owner.
2. Provide two additional training sessions at 6 and 12 months following building's turnover. Each session shall be 8 hrs in length and must be coordinated with the building Owner.

B. Train the designated staff of Owner's Representative and Owner to enable Day-to-day Operators to:

1. Proficiently operate the system.
2. Understand control system architecture and configuration.
3. Understand DDC system components.

4. Understand system operation, including DDC system control and optimizing routines (algorithms).
 5. Operate the workstation and peripherals.
 6. Log on and off the system.
 7. Access graphics, point/object reports, and logs.
 8. Adjust and change system setpoints, time schedules, and holiday schedules.
 9. Recognize malfunctions of the system by observation of the printed copy and graphical visual signals.
 10. Understand system drawings, and Operation and Maintenance manual.
 11. Understand the job layout and location of control components.
 12. Access data from DDC controllers and ASC.
 13. Operate portable operator's terminals.
- C. Train the designated staff of Owner's Representative and Owner to enable Advanced Operators to:
1. Make and change graphics on the workstation
 2. Create, delete, and modify alarms, including annunciation and routing of these
 3. Create, delete, and modify point/object trend logs, and graph or print these
 4. Create, delete, and modify reports
 5. Add, remove, and modify system's physical points/objects
 6. Create, modify, and delete programming
 7. Add panels when required
 8. Add Operator Workstation stations
 9. Create, delete, and modify system displays — both graphical and otherwise
 10. Perform DDC system field checkout procedures
 11. Perform DDC controller unit operation and maintenance procedures
 12. Perform workstation and peripheral operation and maintenance procedures
 13. Perform DDC system diagnostic procedures
 14. Configure hardware including PC boards, switches, communication, and I/O points/objects
 15. Maintain, calibrate, troubleshoot, diagnose, and repair hardware
 16. Adjust, calibrate, and replace system components
- D. Train the designated staff of Owner's Representative and Owner to enable System Managers/Administrators to:
1. Maintain software and prepare backups
 2. Interface with job-specific, third-party operator software
Add new users and understand password security procedures
- E. Provide course outline and materials as per "Submittals" Article in Part 1 of this specification. The instructor(s) shall provide one copy of training material per student.
- F. The instructor(s) shall be factory-trained instructors experienced in presenting this material.

- G. Classroom training shall be done using a network of working controllers representative of the installed hardware.

END OF SECTION



owner approval	
DATE	PHASE

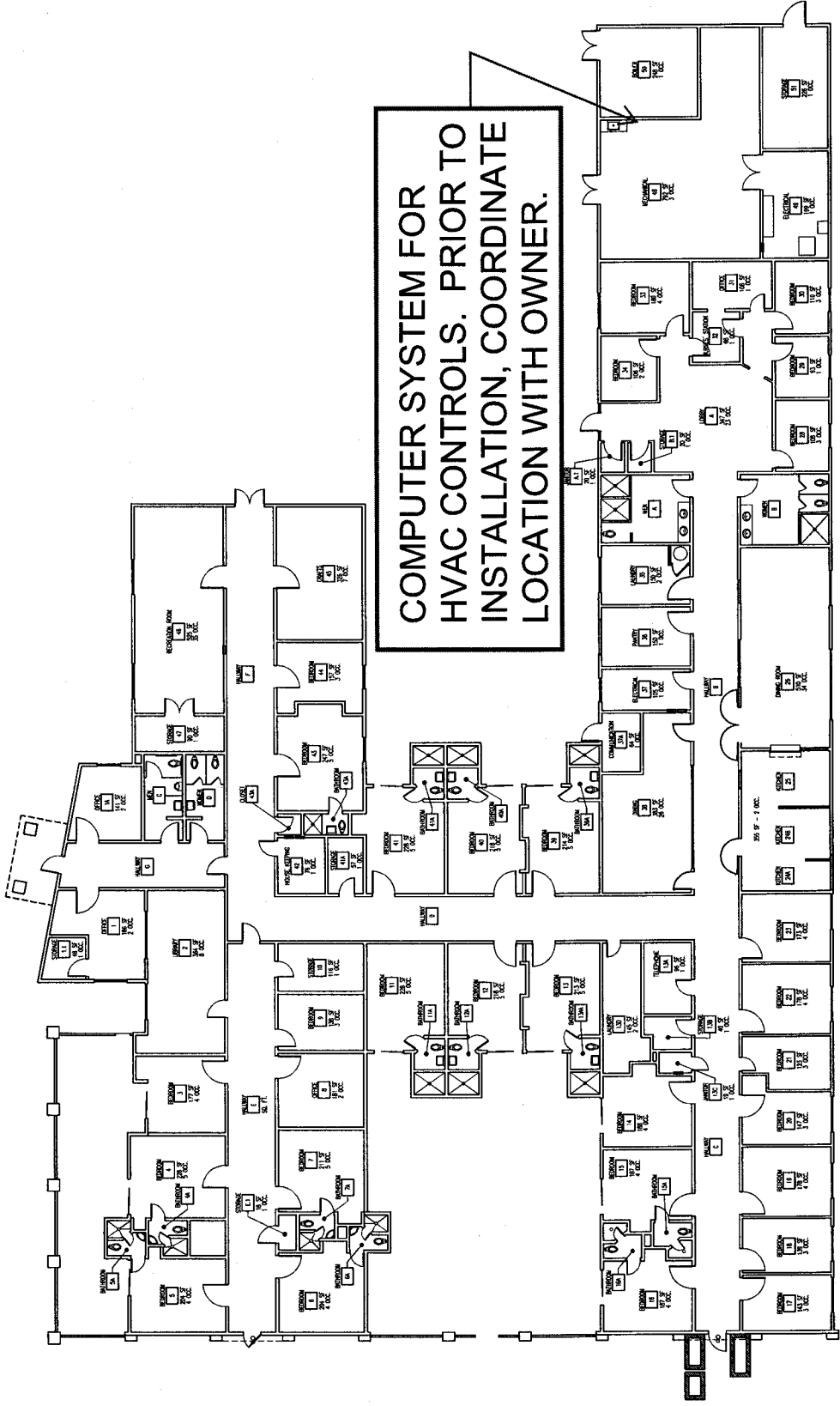
revisions/addenda		
NO.	DATE	COMMENT

**INDIO MENTAL HEALTH MILESTONES
 BUILDING RENOVATION**
 ECONOMIC DEVELOPMENT AGENCY
 RIVERSIDE COUNTY
 3403 10TH STREET, SUITE 300
 RIVERSIDE, CA 92507
 PROJECT NO: 110003393A
 DWG FILE: A-0002JWG
 DRAWN BY: GM
 CHECKED BY: GWM
 DRAWING SCALE: 1/8" = 1'-0"
 DATE: 9-15-11

SHEET NAME

FLOOR PLAN

SHEET NUMBER
 EXHIBIT 'A'
 SHEET ## OF XX SHEETS



FLOOR PLAN
 SCALE: 1/8" = 1'-0"

EXHIBIT 'A' - SECTION 23 0934

SECTION 23 1123

FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Perform excavation and backfill required for work of this Section.
 - 2. Furnish and install gas piping and fittings within building.
- B. Related Requirements:
 - 1. Sections Under 09 9000 Heading: Painting of exterior piping.
 - 2. Section 23 0501: Common HVAC Requirements.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A53-07, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.'
 - b. ASTM A234-07, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.'
 - c. ASTM D2513-08b, 'Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.'

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. BrassCraft, Novi, MI www.brasscraft.com.
 - b. Watts Regulator Co, North Andover, MA www.wattsreg.com
- B. Materials:
 - 1. Above-Ground Pipe And Fittings:
 - a. Black carbon steel, threaded, Schedule 40 pipe meeting requirements of ASTM A53.
 - b. Welded forged steel fittings meeting requirements of ASTM A234 or standard weight malleable iron screwed.
 - 2. Valves:
 - a. 125 psi bronze body ball valve, UL listed.
 - b. Approved Products.
 - 1) CIM 102.1 by Cimbrion Valve.
 - 2) Apollo Series 80-100 by ConBraCo.
 - 3) Model T-204 by Jomar International.
 - 4) Model B-6000-UL by Watts Regulator.
 - 3. Cocks:
 - a. Gauge Cocks: Conbraco 41-560 bronze gauge cock.
 - 4. Flexible Connector:
 - a. Type 304 stainless steel corrugated tube coated for corrosion protection.
 - b. Approved Products.
 - 1) Dormont Supr-Safe.

- 2) BrassCraft Procoat.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Steel pipe installed through air plenums, in walls, and pipes 3 inches and larger shall have welded fittings and joints. Other steel pipe may have screwed or welded fittings.
- B. On lines serving gas-fired equipment, install gas cocks adjacent to equipment outside of equipment cabinet and easily accessible.
- C. Install 3 inch long minimum dirt leg, with pipe cap, on vertical gas drop serving each gas-fired equipment unit.
- D. Use fittings for changes of direction in pipe and for branch runouts.

3.2 FIELD QUALITY CONTROL

- A. Field tests: Subject all portions of gas piping system, in sections or in entirety, to air pressure of 75 psig and prove airtight for 4 hours. Disconnect equipment not suitable for 75 psig pressure from piping system during test period.

END OF SECTION

SECTION 23 2600

CONDENSATE DRAIN PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install condensate drain piping as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0501: Common HVAC Requirements.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM B 88-03, 'Standard Specification for Seamless Copper Water Tube.'

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Materials:
 - 1. Condensate Drains:
 - a. Exterior And Interior Lines: Type M copper meeting requirements of ASTM B 88.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Condensate Drains:
 - 1. Support piping and protect from damage.

END OF SECTION

SECTION 23 3001**COMMON DUCT REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. General procedures and requirements for ductwork.
 - 2. Repair leaks in ductwork at areas of construction only, as identified by duct testing, at no additional cost to Owner.
- B. Related Requirements:
 - 1. Section 01 4316: Duct testing, adjusting, and balancing of ductwork.
 - 2. Section 07 9219: Quality of acoustic sealant.
 - 3. Section 23 0501: Common HVAC Requirements.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Schedule conference immediately before installation of ductwork.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: Specification data on sealer and gauze proposed for sealing ductwork.
 - 2. Samples: Sealer and gauze proposed for sealing ductwork.
- B. Informational Submittals:
 - 1. Manufacturer Instructions: Installation manuals providing detailed instructions on assembly, joint sealing, and system pressure testing for leaks.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Performance:
 - 1. Design Criteria:
 - a. Standard Ducts: Construction details not specifically called out in Contract Documents shall conform to applicable requirements of SMACNA HVAC Duct Construction Standards.
- B. Materials:
 - 1. Duct Hangers:
 - a. 1.5" inch by 18 ga galvanized steel straps or steel rods as shown on Drawings, and spaced not more than 6 feet apart. Do not use wire hangers.
 - b. Attaching screws at trusses shall be 2 inch No. 10 round head wood screws. Nails not allowed.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. During installation, protect open ends of ducts by covering with plastic sheet tied in place to prevent entrance of debris and dirt.
- B. Make necessary allowances and provisions in installation of sheet metal ducts for structural conditions of building. Revisions in layout and configuration may be allowed, with prior written approval of Architect. Maintain required airflows in suggesting revisions.
- C. Hangers And Supports:
 - 1. Install pair of hangers close to each transverse joint and elsewhere as required by spacing indicated in table on Drawings.
 - 2. Install upper ends of hanger securely to floor or roof construction above by method shown on Drawings.
 - 3. Attach strap hangers to ducts with cadmium-plated screws. Use of pop rivets or other means will not be accepted.
 - 4. Where hangers are secured to forms before concrete slabs are poured, cut off flush all nails, strap ends, and other projections after forms are removed.
 - 5. Secure vertical ducts passing through floors by extending bracing angles to rest firmly on floors without loose blocking or shimming. Support vertical ducts, which do not pass through floors, by using bands bolted to walls, columns, etc. Size, spacing, and method of attachment to vertical ducts shall be same as specified for hanger bands on horizontal ducts.

3.2 CLEANING

- A. Clean interior of new duct systems before final completion.

END OF SECTION

SECTION 23 3114

LOW-PRESSURE METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install above-grade low-pressure steel ducts and related items as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
 - 1. Duct smoke detectors.
- C. Related Requirements:
 - 1. Section 01 4316: Duct, Testing, Adjusting, and Balancing.
 - 2. Section 23 0713: Thermal Insulation for ducts, plenum chambers, and casings.
 - 3. Section 23 3001: Common Duct Requirements.
 - 4. Section 23 0933: Temperature control damper actuators and actuator linkages.
 - 5. Section 23 0933: Furnishing of duct smoke detectors.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A 653-08, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.'
 - 2. SMACNA, 'HVAC Duct Construction Standards, Metal, and Flexible, Third Edition' 2005.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Materials:
 - 1. Sheet Metal:
 - a. Fabricate plenum chambers zinc-coated, lock-forming quality steel sheets meeting requirements of ASTM A 653, with G 60 coating.
 - 2. Duct Sealer For Interior Ducts:
 - a. Approved Products.
 - 1) Duct Butter or Butter Tak by Cain Manufacturing Co Inc, Pelham, AL www.cainmfg.com.
 - 2) DP 1010 by Design Polymerics, Fountain Valley, CA www.designpoly.com.
 - 3) SAS by Duro Dyne, Bay Shore, NY or Duro Dyne Canada, Lachine, QB www.durodyne.com.
 - 4) Iron Grip 601 by Hardcast Inc, Wylie, TX www.hardcast.com.
 - 5) 15-325 by Miracle / Kingco, Div ITW TACC, Rockland, MA www.taccint.com.
 - 6) 44-39 by Mon-Eco Industries Inc, East Brunswick, NJ www.mon-ecoindustries.com.
 - 7) Airseal #11 by Polymer Adhesive Sealant Systems Inc, Weatherford, TX www.polymeradhesives.com.
 - 8) Water Base Duct Sealer by Airseal LLC, Columbus, OH www.mcgillairseal.com.
 - 3. Duct Sealer For Exterior Ducts:
 - a. Approved Products.

- 1) Hardcast DT Tape and RTA-50 liquid adhesive by Hardcast Inc, Wylie, TX
www.hardcast.com.

B. Fabrication:

1. General:

- a. Straight and smooth on inside with joints neatly finished.
- b. Duct drops to diffusers shall be round, to accommodate diffuser neck. Drops shall be glass-flex duct. Seal joints air tight.

2. Standard Ducts:

a. General:

- 1) Aluma-Flex ducts shall have vapor barrier and R-8.0 insulation. Dimensions shown on drawings are net clear inside dimensions.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work: Reseal transverse joint duct leaks and seal longitudinal duct joint leaks discovered during air test and balance procedures specified in Section 23 0593, at no additional cost to Owner.
- B. Install internal ends of slip joints in direction of flow. Seal transverse and longitudinal joints air tight using specified duct sealer. Cover horizontal and longitudinal joints on exterior ducts with two layers of specified tape installed with specified adhesive.
- C. Securely anchor ducts and plenums to building structure with specified duct hangers attached with screws. Do not hang more than one duct from a duct hanger. Brace and install ducts so they shall be free of vibration under all conditions of operation.
- D. Ducts shall not bear on top of structural members.
- E. Paint ductwork visible through registers, grilles, and diffusers flat black.
- F. Properly flash where ducts protrude above roof.
- G. Under no conditions will pipes, rods, or wires be allowed to penetrate ducts.

END OF SECTION

SECTION 23 3300**AIR DUCT ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install duct accessories in specified ductwork as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0933: Temperature control damper actuators and actuator linkages.
 - 2. Section 23 3001: Common Duct Requirements.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A 653-08, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.'
 - b. ASTM C 1071-05e1, 'Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).'
 - c. ASTM C 1338-08, 'Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.'

PART 2 - PRODUCTS**2.1 ACCESSORIES**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Air Balance Inc, Holland, OH www.airbalance.com.
 - b. Air-Rite Manufacturing, Bountiful, UT (801) 295-2529.
 - c. CertainTeed Corp, Valley Forge, PA www.certainteed.com.
 - d. Design Polymerics, Fountain Valley, CA www.designpoly.com.
 - e. Ductmate Industries Inc, East Charleroi, PA www.ductmate.com.
 - f. Duro Dyne, Bay Shore, NY www.durodyne.com.
 - g. Dyn Air Inc. Lachine, QB www.dynair.ca
 - h. Greenheck Corp, Schofield, WI www.greenheck.com.
 - i. Johns-Manville, Denver, CO www.jm.com.
 - j. Owens Corning, Toledo, OH www.owenscorning.com.
 - k. Polymer Adhesive Sealant Systems Inc, Irving, TX www.polymeradhesives.com.
 - l. Pottorff Company, Fort Worth, TX www.pottorff.com.
 - m. Ruskin Manufacturing, Kansas City, MO www.ruskin.com.
 - n. Sheet Metal Connectors Inc, Minneapolis, MN www.smcconnectors.com.
 - o. Techno Adhesive, Cincinnati, OH www.techoadhesives.com.
 - p. Titus, Richardson, TX (972) 699-1030. www.titus-hvac.com
 - q. McGill AirFlow, Groveport, OH www.mcgillairflow.com.
 - r. McGill AirSeal, Columbus, OH www.mcgillairseal.com.
 - s. Utemp Inc, Salt Lake City, UT (801) 978-9265.
 - t. Ventfabrics Inc, Chicago, IL www.ventfabrics.com.
 - u. Krueger Richardson, TX www.krueger-hvac.com.

B. Materials:**1. Acoustical Liner System:****a. Duct Liner:**

- 1) One inch thick, 1-1/2 lb density fiberglass conforming to requirements of ASTM C 1071. Liner will not support microbial growth when tested in accordance with ASTM C 1338.
- 2) Approved Products.
 - a) ToughGard by CertainTeed.
 - b) Duct Liner E-M by Knauf Fiber Glass.
 - c) Akousti-Liner by Manson Insulation.
 - d) Quiet R by Owens Corning.
 - e) Permacote Linacoustic HP by Johns-Manville.

b. Adhesive:

- 1) Approved Water-Based Products.
 - a) Cain: Hydrotak.
 - b) Design Polymeric: DP2501 or DP2502 (CMCL-2501).
 - c) Duro Dyne: WSA.
 - d) Elgen Manufacturing: A-410-WB.
 - e) Hardcast: Coil-Tack.
 - f) Miracle / Kingco: PF-101.
 - g) Mon-Eco: 22-67 or 22-76.
 - h) Polymer Adhesive: Glasstack #35.
 - i) Techno Adhesive: 133.
 - j) McGill Airseal: Uni-tack.
- 2) Approved Solvent-Based (non-flammable) Products.
 - a) Cain: Safetak.
 - b) Duro Dyne: FPG.
 - c) Hardcast: Glas-Grip 648-NFSE.
 - d) Miracle / Kingco: PF-91.
 - e) Mon-Eco: 22-24.
 - f) Polymer Adhesive: Q-Tack.
 - g) Techno Adhesive: 'Non-Flam' 106.
- 3) Approved Solvent-Based (flammable) Products.
 - a) Cain: HV200.
 - b) Duro Dyne: MPG.
 - c) Hardcast: Glas-Grip 636-SE.
 - d) Miracle / Kingco: PF-96.
 - e) Mon-Eco: 22-22.
 - f) Polymer Adhesive: R-Tack.
 - g) Techno Adhesive: 'Flammable' 106.

c. Fasteners:

- 1) Adhesively secured fasteners not allowed.
- 2) Approved Products.
 - a) AGM Industries Inc: 'DynaPoint' Series RP-9 pin.
 - b) Cain.
 - c) Duro Dyne.
 - d) Gripnails may be used if each nail is installed by 'Grip Nail Air Hammer' or by 'Automatic Fastener Equipment' in accordance with Manufacturer's recommendations.

2. Flexible Equipment Connections:

- a. 30 oz closely woven UL approved glass fabric, double coated with neoprene.
- b. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of 200 deg F.
- c. Approved Products.
 - 1) Cain: N-100.
 - 2) Duro Dyne: MFN.
 - 3) Dyn Air: CPN with G-90 galvanized off-set seam
 - 4) Elgen: ZLN / SDN.
 - 5) Ventfabrics: Ventglas.
 - 6) Ductmate: ProFlex.

3. Duct Access Doors:

- a. General:
 - 1) Factory built insulated access door with hinges and sash locks, as necessary. Construction shall be galvanized sheet metal, 24 ga minimum.
 - 2) Fire and smoke damper access doors shall have minimum clear opening of 12 inches square or larger as shown on Drawings.
- b. Rectangular Ducts:
 - 1) Approved Products.
 - a) Air Balance: Fire/Seal FSA 100.
 - b) Air-Rite: Model HAD-2.
 - c) Cesco: HDD.
 - d) Elgen Manufacturing: TAB Type / Hinge and Cam.
 - e) Flexmaster: Spin Door.
 - f) Kees Inc: ADH-D.
 - g) Nailor: 085H-01.
 - h) Pottorff: 60-HAD.
 - i) Ruskin: ADH-24.
- c. Round Ducts:
 - 1) Approved Products.
 - a) Ductmate: 'Sandwich' Access Door.
 - b) Elgen Manufacturing: Sandwich Access Door.
 - c) Kees Inc: ADL-R.
 - d) Nailor: 0809.
 - e) Pottorff: RAD.
 - f) Ruskin: ADR.
- 4. Dampers And Damper Accessories:
 - a. Locking Quadrant Damper Regulators:
 - 1) Approved Products.
 - a) Duro Dyne: KS-385.
 - b) Dyn Air: QPS-385.
 - c) Elgen Manufacturing: EQR-4.
 - d) Ventfabrics: Ventline 555.
 - e) Young: No. 1.
 - b. Concealed Ceiling Damper Regulators:
 - 1) Approved Products.
 - a) Cain.
 - b) Duro Dyne.
 - c) Elgen Manufacturing.
 - d) Metco Inc.
 - e) Ventfabrics: 666 Ventlok.
 - f) Young: 301.
 - c. Volume Dampers:
 - 1) Round Ducts:
 - a) Damper Blades:
 - (1) Steel with mechanically locked blade seals.
 - (2) Blade seals shall be neoprene or polyethylene.
 - (3) Single blade type.
 - b) Approved Products. (1) Air Balance: AC 25.
 - (2) American Warming: VC25.
 - (3) Arrow: Type 70 or 75.
 - (4) C & S: AC25R.
 - (5) Cesco: AGG.
 - (6) Honeywell: D-690.
 - (7) Nailor: 1090.
 - (8) Pottorff: CD-25R.
 - (9) Ruskin: CD25.
 - d. Backdraft Dampers:
 - 1) Backdraft blades shall be nonmetallic neoprene coated fiberglass type.
 - 2) Stop shall be galvanized steel screen or expanded metal, 1/2 inch mesh.
 - 3) Frame shall be galvanized steel or extruded aluminum alloy.
 - 4) Approved Products.

- a) Air-Rite: Model BDD-3.
 - b) American Warming: BD-15.
 - c) C & S: BD30.
 - d) Cesco: FBD 101.
 - e) Daniel: FBD-H/V.
 - f) Pottorff: 50FBD.
 - g) Ruskin: NMS2.
 - h) UTEMP: BFEA.
5. Branch Tap for Flexible Ductwork:
- a. Factory-manufactured rectangular-to-round 45 degree leading tap fabricated of 24 ga zinc-coated lock-forming quality steel sheets meeting requirements of ASTM A 653, with G-90 coating.
 - b. One inch wide mounting flange with die formed corner clips, pre-punched mounting holes, and adhesive coated gasket.
 - c. Manual Volume Damper:
 - 1) Single blade, 22 ga minimum
 - 2) 3/8 inch minimum square rod with brass damper bearings at each end.
 - 3) Heavy-duty locking quadrant on 1-1/2 inch high stand-off mounting bracket attached to side of round duct.
 - d. Approved Products.
 - 1) ST-1HD by Air-Rite.
 - 2) STO by Flexmaster.
 - 3) HET by Sheet Metal Connectors.
- C. Fabrication:
- 1. Duct Liner:
 - a. Install mat finish surface on airstream side. Secure insulation to cleaned sheet metal duct with continuous 100 percent coat of adhesive and with 3/4 inch long mechanical fasteners 12 inches on center maximum unless detailed otherwise on Drawings. Pin all duct liner.
 - b. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation shall overlap sides. If liner is all one piece, folded corners shall be tight against metal. Ends shall butt tightly together.
 - c. Coat longitudinal and transverse edges of liner with adhesive.
 - 2. Air Turns:
 - a. Permanently install vanes arranged to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
 - b. Quiet and free from vibration when system is in operation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Duct Liner:
 - 1. Furnish and install acoustic lining in following types of ducts:
 - a. Supply air.
 - b. Return air.
- B. Access Doors In Ducts:
 - 1. Install within 6 inches of fire dampers. Install on side of duct that allows easiest access to damper.
- C. Dampers And Damper Accessories:
 - 1. Install concealed ceiling damper regulators.
 - a. Paint cover plates to match ceiling tile.
 - b. Do not install damper regulators for dampers located directly above removable ceilings or in Mechanical Rooms.
 - 2. Provide each take-off with an adjustable volume damper to balance that branch.

- a. Anchor dampers securely to duct.
- b. Install dampers in main ducts within insulation.
- c. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.
- d. Where concealed ceiling damper regulators are installed, provide cover plate.

END OF SECTION

SECTION 23 3346**FLEXIBLE DUCTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install supply air branch duct runouts to diffusers as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: Common Duct Requirements.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Anco Products Inc, Elkhart, IN www.ancoproductsinc.com.
 - b. Thermaflex by Flexible Technologies, Abbeville, SC www.thermaflex.net.
 - c. Flexmaster USA Inc, Houston, TX www.flexmasterusa.com
- B. Materials:
 - 1. Ducts:
 - a. Formable, flexible, circular duct which shall retain its cross-section, shape, rigidity, and shall not restrict airflow after bending.
 - b. Insulation: Nominal 1-1/2 inches, 3/4 lb/cu ft density fiberglass insulation with air-tight, polyethylene or polyester core, sheathed in seamless vapor barrier jacket factory installed over flexible assembly.
 - c. Assembly, including insulation and vapor barrier, shall meet Class I requirement of NFPA 90A-1989 and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.
 - d. Approved Products.
 - 1) ANCO-FLEX 4625 by Anco Products.
 - 2) M-KC by Thermaflex by Flexible Technologies.
 - 3) Type 4m Insulated by Flexmaster.
 - 2. Cinch Bands: Nylon, 3/8 inch removable and reusable type.

PART 3 - EXECUTION**PART 4 - INSTALLATION**

- A. Install duct in fully extended condition free of sags and kinks, using 72 inch maximum lengths.
- B. Make duct connections by coating exterior of duct collar for 3 inches with duct sealer and securing duct in place over sheet metal collar with specified cinch bands.

END OF SECTION

SECTION 23 3400**HVAC FANS GREASE HOOD AND EVAPORATIVE COOLER****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install exhaust fans as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: Common Duct Requirements.
 - 2. Division 26: Control device and electrical connection.

1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Bear AMCA seal and UL label.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
 - 1. Captive Aire, Raleigh, NC www.captiveaire.com.
 - 2. Greenheck Corp, Schofield, WI www.greenheck.com.
 - 3. Loren Cook Co, Springfield, MO www.lorencook.com.

2.2 MANUFACTURED UNITS

- A. Ceiling Mounted Exhaust Fans:
 - 1. Acoustically insulated housings. Sound level rating of 3.8 sones maximum for fan RPM and CFM listed on Drawings.
 - 2. Include chatterproof integral back-draft damper with no metal-to-metal contact.
 - 3. True centrifugal wheels.
 - 4. Entire fan, motor, and wheel assembly shall be easily removable without disturbing housing.
 - 5. Suitably ground motors and mount on rubber-in shear vibration isolators.
 - 6. Provide wall or roof cap, as required.
 - 7. Class One Quality Standards: Cook Gemini
 - 8. Approved Manufacturers. See Section 01 6200
Broan, Cook-Gemini, Greenheck
- B. Roof Mounted Exhaust Fans:
 - 1. Non-overloading backward inclined wheels, blades and inlets.
 - 2. Variable pitch motor pulley.
 - 3. External disconnect switch.
 - 4. Fully welded grease drain.
 - 5. Grease collection box.
 - 6. Pitched, vented roof curb.
 - 7. Base hinging kit or hinged sub-base
 - 8. Approved Manufacturers. See Section 01 6200.
Captive Aire, Acme, Cook

- C. Roof Mounted Evaporative Cooler:
 - 1. Heavy gauge galvanized steel cabinet.
 - 2. One piece drawn bottom pan.
 - 3. Chem treated adjustable water troughs in pad frames.
 - 4. Bleed-off kit and, pump and float kit.
 - 5. Electrically interlocked with H-1 and EF-1.
 - 6. Platform by general contractor.
 - 7. Level roof platform.
 - 8. Class One Quality Standards: Champion
 - 9. Approved Manufacturers. See Section 01 6200.

- D. Type I Grease Hood:
 - 1. Stainless Steel Construction, ETL and NSL Listed.
 - 2. Grease Filters; stainless steel baffle type with handles.
 - 3. Ansul Fire Suppression System.
 - 4. Front Perforated Supply plenum for makeup air.
 - 5. Recessed incandescent lighting.
 - 6. Grease Drain system
 - 7. Pre-punched hanging angles.
 - 8. Approved Manufacturers. See Section 01 6200.
 - a. Captive Aire, Accurex

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Anchor equipment securely to structure or to curb.

END OF SECTION

SECTION 23 3713**DIFFUSERS, REGISTERS, AND GRILLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install diffusers, registers, and grilles connected to ductwork as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: General Duct Requirements.

1.2 SUBMITTALS

- A. Maintenance Material Submittals:
 - 1. Tools: Leave tool for removing core of each different type of grille for building custodian.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
 - 1. Krueger Air System Components, Richardson, TX www.krueger-hvac.com.
 - 2. Nailor Industries Inc, Houston, TX or Weston, ON www.nailor.com.
 - 3. Titus, Richardson, TX www.titus-hvac.com.
 - 4. Tuttle & Bailey, Richardson, TX www.tuttleandbailey.com.

2.2 MANUFACTURED UNITS

- A. Supply Grilles And Registers:
 - 1. Finish: Off-white baked enamel.
 - 2. Removable core.
 - 3. Approved Products.
 - a. Krueger: 51450 t-bar lay-in or equal.
- B. Ceiling Return And Transfer Grilles:
 - 1. Finish: Off-white baked enamel.
 - 2. 3/4 inch spacing.
 - 3. Approved Products.
 - a. Krueger: S580 t-bar lay-in or equal.
 - b. Krueger, Metal*Aire, Titus.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Anchor securely into openings. Secure frames to ductwork by using four sheet metal screws, one per side. Level floor registers and anchor securely into floor.

END OF SECTION

SECTION 23 4100**AIR FILTERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install filters used in mechanical equipment.
- B. Related Requirements:
 - 1. Section 23 3001: Common Duct Requirements.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Air Handling Unit Filters:
 - 1. 2 inch thick, medium efficiency, disposable type pre-formed pleated design, having at least 4.5 sq ft of filtering media per sq ft of face area.
 - 2. Media shall be reinforced non-woven cotton fabric, treated with adhesive similar to 'Vyclad B' and continuously laminated to supporting steel wire grid conforming to configuration of pleats.
 - 3. Media pack shall be sealed in a chipboard frame or beverage board.
 - 4. Filters shall have rated average efficiency of 25 to 30 percent on ASHRAE Test Standard 52-76 and be capable of operating with variable face velocities up to 500 FPM without impairing efficiency.
 - 5. Initial resistance shall not exceed 0.30 inches wg at 500 FPM or 0.14 inch wg at 300 FPM. Filter shall be listed Class 2 by UL.
 - 6. Approved Products.
 - a. DP-40 by Airguard Industries Inc, Louisville, KY www.airguard.com.
 - b. Aerostar Series 400 by Filtration Group, Santa Rosa, CA www.filtrationgroup.com.
 - c. PrePleat 40 by Flanders, St Petersburg, FL www.flanderscorp.com.
 - d. Type 30/30 by Camfil Farr Co, Riverdale, NJ www.camfilfarr.com

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Provide ample access for filter removal.

3.2 FIELD QUALITY CONTROL

- A. Inspection: At date of Substantial Completion, air filters shall be new, clean, and approved by Owner's representative.

END OF SECTION

SECTION 23 5134

FLUES

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install flues as described in Contract Documents.
- B. Related Requirements:
 - 1. Sections Under 09 9000 Heading: Painting.
 - 2. Section 23 0501: Common HVAC Requirements.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Acme Engineering & Manufacturing Corp, Muskogee, OK www.acmefan.com.
 - b. AMPCO, Holland, MI www.americanmetalproducts.com.
 - c. Breidert Air Products, Jacksonville, FL www.breidert.com.
 - d. Heat-Fab Inc, Turners Falls, MA www.heat-fab.com.
 - e. Metal-Fab Inc, Wichita, KS www.mtlfab.com.
 - f. Metlvent by Hart & Cooley, Holland, MI www.hartandcooley.com.
 - g. Protech Systems, Albany, NY www.protechinfo.com.
 - h. Selkirk Metalbestos, Logan, OH www.selkirkusa.com.
 - i. Simpson Dura-Vent Co, Vacaville, CA www.duravent.com.
 - j. Z-Flex (US) Inc, Bedford, NH www.z-flex.com.
- B. Materials:
 - 1. Flues:
 - a. Double wall, factory-fabricated sectional type 'B', of aluminum construction designed to handle combustion products of fuel being used. Provide with inspection cap as required by local code, roof flashing, and clean-out.
 - b. Size flues according to local codes except:
 - 1) No vertical flue shall have an area of less than 12-1/2 sq inches, 4 inches in diameter.
 - 2) In no case shall vent connector be smaller than outlet collar provided by Manufacturer.
 - c. Horizontal flue connectors shall be double wall.
 - d. Fittings shall be pre-fabricated double wall.
 - e. Approved Products.
 - 1) Ameri-Vent by AMPCO.
 - 2) Metal-Fab Inc.
 - 3) Metlvent by Hart & Cooley.
 - 4) Selkirk Metalbestos.
 - 5) Simpson Dura-Vent.
 - 2. Vent Caps:
 - a. Non-backdraft type for installation on top of flue, aluminum construction.
 - b. Approved Products.
 - 1) Mastervent Type MVR by Acme Engineering & Manufacturing.
 - 2) Ameri-cap by AMPCO.
 - 3) Type L by Breidert Air Products.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Height of flue above roof shall be as shown on Drawings unless local code requires it be higher.
- B. Every portion of flue connector shall have rise of one inch per ft minimum from appliance to vertical flue.
- C. Length of horizontal flues or flue connectors shall not be longer than 75 percent of height of vertical flue between point at which horizontal flue enters vertical flue to top of vertical flue. In no case shall horizontal run exceed 15 feet.
- D. When two or more flue connections enter common vertical flue, smaller flue connector shall enter at higher level. Do not enter flue connectors in same horizontal plane.
- E. Every gas appliance flue shall have a 'backdraft preventer' installed at top of flue.

END OF SECTION

SECTION 23 7413
PACKAGED OUTDOOR UNIT**PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install packaged air conditioning units as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0501: Common Mechanical Requirements.

1.2 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Air-Cooled Condensing Unit Section shall be UL approved and rated according to ARI Standards.
 - 2. Air delivery of units certified in accordance with standard test code for centrifugal fans adopted by AMCA.
 - 3. Furnace sections shall be AGA approved.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Ship units with lifting angles and fully charged with refrigerant.

1.4 WARRANTY

- A. 5 year warranty on compressors.

PART 2 - PRODUCTS**2.1 PERFORMANCE**

- A. Capacities:
 - 1. SEER rating, as defined by ARI, shall be not less than 13.0 for units 5 tons and smaller.
 - 2. EER rating, as defined by ARI, shall be not less than 9.5 for units larger than 5 tons.

2.2 MANUFACTURED UNITS

- A. Air Conditioning Units:
 - 1. Units shall be completely factory assembled and tested. Units shall include following components and features:
 - a. Condenser coils.
 - b. Condenser fans and motors.
 - c. Interconnected wiring.
 - d. Pre-wired control panel.
 - e. Filter section.

- f. Factory installed 100 percent modulating economizer cycle including motorized dampers and controls.
- g. Corrosion-resistant all-weather cabinet.
2. Air-Cooled Condensing Unit Section:
 - a. Strainer-dryer.
 - b. Time delay or cycle protection to prevent short cycling.
 - c. Condenser Coil: 1/2 inch outside diameter copper tube with aluminum fins. Include condenser coil hail guard assembly.
 - d. Compressors:
 - 1) Equip with crankcase heater.
 - 2) Fully hermetic scroll type internally protected. Independent circuits for units 7-1/2 tons and larger.
 - 3) On units 3 tons and larger, mount on factory rubber-shock, internal spring vibration isolators.
 - e. Condenser Fan: Axial flow type propeller fan.
 - f. Refrigerant Coils: Constructed of copper tubes with mechanically bonded aluminum plate fins.
 - g. Refrigerant lines shall have:
 - 1) Flexible connections.
 - 2) Suction and liquid line service valves.
 - 3) Charging valves.
 - 4) Receiver valve.
3. Furnace Section:
 - a. Units Smaller Than 3 Tons:
 - 1) Aluminized or chromized heat exchanger.
 - 2) Induced-draft motor with solid-state sensor for adequate airflow.
 - b. Units 3 Tons And Larger:
 - 1) Tubular section type of 20 ga steel minimum with 1.2 mil nominal aluminum-silicone alloy coating.
 - 2) Factory-installed induced draft blower.
 - c. Gas shut-off valve.
 - d. High limit switches.
 - e. Fan switch safety pilot and control transformer.
 - f. Automatic electric ignition.
4. Fan Section:
 - a. Indoor Blower (evaporator fan):
 - 1) Steel with corrosion-resistant finish and dynamically balanced. Bearings shall be sealed, permanently lubricated, ball bearing type.
 - 2) Belt driven, double inlet, forward curved centrifugal type with adjustable pitch motor pulley.
 - b. Condenser fan shall be direct-driven propeller type and discharge upward. Condenser fan shall have blades riveted to corrosion-resistant steel spiders and be dynamically balanced. Condenser motor shall be totally enclosed.
 - c. Constructed and tested in accordance with AMCA requirements.
 - d. Furnish with flexible connections with weather protection on supply and return air take-offs.
 - e. Evaporator-fan cabinet interior shall be insulated with 1/2 inch thick minimum fiber glass insulation coated on air side. Use Aluminum foil-faced insulation in heating compartment.
5. Controls:
 - a. Low ambient and dual pressure.
 - b. Pre-wired.
 - c. Low voltage control circuit with fuse protection on 24 V transformer side.
 - d. Solid state compressor protection for following factory-supplied safeties:
 - 1) Compressor over-temperature, over-current.
 - 2) Loss of charge / low-pressure switch.
 - 3) Freeze protection thermostat, evaporator coil.
 - 4) High-pressure switch.
 - e. Following minimum protection for heating section:
 - 1) High temperature limit switch.
 - 2) Flame rollout switch.
 - 3) Flame proving controls on units larger than 3 tons.

6. Cabinets:
 - a. Galvanized and weatherproof, with baked enamel finish on externally exposed surfaces and primed interior panel surfaces. Evaporator fan, compressor, and filter panels.
7. Class One Quality Standard: York ZF
 - a. Acceptable Manufacturers
 - 1) York www.york.com
 - 2) Lennox Industries, Dallas, TX www.lennox.com.
 - 3) Trane Co, La Crosse, WI www.trane.com.

2.3 ACCESSORIES

- A. Standard 8" roof curb, economizer, barometric relief, CO2 sensor, smoke detector, filters & t-stat.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install unit on roof curb.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Equipment Manufacturer to provide start-up service.

END OF SECTION

DIVISION 26: ELECTRICAL

26 0000 ELECTRICAL

- 26 0100 ELECTRICAL GENERAL PROVISIONS
- 26 0500 BASIC ELECTRICAL MATERIALS AND METHODS
- 26 0613 ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE

26 1000 LOW (LINE) VOLTAGE DISTRIBUTION

- 26 1110 CONDUIT AND WIRE
- 26 1600 BRANCH CIRCUIT PANELBOARDS, DISTRIBUTION PANELS AND TERMINAL CABINETS

26 4000 LIGHTING

- 26 4250 SWITCHBOARDS

26 5000 LIGHTING

- 26 5100 INTERIOR LIGHTING (16510)
- 26 5600 EXTERIOR LIGHTING

END OF TABLE OF CONTENTS

SECTION 26 0100**ELECTRICAL GENERAL PROVISIONS****PART 1 - GENERAL****1.1 SCOPE**

- A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to, the following:
 - 1. Examine all other sections for work related to those other sections and required to be included as work under this section.
 - 2. General provisions and requirements for electrical work.
 - 3. Division-1.
- B. Organization of the specifications into divisions, sections and articles, and arrangement of drawings shall not control the CONTRACTOR in dividing the contract work among subcontractors or in establishing the extent of work to be performed by any trade.

1.2 GENERAL SUMMARY OF ELECTRICAL WORK

- A. The specifications and drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material for the proper execution of the work in accordance with present practice of the trade shall not relieve the CONTRACTOR from providing such additional labor and materials.
- B. Refer to the drawings and shop drawings of other trades for additional details, which affect the proper installation of this work. Diagrams and symbols showing electrical connections are diagrammatic only. Wiring diagrams do not necessarily show the exact physical arrangement of the equipment.
- C. Before submitting a bid, the CONTRACTOR shall become familiar with all features of the building drawings and site drawings, which may affect the execution of the work. No extra payment will be allowed for failure to obtain this information.
- D. If there are omissions or conflicts between the drawings and specifications, clarify these points with the OWNER'S REPRESENTATIVE before submitting bid and before commencing work.
- E. Provide work and material in conformance with the manufacturer's published recommendations for respective equipment and systems.

1.3 LOCATIONS OF EQUIPMENT

- A. The drawings indicate diagrammatically the desired locations or arrangements of conduit runs, outlets, equipment, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structure conditions encountered.
- B. In the event changes in the indicated locations or arrangements are necessary, due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without cost to the contract, providing the change is ordered before the conduit runs, etc., and work directly connected to same is installed and no extra materials are required.
- C. Coordinate and cooperate in every way with other trades in order to avoid interference and assure a satisfactory job.

- D. The location of the existing utilities, building, equipment and conduit shown on the drawings is approximate.

1.4 ELECTRICAL SERVICE

- A. Conform to all requirements of the serving utility company.
- B. Contractor shall submit Electrical Utility metering and electrical service entrance equipment shop drawings to the Electric Utility Company supplying the project for review and approval by the serving Utility Company. The submittal and acceptance by the Utility shall occur prior to submitting of shop drawings to the OWNER'S Representative or A/E for review. Copies of the serving Electrical Utility approval of the equipment shall be included in the shop drawings submittals to the OWNER'S Representative and A/E.

1.5 PERMITS

Take out and pay for all required permits, inspections and examinations without additional cost to the OWNER.

1.6 QUALITY ASSURANCE

- A. Work and materials shall be in full accordance with the latest rules and regulations as follows. The following publications shall be included in the contract documents requirements. If a conflict occurs between the following publications and any other part of the contract documents, the requirements describing the more restrictive provisions shall become the applicable contract definition:
1. California Code of Regulations Title 24.
 2. California Part 3 "California Electrical Code" CEC, Title 24 and Title 8 "Division of Industrial Safety".
 3. California Building Code - CBC.
 4. The National Electrical Code.
 5. The National Life Safety Code.
 6. The Uniform Building Code-UBC.
 7. National Fire Protection Agency-NFPA.
 8. Underwriter's Laboratory-UL.
 9. Other applicable State and Local Government Agencies laws and regulations.
 10. Electrical Installation Standards National Electrical Contractors Association (NECA) and National Electrical Installation Standards (NEIS):
 - a. NECA/NEIS-1: Standard of Practices for Good Workmanship in Electrical Contracting
 - b. NECA/NEIS-101: Standard for Installing Steel Conduit (Rigid, IMC, etc.)
 - c. NECA/NEIS-111: Recommended Practice Installing Nonmetallic Raceways
 - d. NECA/NEIS-305: Standard for Fire Alarm System Job Practice
 - e. NECA/NEIS-331: Standards for Installing Building and Service Entrance Grounding
 - f. NECA/NEIS-400: Recommended Practice for Installing and Maintaining Switchboards
 - g. NECA/NEIS-402: Recommended Practice for Installing and Maintaining Motor Control Centers
 - h. NECA/NEIS-407: Recommended Practice for Installing Panelboards
 - i. NECA/NEIS-409: Recommended Practice for Installing and Maintaining Dry-Type Transformers
 - j. NEIS/NECA & IESNA-500: Recommended Practice for Installing Indoor Commercial Lighting Systems
 - k. NEIS/NECA & IESNA-501: Recommended Practice for Installing Exterior Lighting Systems

- B. All material and equipment shall be new and shall be delivered to the site in unbroken packages. All material and equipment shall be listed and labeled by Underwriters Laboratories or other recognized testing laboratories, where such listings are available. Comply with all installation requirements and restrictions pertaining to such listings.
- C. Work and material shown on the drawings and in the specifications is new and included in the contract unless specifically indicated as existing or N.I.C. (not in contract).
- D. Keep a copy of all applicable codes and standards available at the job site at all times for reference while performing work under this contract. Nothing in plans or specifications shall be construed to permit work not conforming to the most stringent of building codes.
- E. Where a conflict or variation occurs between applicable Codes, standards and/or the Contract Documents, the provisions of the most restrictive provision shall become the requirement of the Contract Documents.

1.7 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. General

1. Review of CONTRACTOR'S submittals is for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. CONTRACTOR is responsible for quantities; dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of work with that of all other trades and satisfactory performance of their work.
2. The CONTRACTOR shall review each submittal in detail for compliance with the requirements of the contract documents prior to submittal. The CONTRACTOR shall "Ink Stamp" and sign each item of the submittal with a statement "CERTIFYING THE SUBMITTAL HAS BEEN REVIEWED BY THE CONTRACTOR AND COMPLIES WITH ALL THE REQUIREMENTS OF THE CONTRACT DOCUMENTS". The CONTRACTOR shall clearly and specifically identify each individual proposed substitution, substitution of equal, or proposed deviation from the requirements of the contract documents with a statement "THIS ITEM IS A SUBSTITUTION".

The burden of research, preparation of calculations and the furnishing of adequate and complete shop drawings information to demonstrate the suitability of CONTRACTOR's proposed substitutions and suitability of proposed deviations from the contract documents is the responsibility of the CONTRACTOR.

3. Departure from the submittal procedure will result in resubmittals and delays. Failure of the CONTRACTOR to comply with the submittal requirements shall render void any acceptance or any approval of the proposed variation. The CONTRACTOR shall then be required to provide the equipment or method without variation from the contract documents and without additional cost to the contract.
4. The CONTRACTOR at no additional cost or delays to the contract shall remove any work, material and correct any deficiencies resulting from deviations from the requirements of the contract documents not approved in advance by the OWNER prior to commencement of work.
5. Shop drawings submitted by the CONTRACTOR, which are not specifically required for submittal by the Contract Documents, or CONTRACTOR shop drawings previously reviewed and resubmitted without a written resubmittal request to the CONTRACTOR, will not be reviewed, considered, or commented on. The respective shop drawing submittal/resubmittal will not be returned to the CONTRACTOR and will be destroyed without comment or response to the CONTRACTOR. The respective submittal shall be considered null and void as being not in compliance with the requirements of the Contract Documents.
6. Refer to Division-1 for additional requirements.

B. Material Lists and Shop Drawings

1. Submit material list and equipment manufacturers for review within 10 days of award of contract. Give name of manufacturer and where applicable, brand name, type and/or catalog number of each item. Listing of more than one manufacturer for any one item of equipment, or listing items

"as specified", without both make and model or type designation, is not acceptable. Shop drawings shall not be submitted before review completion of manufacturers list. The right is reserved to require submission of samples of any material whether or not particularly mentioned herein.

2. After completion of review of the material and equipment manufacturers list, submit shop drawings for review. Shop drawings shall be submitted in completed bound groups of materials (i.e., all lighting fixtures or all switchgear, etc.). The CONTRACTOR shall verify dimensions of equipment and be satisfied as to fit and that they comply with all code requirements relating to clear working space about electrical equipment prior to submitting shop drawings for review. Submittals, which are intended to be reviewed as substitution or departure from the contract documents, must be specifically noted as such. The requirements of the contract documents shall prevail regardless of the acceptance of the submittal.
3. Shop drawings shall include catalog data sheets, instruction manuals, installation sheet, dimensioned plans, elevations, details, wiring diagrams and descriptive literature of component parts where applicable as well as manufacturer's name, catalogue number and name of local supplier. Shop drawing shall indicate precise equipment to be used, including all options specified. Indicate wording and format of nameplates where applicable. Structural calculations and mounting details, signed by a Structural ENGINEER registered by the State of California, shall be submitted for all equipment weighing over four hundred pounds, and shall be in compliance with Title 21 of the California Code of Regulations. Submit test and evaluation reports of site tests before Substantial Completion.
4. Each shop drawing item shall be identified with the specification section and paragraph numbers, lighting fixture types and drawing sheet numbers; the specific shop drawing is intended to represent. Shop drawings 11" x 17" or smaller in size shall be bound in 3-ring binders. Divider tabs shall be provided in the 3-ring binders identifying and separating each separate shop drawing submittal item. Shop drawings larger than 11" x 17", shop drawing pages/sheets submittals shall be sequentially numbered with unique alphanumeric numbering system to facilitate correspondence referencing identification of individual sheets.
5. The time required to review and comment on the CONTRACTOR'S submittals will not be less than 7 calendar days, or more than 21 calendar days after receipt of the submittals at the office of FBA Engineering. The review of CONTRACTOR submittals and return to CONTRACTOR of submittals with review comments will occur in a timely manner conditioned upon the CONTRACTOR complying with all of the following:
 - a. The submittals contain complete and accurate information, complying with the requirements of the Contract Documents.
 - b. CONTRACTOR'S submittals are each marked with CONTRACTOR'S approval "stamp", and with CONTRACTOR signatures.
 - c. The submittals are received in accordance with a written, shop drawing submittal schedule for each submittal. The CONTRACTOR distributes the schedule not less than 35-day calendar days in advance of the Shop Drawing Submittals, and the schedule identifies the calendar dates, the CONTRACTOR will deliver the various submittals for review.
6. Shop drawings shall include the manufacturers projected days for shipment from the factory of completed equipment, after the CONTRACTOR releases the equipment for production. It shall be the responsibility of the CONTRACTOR to insure that all material and equipment is ordered in time to provide an orderly progression of the work. The CONTRACTOR shall notify the OWNER'S Representative of any changes in delivery, which would affect the project completion date.
7. Submittal Identification
 - a. Each submittal shall be dated: with submittal transmission date; sequentially numbered and titled with submittal contents identification and applicable specification/drawing references (i.e., Submittal dated: 5/12/98 Submittal #4 Contents: Branch circuit panelboards Sheet #E5.1 and transformers Specification Section 26 0500 Paragraph 2.11, etc.).
 - b. Each resubmittal shall be dated: with original submittal date and resubmittal transmission dates; sequentially numbered with original submittal number and sequential resubmittal revision number and titled with submittal contents identification and applicable specifications/drawing references (i.e., Original Submittal Date: 5/12/98 Resubmittal Date: 10/9/98 Original Submittal #4 resubmittal Revision R2 Contents: Transformer resubmittal Specification Section - 26 0500 Paragraph 2.11, etc.)

- C. The CONTRACTOR shall be responsible for incidental, direct and indirect costs resulting from the CONTRACTOR'S substitution of; or changes to; the specified contract materials and work.
- D. The CONTRACTOR shall pay, upon request by the OWNER'S Representative, a fee for the OWNER'S Representative time involved in the review of substitution submittals and design changes resulting from the CONTRACTOR'S requested substitutions. The fee shall be not less than \$125.00 per hour but, in no case, less than stated in Division-1, whichever is greater.
- E. Maintenance and Operating Manuals
 - 1. The CONTRACTOR shall furnish Four copies of typewritten maintenance and operating manuals for all electrical equipment, to the OWNER.
 - 2. Maintenance and operating manuals shall be bound in three-ring, hard-cover, plastic binders with table of contents. Manuals shall be delivered to the OWNER's Representative, with an itemized receipt.
- F. Portable or Detachable Parts: The CONTRACTOR shall retain in his possession, and shall be responsible for all portable and detachable parts or portions of the installation such as fuses, keys, locks, adapters, locking clips, and inserts until final completion of contract work. These parts shall then be delivered to the OWNER's Representative with an itemized receipt.
- G. Record Drawings (ADDITIONAL REQUIREMENTS)
 - 1. Provide and maintain in good order a complete set of electrical contract "record" prints. Changes to the contract to be clearly recorded on this set of prints. At the end of the project, transfer all changes to one set of transparencies to be delivered unfolded to the OWNER'S Representative.
 - 2. The actual location and elevation of all buried lines, boxes, monuments, vaults, stub-outs and other provisions for future connections shall be referenced to the building lines or other clearly established base lines and to approved bench marks. If any necessary dimensions are omitted from the record drawings, the CONTRACTOR shall, at THE Contractor's own expense, do all excavation required to expose the buried work and to establish the correct locations.
 - 3. The CONTRACTOR shall keep the "record" prints up to date and current with all work performed.
 - 4. Refer to Division-1 for additional requirements.
- H. Scheduling
 - 1. Include detailed sequence of individual electrical demolition operations on Construction Schedule specified in Section 01 3200.
 - 2. Coordinate with Owner for equipment and materials to be removed by Owner.

1.8 CLEANING EQUIPMENT, MATERIALS, PREMISES

All parts of the equipment shall be thoroughly cleaned of dirt, rust, cement, plaster, etc., and all cracks and corners scraped out clean. Surfaces to be painted shall be carefully cleaned of grease and oil spots and left smooth, clean and in proper condition to receive paint finish.

Remove obsolete raceways, conductors, apparatus and lighting fixtures promptly from site and dispose of legally.

1.9 JOB CONDITIONS - PROTECTION

Protect all work, materials and equipment from damage from any cause whatever and provide adequate and proper storage facilities during the progress of the work. Provide for the safety and good condition of all the work until final acceptance of the work by the OWNER and replace all damaged or defective work, materials and equipment before requesting final acceptance.

1.10 CUTTING AND PATCHING ADDITIONAL REQUIREMENTS

- A. General

1. Perform cutting, and patching of the construction work required for the proper installation of the electrical work.
2. Patching shall be of the same material, thickness, workmanship and finish as existing and accurately match surrounding work to the satisfaction of the OWNER'S Representative.
3. Prior to penetrating, coring, drilling or cutting existing building elements, concrete and/or masonry, provide imaging equipment examinations of each specific location. The imaging process shall identify existing internal embedded components and locations, including structural elements/anchors, conduit, and piping that are present. Do not penetrate or damage the existing internal embedded elements. Imaging shall employ one of the following, with GPR methodology preferred:
 - a. Non-invasive imaging employing high frequency, ground penetrating radar (GPR), single side echo reflection technology.
 - b. Non-invasive imaging employing x-ray radiography, through-and through imaging technology.

1.11 IDENTIFICATION

- A. Equipment Nameplates
 1. Panelboards, terminal cabinets, circuit breakers, disconnect switches, starters, relays, time switches, contactors, push-button control stations, and other apparatus used for the operation or control of feeders, circuits, appliances, or equipment shall be properly identified by means of descriptive nameplates or tags permanently attached to the apparatus and wiring.
 2. Electrical equipment including switchgear, switchboards, electric panels and control panels, motor control centers, combination motor starters, transformers, disconnects, etc., shall each be labeled by the manufacturer with "Electric-ARC-FLASH" warning signs. The signs shall explain a hazard to personnel may exist if the equipment is worked on while energized or operated by personnel while energized. The sign shall instruct personnel to wear the correct protective equipment/clothing (PPE) when working "Live", or operating "Live" electrical equipment and circuits.
 3. Nameplates shall be engraved laminated phenolic. Shop drawings with dimensions and format shall be submitted before installation. Attachment to equipment shall be with escutcheon pins, rivets, self-tapping screws or machine screws. Self-adhering or adhesive backed nameplates shall not be used.
 4. Provide black-on-white laminated plastic nameplates engraved in minimum 1/4" high letters to correspond with the designations on the drawings. Provide other or additional information on nameplates where indicated.
- B. For equipment and access doors or gates to equipment containing or operating on circuits of more than 240 volts nominal, provide red-on-white laminated warning signs engraved in 1/2" high letters to read: "DANGER - 480 (or applicable voltage) VOLTS KEEP OUT AUTHORIZED PERSONNEL ONLY".
- C. Wire and Cable Identification
 1. Provide identification on individual wire and cable including signal systems, fire alarm, electrical power systems (each individual phase, neutral and ground), empty conduit pull ropes, and controls circuit.
 2. Permanent identification shall be provided at each termination location, splice location, pullbox, junction box and equipment enclosure.
 - a. Individual wire and cable larger than #6 AWG or 0.25 inch diameter, shall be provided with polypropylene identification tag holders, with yellow polypropylene tags interchangeable black alpha/numeric characters, character height 0.25 inch. Attach identification tags with plastic "tie" wraps, minimum of two for each tag. As manufactured by Almetek Industries-"EZTAG" series; or TECH Products - "EVERLAST" series.
 - b. Individual wire and cable #6 AWG and smaller or smaller than 0.25 inch diameter, shall be provided with water and oil resistant, flexible, self-laminating pressure sensitive machine embossed plastic tags that wrap a minimum of 360 degrees around the wire/cable diameter. The entire tag shall then be covered with a clear flexible waterproof plastic

cover wrapped a minimum of 540 degrees around the wire/cable diameter and completely covering the identification. As manufactured by: Brady Identification; or 3M; or Panduit.

- c. Each identification tag location shall indicate the following information: circuit number, circuit phase, source termination and destination termination equipment name (or outlet number as applicable).
3. Install permanent identification after installation/pulling of wire/cable is complete, to prevent loss or damage to the identification.
- D. Cardholders and cards shall be provided for circuit identification in panelboards. Cardholders shall consist of a metal frame retaining a clear plastic cover permanently attached to the inside of panel door. List of circuits shall be typewritten on card. Circuit description shall include name or number of circuit, area, and connected load.
- E. Junction and pull boxes shall have covers stenciled with box number when shown on the drawings, or circuit numbers according to panel schedule. Data shall be lettered in a conspicuous manner with a color contrasting to finish.

1.12 TESTING

- A. The CONTRACTOR shall obtain an independent testing laboratory that will provide all instrumentation and tests on the electrical system and equipment as hereinafter described and further directed by the OWNER'S Representative. The test shall be performed after the completion of all electrical systems included in the Contract Scope of Work. All tests shall be recorded and documented and submitted to the OWNER'S Representative for review.
 1. Test for Phase to Ground and Neutral Condition:
 - a. Open main service disconnects.
 - b. Isolate the system neutral from ground by removing the neutral disconnects link located in the service switchboard.
 - c. Close all submain disconnects.
 - d. Close all branch feeder circuit breakers.
 - e. Turn all switches to "on" position, unplug all portable equipment from outlet receptacles.
 - f. Measure the resistance of each phase to ground and phase to neutral. A properly calibrated "megger" type test instrument shall be used. The test voltage shall be a nominal 500 volts.
 - g. Record all readings after one minute duration and document into a complete report.
 2. Isolating Grounds: In the event that low resistance ground neutral connections are found in the system, they shall be isolated and located by testing each circuit individually as outlined above. Make proper corrections to restore the resistance values to an acceptable value.
- B. Method of obtaining ground resistance shall be in accordance with the latest edition of the James G. Biddle (Plymouth Meeting, Pennsylvania) manual published on this subject.
 1. Perform "fall-of-potential" 3-point tests on the main grounding electrode of system per IEEE Standard No. 81, Section 8.2.1.5. when suitable locations for test rods are not available, a low resistance dead earth or reference ground shall be utilized.
 2. Perform the two-point method test per IEEE Standard No. 81, Section 8.2.1.1, to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.
- C. All equipment and personnel required for testing shall be furnished by the CONTRACTOR.
- D. The testing, calibrating and setting of all ground and ground fault equipment, circuit breakers, circuit device protection relays, and meters adjustable settings shall be by an independent testing laboratory. Set as recommended by the respective manufacturer and coordination study so as to be coordinated with other protection devices within the electrical design. Bound and tabulated copies of the test and settings shall be sent to the OWNER'S Representative.
- E. The Contractor shall complete the following work before any electrical equipment is energized.
 1. All equipment shall be permanently anchored.

2. All bus connections shall be tightened per manufacturer's instructions and witnessed by the OWNER'S Representative.
3. All ground connections shall be completed and identified. Perform and successfully complete all required megger and ground resistance tests.
4. All feeders shall be connected and identified.
5. The interiors of all electrical enclosures including busbars and wiring terminals shall be cleaned of all loose material and debris, paint, plaster, cleaners or other abrasive's overspray removed and equipment vacuumed clean. The OWNER'S Representative shall observe all interiors before covers are installed.
6. The electrical system coordination study shall be complete for circuit breakers, ground relays sets, and circuit relay sets, fuses; tested and calibrated accordingly.

1.13 POWER OUTAGES

- A. All electrical services in all occupied facilities of the contract work are to remain operational during the entire contract period. Any interruption of the electrical services for the performance of this work shall be at the convenience of the OWNER and performed only after consultation with the OWNER'S Representative. Work involving circuit outages shall be only at such a time and of such a duration as approved in writing. Work involving circuit outages for the work required to connect new equipment and disconnect existing equipment shall be performed at the convenience of the OWNER.
- B. The contract work involving outages shall be phased in multiple work time units, to comply with the permitted outage limitations.
- C. Work involving system outages to the building fire alarm system shall be performed only after consultation with the OWNER and shall be only at such a time and of such duration as approved in writing.
- D. Provide overtime work; double shift work; night time work; Saturday, Sunday, and holiday work to meet outages schedule.
- E. Provide temporary electrical power to meet the requirements of this Article.
- F. Any added costs to CONTRACTOR due to necessity of complying with this Article shall be included in the Contract Scope of Work.
- G. When electrical work involving power disruptions to existing areas is initiated, the work shall proceed on a continuous basis without stopping until electric power is restored to the affected areas.
- H. The CONTRACTOR shall request in writing to the OWNER'S Representative a minimum of three weeks in advance, for any proposed electrical outage.

1.14 TEMPORARY ELECTRICAL POWER

- A. Provide temporary electrical power if work requiring power outages cannot be completed in time permitted and approved by the OWNER'S Representative.
- B. Temporary electrical power shall be a standby diesel engine generators. Voltage, frequency, regulation, etc. shall be equal to that of normal utility source. Exhaust system shall have a critical silencing muffler. Generator voltage shall match the existing secondary voltage required at the site. The CONTRACTOR shall furnish all necessary cables, switches, etc., to make all required connections to existing panels, feeders, etc. Generator shall be sized to adequately carry the demand load. If record of demand load is not available, size generator to match corresponding transformer, maximum capacity circuit as directed by the OWNER'S Representative.
- C. After completion of required usage of the temporary generators, prior to completion of the project, the CONTRACTOR shall remove the generators. All temporary cables, switches, etc. shall be removed and all permanent equipment left in satisfactory condition.

- D. Each generator shall be housed in security type sound attenuated housing to prevent access by unauthorized personnel. Temporary power cables, connections, etc. shall be protected from unauthorized personnel.
- E. The CONTRACTOR shall be responsible for complete operation of the generator including personnel, fuel supplies, proper safety precautions, etc. Generator shall not be left unattended while in operation.
- F. The CONTRACTOR shall provide temporary construction lighting and power as required in areas where work is being performed. Temporary power arrangements, outages, installation, work schedules, etc., shall be submitted in writing three weeks prior to requested outage date, and approved by the OWNER'S Representative prior to start of work.

1.15 ASBESTOS, POLYCHLORINATED BIPHENYL (PCB) OR HAZARDOUS WASTE:

- A. It is understood and agreed that this contract does not contemplate the handling of asbestos, PCB or [any hazardous waste material]. If asbestos, PCB or any hazardous waste material is encountered, notify the OWNER'S Representative immediately. Do not disturb, handle or attempt to remove.

1.16 TIME/CURRENT COORDINATION, SHORT CIRCUIT, ARC-FLASH AND SERIES RATED EQUIPMENT

- A. Series rated equipment.
 1. Circuit protective Devices identified as "Series Rated" or "Current Limiting" (i.e., SR-Series Rates CLCB - current limiting circuit breaker; CLF - current limiting fuse, etc.) shall be series rated and tested (UL 489 & CSA5) by the manufacturer with all equipment and circuit protective devices installed down stream of the identified series rated or current limiting device.
 2. Provide nameplates on all equipment located down stream, including the CLCB and CLF devices, to comply with CEC/NEC paragraphs 110-22 and 240-83 "CAUTION SERIES RATED SYSTEM - NEW DEVICE INSTALLATIONS AND REPLACEMENTS SHALL BE THE SAME MANUFACTURER AND MODELS".
- B. Short circuit, coordination and ARC-Flash
 1. Perform and submit engineered settings for each equipment location, fuse and circuit breaker device, showing the correct time and current settings to provide the coordination within the limits of the specified equipment, per the latest application standards of IEEE and ANSI. Provide electrical system short circuit fault analysis, both 3-phase line-to-line and 1-phase line-to-ground calculations as part of the coordination analysis recommendations. Provide Electric ARC-FLASH calculations as part of the coordination analysis recommendations.
 2. The information shall be submitted in both tabular form and on time current log-log graph paper, with an engineering narrative. Written narrative describing data, assumptions, analysis of results and prioritized recommendations, (6) six copies.
 3. The goal is to minimize an unexpected but necessary electrical system outage and personnel exposure to the smallest extent possible within the fault occurrence location, using the specified contract equipment. Shall comply with, but not limited to:
 - a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
 - b. IEEE-399, Recommended Practices for Industrial and Commercial Power System Analysis.
 - c. IEEE-1584, Guide to Performing ARC-FLASH Hazard Study.
 - d. CEC/NEC
 4. Provide permanent warning labels on each equipment location. The labels shall describe ARC-FLASH, Short-Circuit and Time/Current Coordination, including safety precautions and protective clothing. Also described actions to be taken if any circuit changes or equipment modifications occur.

1.17 INDEPENDENT TESTING LABORATORY

- A. Testing Laboratories Definition

1. The Testing Laboratory shall meet Federal OSHA criteria for accreditation of Nationally Recognized Testing Laboratories (NRTL) Title 29 Part 1907 and 29 CFR-1910.
2. Membership in the National Electrical Testing Association (NETA) shall also constitute acceptance of meeting said criteria, for testing of electrical systems.

1.18 EQUIPMENT SEISMIC REQUIREMENTS

- A. Equipment supports and anchorage's provided as part of the contract shall be designed, constructed and installed in accordance with the earthquake regulations of the California Building Code, Title 24, Section 1632A, and the Uniform Building Code (UBC).
- B. Provide equipment anchorage details, coordinated with the equipment mounting provision, prepared, signed and "stamped" with PE registration by a civil or structural engineer licensed as a Professional Engineer (PE) in the State of California.
- C. Mounting recommendations shall be provided by the manufacturer based upon approved shake table tests used to verify the seismic design of that type of equipment.
- D. The equipment manufacturer shall certify that the equipment can withstand, and function following the seismic event, including both vertical and lateral required response spectra as specified in California Title 24 and the UBC. Alternatively, the manufacturer's certification may be based on an approved detailed structural analysis of the assembly, as specified in California Title 24 and the UBC.
- E. The equipment manufacturer shall document the details necessary for proper seismic mounting, anchorage, and bracing of the equipment for back installation location.
- F. Seismic qualification shall be considered achieved when the capability of the provided equipment, as described by the test response spectra, meets or exceeds the required response spectra as specified in California Title 24 and the UBC, for all equipment natural frequencies up to 35 HZ.
- G. The seismic requirements are typical for each equipment item exceeding 100 pounds, including but not limited to the following.
 1. Switchgear, switchboards, and motor control centers
 2. Transformers
 3. Equipment racks
 4. Panels
 5. Conduits with ceiling or wall support suspension attachments.
 6. Lighting equipment
- H. Wall Mounted Electrical Equipment
 1. Surface Mounted Equipment
 - a. Provide multiple horizontal sections of metal "C" channels for support and attaching wall mounted equipment to walls. Channels shall provide "turned lips" at longitudinal edges to hold "lock-in" fasteners and shall comply with ANSI-1008 and ASTM-A569 latest revision. The channels shall be steel hot dip zinc galvanized. As manufactured by Unistrut or Kindorf.
 - b. The "C" channels shall be positioned horizontally within 3 inches of the top and bottom of each, equipment section cabinet and located behind each equipment vertical section. Provide additional intermediate "C" channels at not less than 36 inches on center between the "top" and "bottom" "C" channel positions, located behind each equipment vertical section.
 - c. The "C" channels shall be of sufficient length to provide connection to not less than two (2) vertical structural wall framing elements separated by not less than 16 inches; but in no case shall the "C" channel length be less than the width of the respective equipment section.
 - d. Attach the "C" channels to the wall structural elements after the wall, finish surface, installation (including painting) is complete.

- e. Attach the "C" channels with fasteners to the building wall framing structural elements as follows: welded to steel framing; bolted to wood framing; cast in place concrete inserts for masonry and concrete construction; drilled "afterset" expansion anchors for existing masonry and concrete construction.
- f. Attach the equipment to the "C" channels with threaded and bolted fasteners to "prelocate" and lock into the channel "turned lips" and channel walls.

1.19 ELECTRICAL WORK CLOSEOUT

- A. Prepare the following items and submit to the OWNER'S REPRESENTATIVE before final acceptance.
 - 1. Two copies of all test results as required under this section.
 - 2. Two copies of local and/or state code enforcing authorities final inspection certificates.
 - 3. Copies of record drawings as required under the General Conditions, pertinent Division One Sections and Electrical General Provisions.
 - 4. Two copies of all receipts transferring portable or detachable parts to the OWNER'S Representative when requested.
 - 5. Notify the OWNER's Representative in writing when installation is complete and that a final inspection of this work can be performed. In the event any defect or deficiencies are found during this final inspection they shall be corrected to the satisfaction of the OWNER's Representative before final acceptance can be issued.
 - 6. Prior to energizing, retighten to the proper torque, each circuit conductor lug landing, each bus bar (phases, neutral and ground) and circuit protection device threaded connections in all switchboards, switchgear, motor control centers, transformers, busways, disconnect switches, motor starters, motor terminals and panelboards, after the equipment is installed/connected and prior to energizing the equipment. The torque values shall comply with manufacturer's recommendations.

1.20 PATH OF TRAVEL WORK PLAN

- A. General: Submit the path of Travel Work Plan narrating, detailing, and delineating the means, methods, techniques, observation methods, sequences, phases, procedures, coordination, materials, removal and reinstallation of equipment, transportation, and the like, proposed by the CONTRACTOR to execute the Work between each area of the Work, and the exterior of the building. Do not commence the Work without the written review of the Path of Travel Work Plan.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Performance:
 - 1. Design Criteria:
 - a. Materials and equipment provided under following Sections shall be by same Manufacturer:
 - 1) Section 21 61600: Panelboards.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. All relocations, reconnections, and removals are not necessarily indicated on Drawings. Include such work without additional cost to Owner.
- B. Confirm dimensions, ratings, and specifications of equipment to be installed and coordinate these with site dimensions and with other Sections.

3.2 PREPARATION

- A. Disconnect equipment that is to be removed or relocated. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work.
- B. Where affected by demolition or new construction, relocate, extend, or repair raceways, conductors, outlets, and apparatus to allow continued use of electrical system. Use methods and materials as specified for new construction.
- C. Perform drilling, cutting, block-offs, and demolition work required for removal of necessary portions of electrical system. Do not cut joists, beams, girders, trusses, or columns without prior written permission from Architect.
- D. Remove concealed wiring abandoned due to demolition or new construction. Remove circuits, conduits, and conductors that are not to be re-used back to next active fixture, device, or junction box.
- E. Patch, repair, and finish surfaces affected by electrical demolition work, unless work is specifically specified to be performed under other Sections of the specifications.

3.3 INSTALLATION

- A. General:
 - 1. Locations of electrical equipment shown on Drawings are approximate only. Field verify actual locations for proper installation.
 - 2. Coordinate electrical equipment locations and conduit runs with those providing equipment to be served before installation or rough-in.
 - a. Notify Architect of conflicts before beginning work.
 - b. Coordinate locations of power and lighting outlets in mechanical rooms and other areas with mechanical equipment, piping, ductwork, cabinets, etc, so they will be readily accessible and functional.
 - 3. Work related to other trades which is required under this Division, such as cutting and patching, trenching, and backfilling, shall be performed according to standards specified in applicable Sections.

3.4 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Test systems and demonstrate equipment as working and operating properly. Notify Architect before test. Rectify defects at no additional cost to Owner.
 - 2. Measure current for each phase of each motor under actual final load operation, i.e. after air balance is completed for fan units, etc. Record this information along with full-load nameplate current rating and size of thermal overload unit installed for each motor.

END OF SECTION
042911/462004

SECTION 26 0500**BASIC ELECTRICAL MATERIALS AND METHODS****PART 1 - GENERAL****1.1 SCOPE**

- A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
1. Examine all other sections for work related to those other sections and required to be included as work under this section.
 2. General provisions and requirements for electrical work.

1.2 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Submit product data sheets for all outlet boxes, floor boxes, wiring devices, device plates, relays, contactors, timeswitches, and disconnects fuses.
- B. Submit detailed shop drawings including dimensioned plans, elevations, details, schematic and point-to-point wiring diagrams and descriptive literature for all component parts for transformers, relays, time clocks, and photocells.
- C. Submit transformer test reports.
- D. Submit material list for outlet boxes.

PART 2 - PRODUCTS**2.1 OUTLET AND JUNCTION BOXES**

- A. General
1. Flush or concealed outlet and junction boxes: Pressed steel, steel thickness not less than 0.062-inch, hot-dip galvanized, knockout (KO) type with conduit entrances and quantities size to match conduits shown connecting to respective outlet box. UL-514 listed and labeled. Minimum required box depth is exclusive of extension-ring depth.
 2. Provide boxes of proper code size for the number of wires or conduits passing through or terminating therein, but in no case shall box be less than 4.0 inch square by 2.125 inch deep, unless specified elsewhere or noted otherwise on the drawings. 2.5 inch minimum depth for box widths exceeding 2-gang.
 3. Increase the minimum outlet box size to 4.69 inches square by not less than 2.125 inches deep, where one or more of the following conditions occurs:
 - a. More than two (2) conduits connect to the outlet box.
 - b. Conduit "homerun" connects to outlet box.
 4. Provide extension rings on flush outlets to finish face of extension ring flush with finished building surfaces. Extension ring shall match outlet box construction and contain "attachment mounting-tabs" for wiring devices. Extension rings shall be "screw-attached" to respective outlet box and maintain "ground" bonding continuity.
 5. Boxes installed in masonry or concrete shall be UL "concrete-tight" approved for installation in concrete, and shall allow the placing of conduit without displacing reinforcing bars.
 6. Provide fixture-supporting device in outlet boxes for surface mounted fixtures as required.
 7. Provide solid gang boxes for three or more switches, for mounting behind a common device plate.

8. Outlet boxes installed penetrating into fire rated walls, fire rated floors, fire rated ceilings and all fire rated construction. The outlet boxes shall be UL listed, classified and labeled, for fire rated and temperature rated penetration of the respective fire rated surface and fire rated construction. The outlet box fire rating and temperature rating shall equal or exceed the fire/temperature rating of the surface/construction being penetrated. Provide supplemental fire and temperature protection:

9. Outlet Boxes:

- a. Galvanized steel of proper size and shape are acceptable for all systems. Where metal boxes are used, provide following:
 - 1) Provide metal supports and other accessories for installation of each box.
 - 2) Equip ceiling and bracket fixture boxes with fixture studs where required.
 - 3) Equip outlets in plastered, paneled, and furred finishes with plaster rings and extensions to bring box flush with finish surface.
- b. Non-metallic boxes may be used only for low voltage wiring systems.
- c. HVAC Instrumentation And Control:
 - 1) Junction boxes in mechanical equipment areas shall be 4 inches square.
 - 2) Boxes for remote temperature sensor devices shall be recessed single device.
 - 3) Boxes for thermostats shall be 4 inches square with raised single device cover.

B. Surface Outlet Boxes

- 1. Surface mounted outlet boxes, cast iron Type FS or FD, with threaded hubs as required. Box interior dimensions and interior volume capacity not less than required for "press steel boxes", and "sheet steel boxes". Provide plugs in all unused openings. Provide weatherproof gaskets for all exterior boxes.

2.2 PULL BOXES

- A. Sizes as indicated on the drawings and in no case of less size or material thickness than required by the governing code. Exercise care in locating underground pull boxes to avoid installation in drain water flow areas.
 - 1. General purpose sheet steel pull boxes: Install only in dry protected locations with removable screw covers. Manufacturer's standard baked enamel finishes.
 - 2. Weatherproof sheet steel pull boxes: Fabricate of code gauge, hot-dip galvanized steel with gasketed weathertight cover of same material. Manufacturer's standard baked exterior enamel finish.

2.3 SWITCHES

A. Provide circuit switches totally enclosed, Bakelite or composition base, toggle type with 277 volt A.C. rating for full capacity or contacts for incandescent or fluorescent lamp loads. Switch ratings shall be 20 ampere only. Color as selected by OWNER'S REPRESENTATIVE. Switches controlling circuits connected to emergency power shall be red.

B. Where switches are mounted in multiple gang assembly and are operating at 277 volts and/or 277 volts and 120 volts mounted in same outlet box, there shall be a barrier installed between each switch.

C. Switches

- 1. Single Pole Switches

Make	Toggle Type	Lock Type
Hubbell	#CS1221	#CS1221-L
P&S	#20AC1	#20AC1-L

Sierra	#5021	#5071
Leviton	#1221	#1221-L

2. Three-Way Switches

Make	Toggle Type	Lock Type
Hubbell	#CS1223	#CS1223
P&S	#20AC3	#20AC3-L
Sierra	#5023	#5073-L
Leviton	#1223	#1223-L

2.4 RECEPTACLES

- A. All receptacles in flush type outlet boxes shall be installed with a bonding jumper to connect the box to the receptacle ground terminal. Grounding through the receptacle mounting straps is not acceptable. The bonding jumper shall be sized in accordance with the branch circuit protective device as tabulated herein under "Grounding". Bonding jumper shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws 6-32 or larger (except isolated ground receptacles). For receptacles in surface mounted outlet boxes direct metal-to-metal contact between receptacle mounting strap (if it is connected to the grounding contacts) and outlet box may be used. Color as selected by OWNER'S REPRESENTATIVE. Receptacles connected to emergency power circuits shall be red.
- B. Duplex convenience receptacles shall be grounding type, 120 volt, 15 ampere, and shall have two current carrying contacts and one grounding contact which is internally connected to the frame. Outlet shall accommodate standard parallel blade cap and shall be side wired:
 - 1. P & S #5262
 - 2. Leviton #5262
 - 3. Hubbell #CR5252
- C. Weatherproof receptacle: Ground fault type duplex receptacle, mounted in a flush hinged door enclosure with lock and key. Enclosure shall be a P & S #4600 with a #1591F46 receptacle. On exposed conduit runs, weatherproof ground fault type receptacle as hereinbefore specified, installed in "FS" conduit with one of the following spring door type covers:
 - 1. P & S #4510
 - 2. Hubbell #5211
- D. Special outlets shall be as indicated on the drawings.

2.5 PLATES

Replace damaged plates for every switch, receptacle, telephone, computer, television and other device outlets. Where existing plates are metal provide 040" stainless steel, Type 302 alloy composed of 18% chromium and 8% nickel. Where existing plates are plastic provide nylon or high impact thermoplastic plate, color as selected by architect. Plates shall be manufactured by P & S, Hubbell, Leviton or General Electric only.

2.6 STRUCTURAL AND MISCELLANEOUS STEEL

Structural and miscellaneous steel used in connection with electrical work and located out-of-doors or in damp locations, to be hot-dip galvanized unless otherwise specified. Included are underground pull box covers and similar electrical items. Galvanizing averages 2.0 ounce per square foot and conforms to ASTM A123.

2.7 FLASHING ASSEMBLIES

A. General

1. Flashing shall be compatible with the material being penetrated and with the pipe passing through the flashing. Coordinate with and comply with manufacturer's recommendations, for both the flashing and the material being penetrated.
2. Provide Semco Fig. #1100-4 lead metal flashing assemblies at all roof penetrations, unless recommended otherwise by manufacturer.
3. Seal the joint between the flashing and pipe passing through the flashing with waterproofing compound.the

2.8 DISCONNECTS (SAFETY SWITCHES)

Disconnect switches shall all be rated 600 volt A.C., NEMA Type HD, quick-make, quick-break, h.p.-rated, fused Class "R", in NEMA Type I enclosure, lockable with number of poles and amperage as indicated on the drawings. Provide neutral bus and conductor landing lugs, size to match conductors shown on drawings. Where enclosure is indicated W.P. (weatherproof) switches shall be raintight NEMA Type 3R enclosure, lockable. Maximum voltage, current and horsepower rating clearly marked on the switch enclosure and switches having dual element fuses shall have rating indicated on the nameplate.

2.9 TRANSFORMERS

A. General

1. Provide dry type transformers constructed to meet Underwriters' Laboratories Specification UL 506 and tested in accordance with ANSI I and NEMA Standards. Performance on transformers equal to or better than ANSI, NEMA, IEEE and CEC/NEC published criteria.
 - a. 60HZ AC line and load.
2. UL Class 220°C insulation with maximum winding temperature rise of 150°C in 40°C ambient at 100% continuous rated capacity with overload capacity per ANSI C57.12 and C57.96. Vacuum impregnated core and coil insulation. Transformer efficiency shall meet or exceed NEMA-TP1 (latest revision) requirements.
3. Transformers shall be equipped with not less than five 2.5 percent full capacity voltage taps, two (2) above and three (3) below normal voltage. Line and load terminals shall be accessible, located behind removable front cover plate. Transformer connects shall terminate in "conductor-lugs" to match line side incoming and outgoing secondary side conductors, shall occur on a common (same) side of transformer on insulated supports.
4. Provide wall mount and ceiling mount transformers support brackets, plaforms and attachment structures for transformers.
5. Dry type transformers shall meet or exceed NEMA TP-1 (latest revision), Class-1 efficiency levels and shall be marked as energy efficient for United States Department of Energy and Environmental Protection Agency DOE/EPA "Energy Star".
6. Transformer windings shall be copper or aluminum.
7. Electrostatic Shield: Provide full width, copper, 100% electrostatic shield (Faraday Shield), between line and load transformer windings, on each transformer phase. Shield shall be low impedance grounded to the transformer metal frame and shall attenuate common mode electrical noise 120dB at 1-500Mhz range and transverse mode electrical noise, 30dB at 1-500 Mhz range. Average effective coupling capacitance of 30 picofarads between line and load sides.
8. Connect transformers by one of the following methods:
 - a. Underfloor conduit resulting in no rigid connections to transformer. (Use ground strap for equipment ground.)
 - b. Sealite flexible conduit. (Use ground wire for equipment ground.)
 - c. Pullbox or wireways from transformer which are isolated from transformer with an approved sound absorbing neoprene gasket. (Use ground strap for equipment ground.)
9. The physical dimensions of the transformer, shall not exceed the size shown on the drawings.
10. Transformer and transformer mounting shall be designed and tested and comply with seismic zone-4 earthquake resistance seismic loads, typical for floor, wall and ceiling mount/suspended transformers. Bolt floor-mounted transformers to floor and mounting brackets, provide isolation rubber mounts, on each attachment contact location.

B. Test Requirements:

1. The transformers shall be subjected to the following production tests:
 - a. Applied Potential
 - b. Induced Potential
 - c. No Load Loss.
 - d. Voltage Ratio.
 - e. Polarity
 - f. Continuity
2. The manufacturer shall have performed the following additional tests on transformer units identical to the design type being supplied to this specification. Proof of performance of these tests in the form of test data sheets shall be provided at the time shop drawings are submitted for approval.
 - a. Sound Levels
 - b. Temperature
 - c. Full Load and 50 Percent Load Losses for linear and non linear loads
 - d. Voltage Regulation
 - e. Impedance

C. Transformer Housing

1. Metal, air cooled enclosure
 - a. Removable metal NEMA 1 enclosure, indoor location
 - b. Removable NEMA – 3R enclosure, outdoor locations, with vent shields.
 - c. Provide screen protected ventilation for all openings, including bottom of housing, to prevent accidental contact with internal components and prevent rodent/insect entrance.
2. Manufacturer's rust inhibitor primer and standard finish paint.
3. Removable lifting and skidding provisions.
4. Provide wall mount and ceiling mount transformers support brackets, platforms and attachment structures for transformers.

D. Sound Levels: Transformer sound levels, between no load to full load, shall be guaranteed by the manufacturer not to exceed the following values:

9 kVA and below	40 dba
10 kVA to 50 kVA	45 dba
51 kVA to 150 kVA	50 dba
151 kVA to 300 kVA	55 dba
301 kVA to 500 kVA	60 dba

2.10 WIREWAY**A. General**

Unobstructed lay in type, metal wireway, fittings and connectors UL listed for use as wireway and auxiliary gutter. Length, elbows and "T-S" as shown on drawings. Minimum cross-section size 4 inches X 4 inches, but not less than shown on the drawings. Suitable for mounting in any position orientation.

B. Construction

1. Minimum metal gauge shall not be less than 14 gage.
2. Cover shall be hinged entire length of cover. Cover shall be held in the closed position with bolts and nuts.
3. Provide spring nuts on all hardware fastener penetrations into the interior of the wireway to protect against wire insulation damage.
4. The inside of 90-degree corners in the wireway shall be a 45-degree bevel.

- 5. Grounding continuity between wireway sections and fittings shall be continuous the entire length of the wireway.

C. Finish

- 1. Indoor non-raintight, rust inhibitor phosphatizing base coating and baked enamel finish, manufacturer's standard color.
- 2. Raintight or outdoor-galvanized metal, with corrosion resistant phosphate primer and baked enamel finish, manufacturer's standard color, NEMA 3R construction.
- 3. All hardware shall be plated to prevent corrosion.

PART 3 - EXECUTION

3.1 GROUNDING (ADDITIONAL REQUIREMENTS)

- A. Grounding shall be executed in accordance with all applicable codes and regulations, both of the State of California and local authorities having jurisdiction.
- B. The neutral of each transformer shall be grounded by individual separate ground conductors in individual conduits as follows:
 - 1. Conductor and conduit shall be grounded to building main ground bus.
 - 2. Conductor and conduit shall be grounded to nearest available effectively grounded building structural steel member or grounded metal cold water pipe.
- C. The transformer neutral ground conductors for secondary side of the transformers shall be copper and shall be sized according to the following table:

Secondary Total Equivalent Size Copper	Neutral Ground Wire Size Copper
#2 or smaller	#6-1" conduit
1 or 1/0	#4-1" conduit
2/0 or 3/0	#2-1 1/4" conduit
4/0 thru 350 MCM	#1-1 1/4" conduit
Over 350 MCM thru 600 MCM	2/0-1 1/2" conduit
Over 600 MCM thru 1100 MCM	3/0-1 1/2" conduit
Over 1100 MCM	4/0-2" conduit

- D. Each pull box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.
- E. The maximum resistance to ground shall not exceed 5 ohms.

3.2 WIREWAY INSTALLATION

Wireway hangers shall provide clamp type, hanger rod type, direct bolted bracket type from ceiling or walls as indicated on the drawings and required for field installation locations. Supports shall be installed a minimum of 5 ft. on center.

3.3 GENERAL INSTALLATION

- A. Confirm dimensions, ratings, and specifications of materials to be installed and coordinate these with site dimensions and with other Sections.

3.4 INSTALLATION**A. Interface With Other Work:**

1. Coordinate with Divisions 22 and 23 for installation of raceway for control of plumbing and HVAC equipment.
2. Before rough-in, verify locations of boxes with work of other trades to insure that they are properly located for purpose intended.
3. Install pull wires in raceways installed under this Section where conductors or cables are to be installed under other Divisions.

B. Conduit And Raceway:

1. Conceal raceways within ceilings, walls, and floors, except at Contractor's option, conduit may be exposed on walls or ceilings of mechanical equipment areas and above acoustical panel suspension ceiling systems. Install exposed raceway runs parallel to or at right angles to building structure lines.
2. Keep raceway runs 6 inches minimum from hot water pipes.
3. Make no more than four quarter bends, 360 degrees total, in any conduit run between outlet and outlet, fitting and fitting, or outlet and fitting.
 - a. Make bends and offsets so conduit is not injured and internal diameter of conduit is not effectively reduced.
 - b. Radius of curve shall be at least minimum indicated by NEC.
4. Cut conduit smooth and square with run and ream to remove rough edges. Cap raceway ends during construction. Clean or replace raceway in which water or foreign matter have accumulated.
5. Run two spare conduits from each new panelboard to ceiling access area or other acceptable accessible area and cap for future use.
6. Bend PVC conduit by hot box bender and, for PVC 2 inches in diameter and larger, expanding plugs. Apply PVC adhesive only by brush.
7. Installation In Framing:
 - a. Do not bore holes in joists or beams outside center 1/3 of member depth or within 24 inches of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width.
 - b. Holes shall be one inch diameter maximum.
8. Conduit And Raceway Support:
 - a. Securely support raceway with approved straps, clamps, or hangers, spaced as required.
 - b. Do not support from mechanical ducts or duct supports without Architect's written approval. Securely mount raceway supports, boxes, and cabinets in an approved manner by:
 - 1) Expansion shields in concrete or solid masonry.
 - 2) Toggle bolts on hollow masonry units.
 - 3) Wood screws on wood.
 - 4) Metal screws on metal.
9. Prohibited Procedures:
 - a. Use of wooden plugs inserted in concrete or masonry units for mounting raceway, supports, boxes, cabinets, or other equipment.
 - b. Installation of raceway that has been crushed or deformed.
 - c. Use of torches for bending PVC.
 - d. Spray applied PVC cement.
 - e. Boring holes in truss members.
 - f. Notching of structural members.
 - g. Supporting raceway from ceiling system support wires.
 - h. Nail drive straps or tie wire for supporting raceway.

C. Boxes:

1. Boxes shall be accessible and installed with approved cover.
2. Do not locate device boxes that are on opposite sides of framed walls in the same stud space. In other wall construction, do not install boxes back to back.
3. Locate boxes so pipes, ducts, or other items do not obstruct outlets.

4. Install outlets flush with finished surface and level and plumb.
5. Support switch boxes larger than two-gang with side brackets and steel bar hangers in framed walls.
6. At time of substantial completion, install blank plates on uncovered outlet boxes that are for future use.
7. Location:
 - a. Install boxes at door locations on latch side of door, unless explicitly shown otherwise on Drawings. Verify door swings shown on electrical drawings with architectural drawings, and report discrepancies to Architect before rough-in. Distance of box from jamb shall be within 6 inches of door jamb.
 - b. Properly center boxes located in walls with respect to doors, panels, furring, trim and consistent with architectural details. Where two or more outlets occur, space them uniformly and in straight lines with each other, if possible.
 - c. Center ceramic tile boxes in tile.

END OF SECTION

SECTION 26 5100**INTERIOR LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install lighting system as described in Contract Documents, complete with lamps.
- B. Related Requirements:
 - 1. Section 26 0100: Electrical General Provisions.
 - 2. Section 26 0500: Basic Electrical Materials And Methods

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Product Options: When several lighting fixtures are specified by name for one use on Drawings, select any one of those specified. Do not mix fixtures from different manufacturers specified for one use.
- B. Materials
 - 1. Lighting Fixtures:
 - a. Acceptable Products:
 - 1) See Fixture Schedule on Drawings for acceptable manufacturers and models.
 - 2) Equals as approved by Architect before bidding. See Section 01 6200.
 - 2. Fluorescent Ballasts:
 - a. Energy saving electronic for T8 lamps.
 - 1) Instant start.
 - 2) Parallel circuit type.
 - 3) Minimum power factor of 95 percent.
 - 4) Maximum total harmonic distortion of 10 percent.
 - 5) Operation of lamps in compliance with Lamp Manufacturer's recommendations.
 - 6) Minimum starting temperature 0 deg F for T8 lamps.
 - 7) Class A sound rating.
 - 8) Transient protection in accordance with IEEE / ANSI C62.41-1984, Category A.
 - 9) Comply with FCC 47CFR Part 18.
 - 10) Ballast factor of 0.78.
 - 11) Maximum crest factor of 1.7.
 - 12) Five year full replacement warranty including labor allowance for replacement.
 - 13) Input voltage to match system voltage.
 - 14) Approved Manufacturers.
 - a) ROP-LWSC or VOP-LWSC by Advance.
 - b) GE-MAX-L/ULTRA by General Electric.
 - c) B-IUNVEL-A by Universal Lighting Technologies.
 - d) QHE-UNV-ISL-SC by Osram / Sylvania.
 - 3. Lamps:
 - a. T8 Fluorescent Lamps:
 - 1) Minimum initial output of 4100 Lumens.
 - 2) Rated life of 24,000 hrs at 3 hrs per start for lamps operated on instant start ballasts.
 - 3) Minimum CRI 85
 - 4) Meet Federal TCLP criteria.

- 5) Approved Manufacturers.
 - a) General Electric.
 - b) North American Philips.
 - c) Osram / Sylvania.
 - d) Westinghouse
- b. Other Lamps:
 - 1) Approved Manufacturers.
 - a) General Electric.
 - b) North American Philips.
 - c) Osram / Sylvania.
 - d) Westinghouse
- C. Factory Assembly:
 - 1. Fixtures shall be fully assembled complete with necessary wiring, sockets, lamps, reflectors, ballasts, auxiliaries, plaster frames, recessing boxes, hangers, supports, lenses, diffusers, and other accessories essential for complete working installation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Interface With Other Work:
 - 1. Coordinate with Sections under 09 5000 heading to obtain symmetrical arrangement of fixtures in acoustic tile ceiling.
- B. Securely mount fixtures. Support fixtures weighing 50 lbs or more from building framing or structural members.
- C. Fasten lay-in fluorescent fixtures to ceiling suspension system on each side with bolts, screws, rivets, or clips. In addition, connect lay-in fixtures weighing less than 50 lbs with two-wire hangers minimum to building framing or structural members. Connect wires to opposing corners of fixture and may be slightly slack. Make final conduit connections to lay-in fluorescent fixtures with specified flexible conduit or flexible fixture whips.
- D. Where recessed fixtures are to be installed, provide openings, plaster rings, etc, of exact dimensions for such fixtures to be properly installed. Coordinate fixture installation with ceiling type and thickness. Terminate circuits for recessed fixtures in an extension outlet box near fixture and connect with specified flexible conduit.

3.2 ADJUSTMENT

- A. Repair scratches or nicks on exposed surfaces of fixtures to match original undamaged conditions.

END OF SECTION

SECTION 26 5600
EXTERIOR LIGHTING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install exterior lighting system as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Anchor bolts.
- C. Related Requirements:
 - 1. Section 26 0100: Electrical General Provisions.
 - 2. Section 26 0500: Basic Electrical Materials And Methods

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Gardco Lighting, San Marco, TX, Sitelighting.com, 800-227-0758 or 512-753-1000.
 - b. Equal as approved by Architect and Owner prior to bidding.
- B. Materials:
 - 1. Exterior Fixtures:
 - a. Finish shall meet requirements of AAMA 603.8 for baked-on organic coating, AAMA 605.2 high performance organic coating, or AAMA Architectural Class I anodizing as necessary to provide specified color.
 - b. Color to match existing.
 - c. Acceptable Products:
 - 1) As indicated on Fixture Schedule. Do not mix fixtures from different manufacturers for one use.
 - 2) Equals as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Interface With Other Work: Coordinate location of anchor bolts and conduit with other trades as required.

END OF SECTION

SECTION 26 0613

ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE

PART 1 - GENERAL: Not Used

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Unless otherwise indicated, mount center of outlets or boxes at following heights above finish floor. Refer special conditions to Architect before rough-in and locate outlet under his direction.
- B. Mounting Heights:
1. HVAC:
 - a. Temperature Control Junction Boxes: As required by Code.
 - b. Thermostats: As required by Code.
 - c. Other Motor Disconnects: 60 inches.
 - d. Motor Controls: 60 inches.
 2. Electrical:
 - a. Distribution Panels: 72 inches to top.
 - b. Receptacles: 18 inches.
 - c. Wall Switches: 42 inches.

END OF SECTION

SECTION 26 1110**CONDUIT AND WIRE****PART 1 - GENERAL****1.1 SCOPE**

- A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
1. Examine all other sections for work related to those other sections and required to be included as work under this section.
 2. General provisions and requirements for electrical work.

1.2 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Submit product data sheets for all wire, supports, conduit, fittings and splicing materials.
- B. Submit material list for all conduit and conduit fittings.
- C. Submit details and structural engineering calculations for conduit support systems.

PART 2 - PRODUCTS**2.1 CONDUIT**

- A. General
1. The interior surfaces of conduits and fittings shall be continuous and smooth, with a constant interior diameter. Conduits and conduit fittings shall provide conductor raceways of fully enclosed circular cross section. The interior surfaces of conduits and fittings shall be without ridges, burrs irregularities or obstructions. Conduits and fittings of the same type shall be of the same uniform weight and thickness.
 2. Type of conduit, type of conduit fittings and conduit supports shall be suitable for the conditions of use and the conditions of location of installation, based on the manufacturer's recommendations and based on applicable codes.
 3. All fittings for metal conduit shall be suitable for use as a grounding means, pursuant to the applicable code requirements. All metal conduit and metal conduit fittings shall provide 3 second duration ground fault current carrying ratings, when installed and connected to the respective conduit, as follows:
 - a. RMC and EMT conduit fittings.
 - 1) 0.5 inch through 1.5 inch conduit/fitting size - 10,000 ampere RMS.
 - 2) 2.0 inch and larger conduit/fitting size - 20,000 ampere RMS.
 - b. FMC and LTFMC Conduit Fittings
 - 1) 0.5 inch through 1.25 inch conduit/fitting size-1,000 ampere RMS (without external bonding jumper).
 - 2) 1.5 inch through 4.0 inch fitting size-10,000 ampere RMS with bonding jumper.
 4. Protective corrosion resistant finish for metal conduit fabricated from steel and metal conduit fittings fabricated from steel, shall be as follows:
 - a. Clean all metal surfaces (including metal threads) with acid bath "pickle" prior to coating, to remove dirt, oil and prepare surfaces for galvanizing.
 - b. Hot-dip galvanized zinc coating on all interior and exterior steel surfaces. Minimum finish zinc coating thickness shall not be less than 0.002 inches.
 - c. Threads shall be hot-dip zinc coated after machine fabrication.

- d. Exterior metal surfaces shall be finished with clear organic polymer topcoat layer, after galvanizing.
 - e. The inner metal surfaces of conduit fittings shall be finished with a lubricating topcoat after galvanizing, to facilitate conductor pulling through the conduit/fitting.
 - 5. Threads for metal conduit and metal conduit fittings shall be taper-pipe-thread, National Pipe Standards(NPS) and shall comply with ANSI-B1.20.1.
 - 6. Metal conduit termination connector fittings shall be provided with a manufacturer installed, insulating throat bushing inside the fitting. The bushing shall protect the wire conductor insulation from cutting, nicks and abrasion during conductor installation and electrical load "cycling" after installation is complete. The bushing shall comply with UL 94V-0 flammability.
 - 7. Provide conduit bonding/grounding jumper from metal enclosures with "concentric ring" knockouts, to positively ground/bond each respective conduit(s) to the metal enclosure.
 - 8. Metal conduit fittings connecting to PVC coated metal conduit shall be PVC coated to match the conduit.
 - 9. The conduit and fittings shall be watertight and airtight without cracks and pinholes.
- B. Rigid metal Conduit (RMC)
- 1. Rigid metal, round tubing, machine threaded at both ends.
 - a. The conduit and conduit fittings shall comply with the requirements for a equipment grounding conductor, pursuant to applicable codes.
 - 2. RMC raceway types shall be as follows:
 - a. Rigid galvanized steel conduit (RGS), minimum yield strength shall be 35,000 PSI. Shall comply with NEMA standard 5-19 (latest revision); ANSI C80.1 and ANSI-C80.4 (latest revision); U.L. 514-B and UL 6 (latest revisions); National Pipe Standard Specification (latest revision).
 - b. Intermediate steel conduit (IMC). Shall comply with NEMA Standard 5-19 (latest revision) ANSI-C80.6 (latest revision); UL 2142 (latest revision).
 - 3. RMC fittings:
 - a. Fittings shall be compatible with RGS and IMC.
 - b. Fittings shall be rated "liquid tight".
 - c. Fittings imbedded in concrete shall be rated "liquid tight" and "concrete tight".
 - d. Connectors and couplings for terminating, connecting and coupling to RMC conduit shall be threaded metal.
 - e. Fittings shall comply with ANSI C80.4 and ANSI C33-84 (latest revision); NEMA FB1 (latest revision); UL 514 (latest revision).
 - 4. RMC fittings as manufactured by:
 - a. For threaded enclosure, termination connection.
 - 1) Thomas & Betts - 106 Series bonding locknut, 5302 series sealing ring with stainless steel retainer.
 - b. For non-threaded enclosure, termination connector.
 - 1) Thomas & Betts - 370 Series watertight threaded sealing hub, 106 series threaded bonding lock nut, Sta-Con Series enclosure bonding jumper and 3870 Series threaded ground bushing.
 - 2) OZ/Gedney-CHMT/CHT watertight threaded hub with bonding locknut and GH50G Series enclosure bonding jumper.
 - c. For RMC to RMC conduit-to-conduit coupling
 - 1) Erickson - 674 (threaded) Series
 - 2) OZ/Gedney Type 4 (threaded) Series
 - 3) Threaded RMC conduit couplings, product of the same manufacturer as the RMC conduit.
 - d. For RMC Conduit Seals
 - 1) OZ/Gedney-EYA and EYAM (threaded) Series
 - 2) Appleton-EYF and EYM (threaded) Series
- C. Electrical Metallic Tubing (EMT)
- 1. Rigid metal round tubing, "thin wall" steel construction, with non-threaded ends.

- a. The conduit and conduit fittings shall comply with the requirements for a equipment grounding conductor pursuant to applicable codes.
 - b. The conduit shall be watertight and airtight without cracks and pinholes.
2. EMT shall be allowed for conduit size ranges from 0.5 inch through 4.0 inch.
 3. Comply with ANSI C80.3, C80.4, and ANSI C33.98 (latest revisions); UL 594 and UL 797 (latest revisions); CEC Section 12500 (latest revision).
 4. EMT fittings:
 - a. Connectors and couplings for terminating, connecting and coupling to EMT conduit shall be non-threaded steel fabrication.
 - b. EMT termination connector fittings shall be as follows:
 - 1) Set screw type "concrete tight" when installed in dry interior locations.
 - 2) Compression types "raintight" and "concrete tight" when installed in wet or damp locations, outdoors and in concrete or masonry construction.
 - c. Fittings shall comply with ANSI C33.84 (latest revision); UL 514 (latest revision); NEMA FB-1.
 5. EMT fittings as manufactured by:
 - a. For threaded and non threaded enclosure, termination connector
 - 1) Thomas & Betts-TC5031 (set screw type) Series (with locknuts).
 - 2) OZ/Gedney-4000ST (set screw type) Series.
 - 3) Thomas & Betts-5123 (compression type) Series (with 2 locknuts).
 - 4) OZ/Gedney-7000ST (compression type) Series (with locknut).
 - 5) Thomas & Betts-4240 (compression type) Series (90 degree angle with locknut).
 - 6) OZ/Gedney-8000WT (compression type) Series (90 degree angle with locknut).
 - b. For EMT to EMT conduit-to-conduit coupling:
 - 1) Thomas & Betts-TK121 (set screw type) Series (with locknut).
 - 2) OZ/Gedney-5000 (set screw type) Series (with locknut).
 - 3) Thomas & Betts-5120 (compression type) Series.
 - 4) OZ/Gedney-6000S (compression type) Series.
 - c. For EMT to RMC conduit to conduit combination coupling:
 - 1) Thomas & Betts-HT221 (set screw type) Series.
 - 2) OZ/Gedney-ESR (set screw type) Series.
 - 3) Thomas & Betts-530 (compression type) Series.
 - 4) OZ/Gedney-ETR (compression type) Series.
- D. Flexible Metal Conduit (FMC)
1. Round flexible conduit, fabricated from a single continuous steel strip. The steel shall be factory formed into continuous interlocking convolutions to form a complete lock between steel strips and provide raceway flexibility.
 2. Metal to metal grounding contact shall be maintained throughout the length of the FMC conduit.
 3. FMC shall be allowed for conduit size ranges from 0.5 inch through 4.0 inch.
 4. FMC shall comply with ANSI-C.33.84 and ANSI C33.92; NEMA FB-1; CEC 12-1100.
 5. FMC Fittings
 - a. FMC fittings shall be malleable iron construction or steel construction.
 - b. Fitting shall automatically cause the FMC raceway throat opening to be centered with respect to the fitting throat opening.
 - c. Straight and angled connector termination fittings shall be threaded on one end and shall include a threaded locknut, suitable for connection to threaded and unthreaded enclosures.
 - d. The attachment of the fittings to FMC shall be angled saddle type, to engage and interlock with the FMC spiral groove, and shall be unaffected by vibration. Direct bearing screw type fittings shall not be used.
 - e. Direct FMC conduit-to-FMC conduit coupling of FMC shall not be permitted.
 - f. Shall comply with ANSI C33.9, and ANSI C33.92 (latest revision); NEMA FB1 (latest revision); U.L. 514.

6. FMC fittings as manufactured by:

- | | |
|---|--|
| <p>a. <u>Straight Termination Connectors</u></p> <p>1) Thomas & Betts-3110 Series with locknut)</p> | <p><u>45 & 90 Degree Angle Connectors</u></p> <p>Thomas & Betts-3130 Series (with locknut)</p> |
| <p>b. FMC to EMT conduit combination coupling:</p> <p>1) Thomas & Betts 503TB Series.</p> | |

E. Liquid Tight Flexible Metal Conduit (LTFMC)

1. The metal conduit core of LTFMC shall comply with the same requirements as FMC conduit, with the addition of a thermoplastic exterior flexible jacket over the metal core.
2. The exterior jacket shall be positively locked to the metal core to prevent jacket "sleeving".
3. The LTFMC shall be rated for installation and operating service temperatures of between 0 [minus 20] degrees centigrade through plus 90 degrees centigrade.
4. The LTFMC jacket shall be suitable for continuous exposure to sunlight, rainwater, water vapor, mineral oils and liquid solvents, without penetrating into the conduit and without deteriorating the jacket.
5. LTFMC sizes from 0.5 inch through 1.25 inches shall include an additional internal ground conductor, fabricated by the manufacturer, as a integral part of the conduit core.
6. Direct LTFMC conduit-to-LTFMC conduit coupling of LTFMC shall not be permitted.
7. LTFMC shall be allowed for conduit size ranges from 0.5 inch through 4.0 inches.
8. In addition to the requirements for FMC conduit, LTFMC shall also comply with ANSI C-33.84 (latest revision); NEMA-FB1 (latest revision); CEC 12-1400 (latest revision).
9. LTFMC fittings
 - a. Fittings shall include an external mechanical ground/bond wire connector.
 - b. The attachment of the fitting to LTFMC shall be threaded compression type onto the conduit core with locknut and liquid tight jacket compression seal. The fitting shall automatically prevent "sleeving" of the jacket.
 - c. Straight and angled termination connector fittings shall be threaded on one end and shall include locknut suitable for connection to threaded and unthreaded enclosures.
10. LTFMC fittings as manufactured by:
 - a. Termination connector fittings:

<u>Straight Angle Connectors</u>	<u>45 and 90 Degree</u>
<p>1) Thomas & Betts-5331 GR Series.</p> <p>2) Appleton-STB Series; STN-L Series for use with preformed "knockouts".</p> <p>3) OZ/Gedney-4QLT Series.</p>	<p>Thomas & Betts-5341GR and 5351GR Series.</p> <p>Appleton-STB-L Series; STN-L Series for use with performed "knockouts".</p> <p>OZ/Gedney-4QLT</p>
<p>b. LTFMC to RMC conduit to conduit combination coupling fittings:</p> <p>1) Thomas & Betts-5271 GR Series.</p> <p>2) OZ/Gedney-4QFML Series</p>	

F. Rigid Non Metallic Conduit (RNMC)

1. General
 - a. Conduit and fittings shall be 90 degree centigrade conductor rated. Fabricated from homogeneous material, free from visible crack holes or foreign inclusions, with integral "end-bell". The conduit and conduit fittings shall be watertight and airtight.

- b. Conduit, conduit fittings and conduit fitting assembly "solvent cement" shall all be the product of the same manufacturer. Conduit fittings shall be solvent cement welded watertight.
 - c. Conduit and fittings shall be identified with legible markings showing ratings, size and manufacturers name.
 - d. RNMC and fitting shall be corrosion resistant, watertight.
 - e. Conduit shall be suitable for conductor operating temperatures from minus 20 degrees centigrade to 90 degrees centigrade.
 - f. RNMC shall comply with NEMA TC-2 (PVC 40 conduit, latest revision) NEMA TC-6 (EB conduit latest revision) and NEMA TC-3 (fittings, latest revision); UL 514 and UL 651 (latest revision).
2. Polyvinyl Chloride (PVC)-RNMC
- a. PVC-schedule 40 heavy wall construction.
 - b. PVC-schedule 80 extra heavy wall construction.
 - c. PVC-type EB.
3. RNMC fittings connecting to metallic raceways shall be provided with a ground/bond jumper connection.
- G. Expansion Joint, Deflection Joint and Seismic Joint Conduit Fittings
1. Expansion Conduit Fitting - Fitting shall provide for a minimum of two (2) inches straight line movement between two connecting conduits in each direction (total four (4) inches conduit expansion and contraction) parallel to the respective conduit lengths. Fitting shall be watertight.
 2. Deflection Conduit Fitting - Fitting shall provide for a minimum of 30 degrees angular deflection movement ("Shear" deflection) between two connecting conduits, in any direction perpendicular to the length of the respective conduits. Fitting shall be watertight.
 3. Combination Expansion/Deflection Conduit Fitting - Fitting shall provide the combined "expansion" and "deflection" movement capacity between two connecting conduits as described for separate "expansion" and "deflection" conduit fittings. Fitting shall be approved for installation concealed in both masonry/concrete construction and exposed non-masonry/concrete construction. Fitting shall be watertight.
 4. Fittings shall comply with U.L.
 5. Fittings as manufactured by:
 - a. Conduit expansion fittings exposed or concealed locations as manufactured by:
 - 1) OZ/Gedney - AX8 Series for RMC conduit.
 - 2) OZ/Gedney - TX Series for EMT conduit.
 - 3) Appleton - XJ8 Series for RMC conduit and EMT conduits. Provide RMC to EMT combination conduit coupling fittings for each end of the expansion fitting.
 - b. Combination expansion/deflection conduit fittings exposed or concealed conduit locations as manufactured by:
 - 1) OZ/Gedney - AXDX Series for RMC conduit.
 - 2) OZ/Gedney - AXDX Series for EMT conduit. Provide RMC to EMT combination conduit coupling fittings for each end of the expansion/deflection fitting.
 - c. Conduit expansion/deflection fittings for FMC and LTFMC conduit.
 - 1) Provide a minimum of 12 inches of "slack" LTFMC in each FMC or LTFMC conduit at building and structure seismic or expansion joint conduit crossings.
 - 2) Note: Each FMC "slack" expansion/deflection location, shall be considered as not less than a 90 degree conduit bend location, for compliance with the maximum quantity of conduit bends allowed in a raceway.
 6. Conduit fitting bonding jumper:
 - a. The grounding/bonding path of metal conduit shall be maintained by the fitting.
 - b. Provide a bonding jumper at each expansion, deflection and combination expansion deflection conduit fitting.
 - c. The jumper shall be a bare flexible copper "braid". The copper braid electrical current carrying capacity shall be equal to the metal conduit.
 - d. Provide a factory terminated ground clamp on each end of the braid with adjusting steel conduit grounding clamps and connect to each respective conduit end.

- e. The jumper braid length shall be eight (8) inches longer than the respective conduit fitting.
- f. Bonding jumper for FMC and EMT fittings as manufactured by:
 - 1) OZ/Gedney - BJ Series
 - 2) Appleton - XJB Series

I. Conduit Bodies Conduit Fitting

- 1. Conduit bodies shall provide conductor access with a removable conduit body cover and wiring area enclosed in metal housing. The conduit body shall facilitate pulling conductors.
- 2. In-line form "C" conduit bodies shall be prohibited.
- 3. The interior space "length" of 90 degree "elbow" conduit bodies shall not be less than 6 times the diameter size of the largest conduit connecting to the conduit body.
- 4. Conduit body covers shall be removable, gasketed; watertight "domed" metal covers with threaded screw attachment to the conduit body.
- 5. Lubricated, reusable, wire roller guards inside the conduit body shall protect wire from insulation damage during wire "pulling".
- 6. Conduit body fittings shall comply with UL 514.
- 7. Conduit bodies as manufactured by:
 - a. For RMC Conduit

OZ/Gedney - LB 6X/Mogul (90 degree elbow) Series - threaded body.

Appleton - LB/Mogul (90 degree elbow) Series - threaded body.

b. For EMT Conduit

- 1) Same as for RMC conduit. Provide EMT to RMC conduit combination coupling fitting for each outlet body connection.

2.2 PVC COATING

- A. PVC coatings shall be provided as described for specified metal products.
- B. PVC coating shall be factory applied, to comply with NEMA-RN1 and 5-19.
- C. The adhesion of the PVC coating to the coated metal shall exceed the strength of the coating itself, based on 0.5 inch "strip-pull" test.
- D. Uniform coating thickness shall be continuous without "breaks" or "pinholes" and shall not be less than the following:
 - 1. Exterior metal surfaces, 40 mil. coating thickness.
 - 2. Interior metal surfaces, 10 mil. PVC or urethane coating thickness (i.e. interior of conduits, interior of conduit fittings etc.)

2.3 CONDUIT SUPPORTS

A. General

- 1. Conduit Supports, hangers and fasteners for metal conduit shall be steel, hot dip zinc galvanized.
- 2. Conduit supports, hangers and fasteners for PVC coated conduit shall be PVC coated to match the conduit PVC coating.
- 3. Threaded hardware shall be continuous, free running threads.
- 4. Conduit support systems, including support channels, pipe clamps, braces, anchors, hardware, fasteners, shall be sized to support the full capacity circuit conductors weight, plus the installed conduit weight, plus the conduit fitting weight and support hardware weight, plus a 300 percent additional weight capacity safety factor.
- 5. Provide lock washer at each "bolted"/threaded connection.

6. Conduit supports, fasteners, channels, braces, hardware, anchors, pipe clamps and hangers as manufactured by Unistrut or Kindorf.
 7. Supports shall be free of "BURRS" and sharp edges.
 8. Metal supports cut in the field shall be zinc galvanized after cutting to prevent rust.
- B. Conduit Hangers
1. Threaded steel hanger rods.
 - a. Hanger rods smaller than 0.375 inches in diameter shall not be used for support of individual conduits.
 - b. Hanger rods smaller than 0.5 inches in diameter shall not be used for support of multiple conduits.
 2. Conduit hanger wires shall be not less than 12 gauge steel.
 3. Conduit hangers shall attach to structure fasteners with steel "Clevis" or "Swing" hangers and shall provide a minimum of 45 degrees of angular movement in any direction at the point of the conduit hanger attachment to the structure fasteners.
 4. Conduits individually suspended by conduit hangers shall fasten to the respective hangers with "Clevis" type pipe hangers. The pipe hangers shall be steel, adjustable to fit conduit size and shall completely enclose the conduit circumference.
- C. Conduit Support Channels
1. "C" channels shall be factory preformed with a minimum 12 gauge thickness metal. The channel shall be factory "punched" with regularly spaced slotted holes for fastener attachments along the length of the channel.
 2. The "C" channel shall not deflect more than 0.1 inches between channel supports at maximum installed design load, including required safety factor.
 3. Channels shall comply with ANSI-1008 (latest revision) and ASTM-A569 latest revision).
 4. Channels shall provide "turned lips" at longitudinal edges to hold (lock-in) fasteners.
 5. Conduit support channels suspended from conduit hangers shall attach to conduit hangers with treaded connections. Provide a minimum of two hangers (trapeze style) connected to each channel.
 6. Non-suspended conduit support channels shall connect to structure fasteners with threaded connectors.
- D. Fasteners
1. Channel fasteners:
 - a. Channel fasteners shall "prelocate" and lock into the channel "turned lips" and channel "walls".
 - b. A separate metal strap shall "tie" each conduit to each channel with conduit channel fasteners.
 2. Structure fasteners:
 - a. Structure fasteners for wall and floor mounted conduit attachments shall attach to existing masonry and concrete structures with structure fasteners using drilled, mechanical, expansion shield anchors.
 - b. Structure fasteners for wall and floor mounted conduit attachments shall attach to new masonry and concrete structures with structure fasteners using steel threaded inserts precast into the structures.
 - c. Structure fasteners shall attach to steel structural members with "swing-beam clamps", with set-locking screw structure fasteners. Beam clamps shall include integral safety rod, strap or "J"-hook to secure the clamp to the beam flanges on both sides of the beam.
 - d. Structure fasteners for wall and floor mounted conduit attachments shall attach to wood structural members with flush "through-bolted" wood beam/wood framing stud structure fasteners.
 - e. Structure fasteners for wall mounted conduit attachments shall attach to steel framing studs and steel structural elements with spot welded steel structure fasteners or drilled and bolted structure fasteners.

E. Brace Connectors

1. Provide lateral brace connectors to resist horizontal, lateral and vertical movement of suspended conduits during seismic earthquakes.
2. The braces shall connect from each conduit support, attach as close to the conduit as possible, and attach to fixed rigid, nonsuspended building "main" structural elements with fixed anchoring.
3. Brace attachment connectors and fasteners shall be rigid preformed steel channels or flexible #10 gauge steel hanger wire.
4. Connect and attach the brace connectors to fixed structural elements in the same manner as conduit support hangers. The connection of braces to structural elements shall be independent of the conduit support hanger structure fasteners.

2.4 WIRE AND CABLE

A. All wire and cable shall be copper, 600 volt, #12 AWG minimum unless specifically noted otherwise on the drawings. Conductors #10 AWG and smaller shall be solid. Conductors #8 AWG and larger shall be stranded. Type of insulation as noted on drawings as follows: Insulation of conductor connected to circuit protection devices required to be "100%" rated, shall be 90 degree rated insulation:

1. Type THHN/THWN insulation used for #4 AWG and smaller.
2. Type THW/XHHW or THHN/THWN insulation used for #2 AWG and larger.
3. Type THWN or XHHW insulation used for all panel feeders' switchboard feeders, motor control center feeders, transformer feeders and service conductors.
4. Type THHN insulation used for circuit conductors installed in fluorescent lighting fixture raceways, for conductors connected to the secondary of fluorescent or mercury vapor fixture ballast or other hot locations.
5. Type XHHW or THWN insulation shall be used where conductors are installed in conduit exposed to the outdoor weather.
6. The following color code for branch circuits:

Neutral White (Tape feeder neutrals with white tape near connections)

a. Normal Power

120/208 Volt

Ground Green
Phase A Black
Phase B Red
Phase C Blue

480/277 Volt

Ground Green
Phase A Brown
Phase B Orange
Phase C Yellow

- b. Isolated ground insulation shall be green with a longitudinal yellow stripe.
- c. Emergency power same insulation color as normal power except as follows:

120/208 Volt

Provide a continuous stripe on each conductor insulation, orange or yellow, except ground

480/277 Volt

Provide a continuous stripe on each conductor insulation blue or black, except ground

- d. Conductors size No. 10 and smaller shall be colored full length. Tagging or other methods for coding of conductors size No. 10 and smaller not allowed.
- e. For feeder conductors larger than No. 10 at pull boxes, gutters, and panels, use painted or taped band or color tag color-coded as specified above.

7. When individual neutral conductors are shown for each branch circuit, the color code for the neutral conductors shall be as follows:
 - a. 120/208 volt; Phase A - White with Black stripe; Phase B - White with Red stripe; Phase C - White with Blue stripe.
8. Feeders identified as to phase or leg in each panelboard with printed identifying tape.

2.5 MC CABLE

A. General

1. Metal clad electrical cable type "MC", UL listed and labeled; low smoke per IEEE-FT4 1212 procedure and UL-1685 and 1569. Fire stop penetration rated. Rated for installation in environmental air plenums.
2. The cable assembly shall be rated for continuous full load operation in ambient temperatures as follows:
 - a. Dry locations 90 degrees centigrade.
 - b. Wet locations 75 degrees centigrade.
3. The type of MC cable, MC fittings and supports shall be suitable for the conditions of use and the conditions of location of installation, based on the manufacturer's recommendations and based on applicable codes.

B. Conductors

1. Wire conductors shall be 600 volt 60HZ AC thermoplastic insulated, copper wire conductor.
 - a. Wire sizes smaller than #8 AWG shall be solid conductors. Wire sizes #8 AWG and larger shall be stranded conductors.
 - b. Copper conductor - soft annealed copper, ASTM-B3 or B8. Minimum wire conductor size shall not be less than #12 AWG.
2. 600 volt color-coded insulation phase wire conductors.
3. 600 volt white insulation neutral wire conductor.
4. 600 volt green insulation ground wire conductor.
5. A 100 percent coverage internal jacket binder tape shall enclose all conductors, located directly under the jacket armor. The binder tape shall provide isolation of "movement" (reduce friction contact) between the conductors and the metal jacket.
6. The insulation of each wire conductor shall be individually 100 percent enclosed in a continuous tape. The tape shall provide isolation of "movement" (reduce friction contact) between individual conductors insulation and between conductor insulation and the internal jacket tape.

C. Jacket

1. Interlocking flexible metal armor shall be galvanized steel armor jacket. The armor jacket shall 100 percent enclose the insulated wire conductors inside the armor jacket.
2. PVC overall cable jacket:
 - a. A continuous polyvinyl chloride (PVC) flexible jacket shall be applied over the armor jacket 100 percent enclosing coverage.
 - b. The PVC jacket shall be impervious to water infiltration, free of cracks and "pin-holes".
 - c. The PVC jacket shall be provided on MC locations as described in the Contract Documents.
3. The interior surfaces of fittings shall be continuous and smooth, with a constant interior diameter. Fittings shall provide fully enclosed circular cross section. The interior surfaces of fittings shall be without ridges, burrs irregularities or obstructions. Fittings of the same type shall be of the same uniform weight and thickness.
4. Protective corrosion resistant finish for MC fittings fabricated from steel, shall be as follows:
 - a. clean all metal surfaces (including metal threads) with acid bath "pickle" prior to coating, to remove dirt, oil and prepare surfaces for galvanizing.
 - b. Hot-dip galvanized zinc coating on all interior and exterior steel surfaces. Minimum finish zinc coating thickness shall not be less than 0.002 inches.

- c. Threads shall be hot-dip zinc coated after machine fabrication.
 - d. Exterior metal surfaces shall be finished with clear organic polymer topcoat layer, after galvanizing.
 - e. The inner metal surfaces shall be finished with a lubricating topcoat after galvanizing, to facilitate conductor pulling through the fitting.
5. Threads for MC cable fittings shall be taper-pipe-thread, National Pipe Standards (NPS) and shall comply with ANSI-B1.20.1.
 6. Terminal connector fittings shall be provided with a manufacturer installed, insulating throat bushing inside the fitting. The bushing shall protect the wire conductor insulation from cutting, nicks, and abrasion during conductor installation and electrical load "cycling" after installation is complete. The bushing shall comply with UL 94V-0 flammability. The bushing shall be visible and provide physical isolation between the jacket metal armor and the internal conductor insulation.
 7. Fittings connecting to MC cable with PVC jacket coating, shall be PVC coating to match the cable.

PART 3 - EXECUTION

3.1 GROUNDING

- A. Grounding shall be executed in accordance with all applicable codes and regulations, both of the State and local authorities having jurisdiction.
- B. Where nonmetallic conduit is used in the distribution system, the CONTRACTOR shall install the proper sized copper ground wire in the conduit with the feeder for use as an equipment ground. The electrical metallic raceway system shall be grounded to this ground wire.
- C. The maximum ground/bond resistance to the grounding electrode shall not exceed 1 ohms from any location in the electrical system. The maximum ground resistance of the grounding electrode to earth shall not exceed 5 ohms.
- D. Ground/Bond Conductors
 1. Provide an additional, dedicated, green insulation equipment ground/bond wire inside each conduit type as follows. The metal conduit shall not be permitted to serve (function) as the only (exclusive) electrical ground return path:
 - a. All types of nonmetallic conduit raceways including but not limited to: RNMC - Rigid Nonmetallic Conduit.
 - b. FMC - Flexible Metal Conduit.
 - c. LTFMC - Liquid Tight Flexible Metal Conduit.
 - d. RMC - Rigid Metal Conduit.
 - e. EMT - Electrical Metal Tubing.
 2. The equipment ground/bond wire shall be continuous from the electrical circuit source point of origin to the electrical circuit end termination utilization point as follows:
 - a. Every conduit path containing any length of the above identified conduits.
 - b. Every conduit path connected to any length of the above-identified conduits.
 3. The equipment ground/bond wire shall be sized as follows, but in no case smaller than indicated on the drawings. Install equipment ground/bond wire in each conduit/raceway, with the respective phase conductors:

<u>Feeder, Subfeeders & Branch Circuit Protection</u>	<u>Minimum Equipment Ground Wire Size</u>
15 Amp	#12
20 Amp	#12
30 to 60 Amp	#10
70 to 100 Amp	#8

101 to 200 Amp	#6
201 to 400 Amp	#2
401 to 600 Amp	#1
801 to 1000 Amp	2/0
1001 to 1200 Amp	3/0
1201 to 1600 Amp	4/0
1601 to 2000 Amp	250 MCM
2001 to 2500 Amp	350 MCM
2501 to 4000 Amp	500 MCM

4. Splices in ground/bond wires shall be permitted only at the following locations:
 - a. Ground buses with listed and approved ground lugs.
 - b. Where exothermic welded ground/bond wire splices are provided.
 5. Provide ground/bond wire jumpers for conduit fittings with ground lugs, expansion and deflection conduit fittings at conduit fittings connecting between metallic and non-metallic raceways and to bond metal enclosures to conduit fittings with ground lugs.
- E. Where conductors are run in parallel in multiple raceways, the grounding conductor shall be run in parallel. Each parallel equipment-grounding conductor shall be sized on the basis of the ampere rating of the overcurrent device protecting the circuit conductors in the raceway. When conductors are adjusted in size to compensate for voltage drop, grounding conductors, where required, shall be adjusted proportionately in size.
- F. Ground conductors for branch circuit wiring shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws, 6-32 or larger.
- G. Each panelboard, switchboard, pull box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.
- H. Provide a separate ground/bond insulated grounding electrode conductor, copper wire from the main electrical service ground bus to each of the following locations. The ground/bond conductor shall be sized to comply with applicable codes and as indicated on the drawings, but in no case smaller than the following:
1. Main service entrance equipment ground bus:
 - a. Services smaller than 1200 ampere 1.5 inch conduit with 1#4/0.
 - b. Services 1200 ampere and larger 2.5 inch conduit with 1#500MCM.
 - c. Where a separate ground bus is not required, connect ground to electrical equipment metal housing
 2. Each telephone backboard and signal system backboard location, 1.0 inch conduit with 1#1.
 3. Metal cold water pipe located inside the building, 1.5 inch conduit with 1#4/0.
 4. Outdoor underground metal cold water pipe, make connection five feet from the building, 1.5 inch conduit with 1#4/0.
 5. Each transformer (size as indicated and to comply with applicable codes).
 6. Each service entrance ground bus and each separately derived ground rod system:
 - a. Services smaller than 1200 ampere 1.5 inch conduit with 1#4/0.
 - b. Services 1200 ampere and larger 2.5 inch conduit with 1#500MCM.
 7. Separate
 - 1.25 inch conduit with 1#2 (AWG) bonding conductor to each interior metal pipe system located in the same building, including but not limited to, the following:
 - a. Fire sprinkler system each stand pipe location (water based and non-waterbased).
 - b. Roof drains.
 - c. Waste liquid disposal systems.
 - d. Metal gas pipe service entrance and service meters.

3.2 CONDUIT

A. General

1. The sizes of the conduits for the various circuits shall be as indicated on the drawings, but not less than the conduit size required by code for the size and quantity of conductors to be installed in the conduit.
2. Conduits shall be installed concealed from view. Install conduits concealed in walls, concealed in/below floors and concealed above ceilings, except as specifically noted otherwise.
3. The following systems shall be considered as circuits 100 volts and less, all other circuits shall be considered to be over 100 volts (power circuits) unless specifically noted otherwise: Fire alarm, energy management control, telephone, public address, data, computer, television, intercom, intrusion alarm and nurse call.
4. Conduits shall be provided complete with conduit bends, conduit fittings, outlet boxes, pullboxes, junction boxes, conduit anchors/supports, grounding/bonding for a complete and operating conductor/wire raceway system.
5. Metal and nonmetal conduits shall be provided mechanically continuous between termination connection points. Metal conduit shall be provided electrically continuous between termination connection points.
6. Individual conduit paths and home runs shown on the drawings shall be maintained as separate individual conduits for each homerun and path.
7. Conduits, conduit fittings and installation work occurring in classified hazardous materials locations shall comply with applicable code Class 1 Division 1 requirements, unless specifically noted otherwise.
8. Transitions between conduits constructed of different materials and occurring in above grade locations shall be allowed only at outlet boxes, junction boxes, pull boxes and equipment enclosures unless specifically indicated otherwise. Provide outlet boxes and junction boxes.
9. Metal conduit terminating to nonmetal enclosures; terminating into metal enclosures with "concentric ring" knockouts; terminating into metal enclosures with knockout reducing washers, including but not limited to equipment housings, outlet boxes, junction boxes, pull boxes, cable trenches, manholes, shall be provided with a ground/bonding lug integrated with the conduit termination conductor fitting construction, by the fitting manufacturer. The lug shall provide for connection of a grounding/bonding conductor (insulated or uninsulated). The grounding lug shall be located on the fitting, inside the termination enclosure.
10. The type of conduit, type of conduit fittings, and type of conduit supports and method of conduit installation shall be suitable for the conditions of use and conditions of location of installation based on the manufacturer's recommendations; based on the applicable codes and based on the requirements of the contract documents.

B. RMC Installation Locations

RGS, IMC conduits and RGS, IMC fittings shall be installed in the following locations:

1. Embedded in floors, walls, ceilings, roofs, foundations, and footings constructed with concrete
2. Embedded in walls and foundations constructed with brick and masonry.
3. Interior of buildings, within nine feet of finish floor lines for exposed conduit locations.
4. Exterior of building for exposed conduit locations.
5. Damp or wet locations, exposed or concealed locations.
6. Exposed on roofs.
7. In hazardous materials areas and locations; below hazardous materials areas and locations; above hazardous materials areas and locations.
8. Exposed on utility service poles, for pole risers less than 9 feet above finish grade.
9. RMC conduit and RMC fittings may be installed in any location where EMT and FMC conduit is permitted to be installed.

C. EMT Installation Locations

EMT conduit and EMT fittings may be installed in the following locations, for circuit conductors operating below 600 volts to ground; locations containing only "non-hazardous materials"; only dry locations:

1. Concealed in hollow non masonry, metal stud frame and wood stud frame walls.
2. Concealed above ceilings.
3. Exposed inside interior enclosed crawl spaces.
4. Exposed interior locations placed 9 ft. or higher above finished floors.
5. Exposed in the following dedicated function areas, interior enclosed room locations:
 - a. Indoor enclosed electrical equipment rooms and closets.
 - b. Indoor enclosed data and telecommunication terminal rooms and closets.
 - c. Indoor enclosed HVAC equipment rooms and closets.
6. Any location where FMC is described to be installed, except as the final connection to rotating or vibrating equipment.

D. FMC Installation Locations

FMC conduit and FMC fittings may be installed in the following locations for circuit conductors operating below 600 volts to ground; locations containing only "non-hazardous materials"; only dry, interior locations:

1. Concealed in hollow non-masonry metal stud frame and wood stud frame fully enclosed walls.
2. Concealed above fully enclosed ceiling spaces.
3. FMC conduit shall be installed in continuous lengths between termination points. FMC shall not be "spliced" or coupled directly to FMC or any other conduit type under any circumstance.
4. The maximum continuous length of FMC that shall be installed between termination end points is 15 feet. Circuits requiring continuous conduit lengths exceeding 15 feet between termination end points shall be installed using either RMC or EMT conduits. FMC lengths shorter than 16 inches are prohibited.
5. The minimum size FMC conduit shall be as shown on the drawings but not be less than the following:
 - a. FMC lengths of six feet or less, minimum FMC conduit size shall be 0.50 inches.
 - b. FMC lengths exceeding six feet, minimum FMC conduit size shall be 1.0 inches.

E. LTFMC Installation Locations

LTFMC conduit and LTFMC fittings shall be installed in the following locations for circuit conductors operating below 600 volts to ground; locations containing only "non-hazardous materials":

1. Final electrical connection to vibrating or rotating equipment; control and monitoring devices mounted on vibrating and rotating equipment including the following. Minimum conduit length shall not be less than 24 inches:
 - a. Motor, engines, boilers, solenoids, and valves.
 - b. Fixed mounted "shop" (manufacturing) production equipment.
 - c. Fixed mounted food preparation equipment and "kitchen" equipment.
2. All locations where exposed flexible conduit connections are required, both indoor and outdoor.
3. Final connection to indoors electrical transformers. Minimum conduit length shall not be less than 24 inches, maximum conduit length shall not exceed 72 inches.
4. Do not install LTFMC located in environmental air plenums.

F. RNMC Installation Locations

RNMC conduit and RNMC fittings shall be installed in the following locations containing only "non-hazardous material":

1. Underground, concealed below earth grade, unless specifically noted or specified otherwise.
2. Exposed on utility service poles, for pole risers at 9 feet or higher above finish grade, schedule 80 PVC only.
3. RNMC type "EB" conduit(s) shall be concrete encased along the entire length of the conduits for all installation locations.

G. Conduit Installation

1. Conduit Supports
 - a. Securely and rigidly support all raceways/conduits from the building structure. Raceways/Conduits shall be supported independent of all piping, air ducts, equipment

- ceiling hanger wires, and suspended ceiling grid systems. Secure conduit to structural element by means of U.L. listed and approved hangers, fasteners, "C" channels and pipe clamps.
- b. Provide conduit supports spaced along the length of the conduit as follows:
 - 1) RMC and EMT conduit, maximum not to exceed 96 inches on center; within 24 inches of each conduit bend and conduit termination location.
 - 2) FMC and LTFMC conduit, maximum not to exceed 24 inches on center; within 6 inches of each conduit bend and conduit termination location.
 - c. Suspended conduit methods:
 - 1) Individual, suspended raceways/conduits separated by more than 12 inches from any other conduit and suspended from ceilings and roofs shall be supported as follows:
 - a) Conduits smaller than 1.5 inches by means of hanger rods or hanger wires.
 - b) Conduits 1.5 inches and larger by means of hanger rods.
 - c) The conduit shall attach to the hangers with pipe clamps.
 - 2) Suspended raceways/conduits positioned within 24 inches of any other conduit shall be grouped and supported by hanger rods using trapeze type conduit support channels ("C" channels). Conduits shall individually attach to common channels side-by-side, with pipe clamps.
 - d. Non-suspended conduit methods:
 - 1) Individual raceway/conduits placed against wall/ceiling/floors, placed inside hollow wall/ceiling construction or structure framing (i.e., "dry-wall" or plaster hollow wall construction), shall be secured by means of individual pipe clamps and fasteners attached to the framing studs or other structural members and the conduit/raceway.
 - 2) Provide common "C" channel supports for all multiple raceway/conduits placed against vertical or horizontal surfaces and positioned within 24 inches of other raceways/conduits. Attach channels to the framing studs or other structural members. Attach the conduits/raceway individually to common channels, side-by-side, with pipe clamps.
 - 3) The use of toggle bolts is prohibited.
 - e. Conduit rising from floor for motor connection shall be independently supported if extending over 18" above floor. Support shall not be to a motor or ductwork, which may transmit vibrations.
 - f. Provide conduit anchoring, conduit support and conduit bracing systems conforming to Earthquake Seismic Zone 4 requirements. The conduit support/anchoring system capacity shall include the weight of the conduits, conduit fittings, conduit supports and conductors/wires/cables installed in the conduits plus a 300 percent safety factor. Submit shop-drawing details showing each typical conduit anchor, conduit support and conduit brace location. Submit structural calculations performed by and signed by a Professional Structural Engineer (P.E.) with a P.E. license, registered in the state of California, U.S.A.
2. Conduit separation:
- a. Conduit installed underground or below building slab without full concrete encasement: Shall be separated from adjacent conduits of identical systems (i.e. signal to signal, data to data, power to power, control to control etc.) by a minimum of 3 inches. Conduits of non-identical systems (i.e. signal to power; data to power; power to control; signal to control, etc.) shall be separated by a minimum of 12 inches.
 - b. Conduit installed underground with full concrete encasement; shall be separated from adjacent conduits of similar systems (100 volt and less) by a minimum of 2 inches; conduits for non power systems (100 volts and less to ground) shall be separated by a minimum of 6 inches from power circuits (over 100 volts to ground); conduits for power circuits shall be separated from adjacent conduits of similar power systems (over 100 volts to ground) by a minimum of 3 inches.
 - c. Separation of conduits entering termination points or crossing other conduits may be reduced as required within 60 inches of the termination or crossing points.
 - d. Conduits containing Utility Company service circuits (i.e. electrical power, telephone, or cable television) shall be separated a minimum of 12 inches from all other utilities and

- conduits, with or without concrete encasement; metallic or non-metallic conduit, above grade or underground conduit locations.
- e. Conduits shall be separated from hot water piping, exhaust flues/chimneys, steam piping, boilers, furnaces, ovens by a minimum of 12 inches.

3. Expansion joint, deflection joint and seismic joint fittings.

- a. Provide a conduit expansion fitting for each conduit length and conduit type as follows (Note - The installation of specified combination expansion/deflection fittings at seismic joints shall satisfy this spacing requirement also):

Conduit Type	Fitting Length Conduit	Spacing
1) RMC and EMT locations	Exposed exterior	200 ft
2) RMC and EMT protected locations	Interior weather	400 ft

- b. Provide a conduit combination expansion/deflection fitting for each conduit, crossing the following elements:
 - 1) At each building or non-building structure seismic joint.
 - 2) At each building on non-building structure expansion joint.
 - 3) At each conduit penetration of a "sound-rated" wall, floor or ceiling.
- 4. Provide two locknuts and an insulated throat bushing at each metal conduit terminating at enclosures, including but not limited to outlet boxes, junction boxes, terminal cabinets, switchgear, transformers, switchboards, distribution panels and panelboards.
- 5. Provide metallic or plastic closure caps on all conduit ends during construction, until installation of conductors in the respective conduit.
- 6. Conduit run exposed, shall be run at right angles or parallel to the walls or structures. All changes in directions, either horizontally or vertically, shall be made with conduit outlet bodies as manufactured by Crouse Hinds, OZ or equal. Conduits run on exposed beams or trelliswork shall be painted to match surrounding surfaces.
- 7. Conduit exposed on roof:
 - a. Conduits installed exposed on roofs shall be installed on conduit sleepers. Place the conduit sleepers a maximum 5-foot on center along the entire length of the conduit; under conduit expansion/deflection fittings; under each junction box and within 24 inches of each conduit bend.
 - b. Provide a conduit support "C" channel continuous along the top length of the sleeper and rigidly bolted to the sleeper. Conduits shall be loosely fastened to each sleeper "C" channel with pipe clamps to allow for relative movement between the sleeper and conduit.
 - c. Conduits shall not block or interfere with roof hatches, doors, ventilation openings, dampers, equipment access panels/doors, roof water drainage.
 - e. Conduit sleepers shall be fabricated from "clear" solid redwood 4 inch x 4 inch (nominal) size. Sleeper length shall extend a minimum of 9 inches past the conduits attached to the sleeper, but in no case shall the length of the sleeper be less than 24 inches.
 - f. Provide a pad under each sleeper, sleepers shall not be installed in direct contact with the roofing. Sleeper pads shall extend a minimum of 6 inches past each side of the sleeper. The sleeper pad shall be semirigid mineral surfaced composition board, not less than 0.375 inch thickness, bituminous impregnated, manufactured for application on the specific roofing material. Remove roofing "ballast" (gravel) under pad, prior to installation of sleeper pad. Do not puncture roof membrane.
 - g. Position the "length" of the conduit sleepers' perpendicular to the roof slope, to prevent obstruction of roof drainage water flow. Where the conduit routing prevents placing the conduit sleeper parallel to the roof slope, provide two separate sleeper pads for the conduit sleeper, with a continuous 3 inch wide water drainage gap between the sleepers. Align the water drainage gap to allow unimpeded water travel along the roof slope drainage flow line between the pads.

- h. Sleepers and sleeper pads shall be set in nonhardening mastic, a minimum of 0.25 inch thickness. Mastic shall be inorganic, nonhardening, and complying with ASTM-D1227. Mastic shall be applied with continuous uniform coverage, minimum 0.25 inch thickness, on all the surfaces of each conduit sleeper and on the sleeper pad contact surface with the roof.
 - 8. Rigid steel conduit or electrical metallic tubing shall not be strapped or fastened to equipment subject to vibration or mounted on shock absorbing bases.
 - 9. RMC conduit threads:
 - a. Machine cut threads on RMC conduit required for field fabrication shall comply with NPS and ANSI-B1.20.1.
 - b. The length of bare metal exposed during thread fabrication shall be completely covered by conduit couplings and fittings. Additionally, the thread length shall insure that conduit joints will reach "torque" tightness and become secure before conduit ends "butt" together and before conduit ends "butt" into the "shoulders" of other conduit fittings.
 - c. Running threads or right/left handed threads shall not be used to connect RMC.
 - 10. RNMC conduit:
 - a. Joints and fittings shall be solvent welded to RNMC conduit. Joints and fittings shall be watertight and airtight after fabrication.
 - 11. Tighten each conduit fittings and fitting appurtenance, to the "torque" (allowable tolerance ± 5 percent) value recommended by the fitting manufacturer and applicable code. If three (3) or more conduit fittings are found to not be in compliance with the manufacturer's "torque" (tightness) recommendations, the following corrective actions shall occur:
 - a. The CONTRACTOR shall tighten "re-torque" the defective fittings and all similar conduit fittings installed as part of the contract documents in the presence of the OWNER's REPRESENTATIVE.
 - b. If the respective conduit fittings similar to the deficient "torque tightness" fittings are installed concealed in walls, floors, above ceilings or below grade, the CONTRACTOR shall expose the fitting, to allow retightening each similar conduit fitting to the manufacturers recommended "torque" values.
 - c. All the cost to repair the direct, indirect, incidental damages and contract delays resulting from complying with these requirements shall be the sole responsibility of the CONTRACTOR and shall be included in the bid price.
- H. Conduit Bodies
- 1. Conduit bodies shall be installed in exposed conduit locations only or above accessible ceilings.
 - 2. Conduit bodies shall be accessible for removing body cover and pulling wire through the conduit body.
 - 3. Conduit bodies shall not be installed inside enclosed walls.
- I. Preparation of Reuse of Existing Conduits
- 1. Prepare existing conduits shown to be reused as part of contract work as follows: Complete the required work prior to installing any conductors or cables in respective existing conduits.
 - a. "Rod" out existing raceways to be used under this contract, with approved test and flexible mandrels to remove all obstructions to clear debris from inside conduits.
 - b. Use test mandrels at least 12-inch long, 0.25-inch less than diameter of duct at center, tapering to 0.5-inch less than duct size at ends.
 - 2. If test mandrels cannot be pulled through raceways, CONTRACTOR shall perform the following to clear the existing raceways:
 - a. Force rigid or semi-rigid rods through the raceways to clear the obstructions from one to both ends of the raceway.
 - b. Force a power driven rotating router device through the conduit from one or both ends of raceways. Device shall incorporate small diameter cutting blades. Repeat the "router" process in incremental stages to a cutting blade diameter approximately 1/8" smaller than the raceway inside diameter.

3. After clearing the raceway of obstructions, pull a test mandrel or brush through the raceway to clear the remaining debris from the raceway.

3.3 WIRE AND CABLE

- A. Branch circuit and fixture joints for #10 AWG and smaller wire shall be made with UL-approved connectors listed for 600 volts, approved for use with copper and/or aluminum wire. Connector to consist of a cone-shaped, expandable coil spring insert, insulated with a nylon shell and 2 wings placed opposite each other to serve as a built-in wrench or shall be molded one-piece as manufactured by 3M-"Scotchlok".
- B. Branch circuit joints of #8 AWG and larger shall be made with screw pressure connectors made of high strength structural aluminum alloy and UL-approved for use with both copper and/or aluminum wire as manufactured by Thomas & Betts. Joints shall be insulated with plastic splicing tape, tapered half-lapped and at least the thickness equivalent to 1.5 times the conductor insulation. Tapes shall be fresh and of quality equal to Scotch.
- C. Use U.L. listed pulling compound for installation of conductors in conduits.
- D. Correspond each circuit to the branch number indicated on the panel schedule shown on the drawings except where departures are approved by the OWNER'S REPRESENTATIVE or the OWNER'S Representative.
- E. All wiring, including low voltage, shall be installed in conduit.
- F. Control wiring to conform to the wiring diagrams shown on the mechanical drawings and the manufacturer's wiring diagrams.
- G. All splices in exterior pull boxes and light poles shall be cast resins encapsulated.
 1. Power conductor splices - 3M Scotchcast Series 82/85/90; Plymouth or equal.
 2. Control and signal circuits 3M Scotchcast series 8981 thru 8986, Plymouth or equal.
- H. Neatly group and lace all wiring in panelboards, motor control centers and terminal cabinets with plastic ties at 3" on centers. Tag all spare conductors.

3.4 MC CABLE INSTALLATION

- A. General
 1. MC cable shall not be "spliced" or coupled directly to any other conduit type under any circumstance.
 2. MC cable shall not be installed exposed. Where exposed installation occurs, provide a conduit to completely enclose and protect the MC Cable. The inside diameter of the conduit shall be sized 1.6 times the outside diameter of the MC cable. The conduit type and installation methods shall comply with the Contractor Documents.
 3. MC cable shall be continuous length between end point terminations, without intermediate splices or junctions.
 4. MC cable shall be supported and attached. MC cable supports and attachments shall be the same as contract document requirements for conduit, with the following exceptions:
 - a. Support at not more than 3ft. intervals along the entire length of the MC cable.
 - b. Support within 12 inches of each bend or change of direction.
 - c. Support within 12 inches of each termination entrance.
 5. The minimum installed bending radius shall not be less than 8 times the outside diameter of cable assembly, as measured at the inside radius cable jacket surface.
 6. Cable lengths of less than 6ft. shall not be permitted.
 7. MC cable shall be installed and terminated to comply with Manufacturer's recommendations.
- B. Permitted Applications

1. MC cable may be provided only for electric power circuits and where complying with all of the following conditions:
 - a. Circuits operating on line to ground 60HZ-AC circuit voltages, exceeding 100 volts and less than 500 volts.
 - b. The full load ampere rating and circuit conductor quantities of the proposed MC cable shall be equal to or greater than the full load ampere rating for the conduit and wire conductors shown on the contract drawings.
 - c. The electrical circuit voltage drop of the proposed MC cable shall be equal to or less than for the conduit and wire conductor sizes shown on the contract drawings.
 - d. The conductor sizes in MC cable shall not be smaller than the conductor sizes described for conduit and wire installations.
 - e. MC cable shall not be permitted on circuits with more than one (1) phase conductor per phase.
2. MC type cable may only be installed in the following locations in areas that do not contain classified hazardous materials (MC cables without PVC jacket):
 - a. Concealed in hollow non-masonry metal stud frame and wood stud frame fully enclosed walls.
 - b. Concealed above fully enclosed ceiling spaces.
3. MC Cables with PVC jacket may only be installed in the following locations:
 - a. Underground installation locations.
 - b. MC cable installed below grade shall be not less than #4 AWG conductor size.
 - c. The underground installation requirements for MC cable shall be the same as for conduit and wire systems including but not limited to trenching, burial depth, circuit separation, supports, concrete encasement, etc.
 - d. MC cables shall not be installed below areas with classified hazardous materials.

3.5 INSTALLATION

A. General:

1. Conductors and cables shall be continuous from outlet to outlet.
2. Do not use direct burial cable.

B. Line Voltage Conductors:

1. Install conductors in raceway where indicated on Drawings. Run conductors of different voltage systems in separate conduits.
2. Route circuits at own discretion, however, circuiting shall be as shown in Panel Schedules. Group circuit homeruns to panels as shown on Drawings.
3. Neutrals:
 - d. On three-phase, 4-wire systems, do not use common neutral for more than three circuits.
 - e. On single-phase, 3-wire systems, do not use common neutral for more than two circuits.
 - f. Run separate neutrals for each circuit where specifically noted on Drawings.
 - g. Run one neutral for each home run circuit, connect phase conductors to breakers in panel which are attached to separate phase legs so neutral conductors will carry only unbalanced current. Neutral conductors shall be of same size as phase conductors unless specifically noted otherwise.
4. Pulling Conductors:
 - d. Do not pull conductors into conduit until raceway system is complete and cabinets and outlet boxes are free of foreign matter and moisture.
 - e. Do not use heavy mechanical means for pulling conductors.
 - f. Use only listed wire pulling lubricants.

C. Line Voltage Cables:

1. Route circuits at own discretion, however, circuiting and numbering shall be as shown in Panel Schedules.

2. Support cables using approved staples, cable ties, straps, hangers, or similar fittings, spaced as required.
3. Where installing in framing, do not bore holes in joists or beams outside center 1/3 of member depth or within 24 inches of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width. Holes shall be one inch diameter maximum.
4. Conceal cables within ceilings and walls of finished areas. Cables may be exposed in unfinished areas but not run on floors of mechanical equipment spaces or in such a way that they obstruct access to, operation of, or servicing of equipment.
5. Install exposed cables parallel to or at right angles to building structure lines.
6. Keep cables 6 inches minimum from hot water pipes.
7. Do not support cables from mechanical ducts or duct supports without Architect's written approval.
8. Prohibited procedures:
 - d. Boring holes for installation of cables in vertical truss members.
 - e. Notching of structural members for installation of cables.

END OF SECTION
042911/462004

SECTION 26 1600**BRANCH CIRCUIT PANELBOARDS, DISTRIBUTION PANELS AND TERMINAL CABINETS****PART 1 - GENERAL****1.1 SCOPE**

- A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
1. Furnish and install circuit-breaker panelboards as described in Contract Documents.
 2. Examine all other specification sections and drawings for related work required to be included as work under Division Sixteen.
 3. General provisions and requirements for electrical work.

1.2 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Provide manufacturers catalog data for panels, cabinets and circuit breakers.
- B. Provide shop drawing showing panel circuit arrangements, size, voltage, ampacity, overcurrent protective devices, etc.
- C. Provide nameplate engraving schedule.
- D. SHORT CIRCUIT, COORDINATION AND ARC-FLASH
1. Perform and submit engineered settings for each equipment location, fuse and adjustable circuit breaker device, showing the correct time and settings to provide the coordination within the limits of the specified equipment, per the latest applicable standards of IEEE and ANSI. Provide electrical system short circuit fault analysis, both 3-phase line-to-line and 1-phase line-to-ground calculations as part of the coordination analysis recommendations. Provide Electric ARC-FLASH calculations as part of the coordination analysis recommendations.
 2. The information shall be submitted in both tabular form and on time current log-log graph paper, with an engineering narrative. Written narrative describing data, assumptions, analysis of results and prioritized recommendations, (6) six copies.
 3. The goal is to minimize an unexpected but necessary electrical system outage and personnel exposure to the smallest extent possible within the fault occurrence location, using the specified contract equipment. Shall comply with, but not limited to:
 - a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
 - b. IEEE-399, Recommended Practice for Industrial and Commercial Power System Analysis.
 - c. IEEE-1584, Guide to Performing ARC-FLASH Hazard Study.
 - d. CEC/NEC
 4. Electrical equipment including switchgear, switchboards, electrical panels, and control panels, transformers, disconnects, etc., shall each be labeled by the manufacturer with "Electrical-ARC-Flash" warning signs. The signs shall explain a hazard to personnel may exist if the equipment is worked on while energized or operated by personnel, to wear the correct protective equipment/clothing (PPE) when working "Live", or operating "Live" equipment and circuits.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND DISTRIBUTION PANELS

- A. Shall be flush or surface mounting as indicated with group-mount circuit protection devices as shown on panel schedule, hinged lockable doors, index cardholders and proper bussing.
 - 1. Panelboards shall comply with the latest versions:
 - a. NEMA – PB1.
 - b. UL – 50 and 67.
 - c. CEC/NEC.
 - d. ASTM-B187.
 - 2. Where indicated on the drawings shall be furnished with subfeed breakers and/or additional conductor lugs, split bussing, contactors, time switches, relays, etc., as required.
 - a. Branch circuit panels up through 42-circuits shall be single section, to accommodate all of the circuits and components.
 - b. Distribution panels shall be single section or multi-section, to accommodate all of the circuits and components.
 - 3. Panels shall be "Service-Entrance" equipment rated when the panel main incoming supply feeder originates from one of the following:
 - a. Originates outdoors exterior of the building in which the respective panel is located.
 - b. Originates from an electrical supply source not located in the same building as the respective panel.

- B. Housing and Painting, Panels and Terminal Cabinets
 - 1. Shall be finished with one coat of rust inhibitor zinc chromate and coat of primer sealer after a thorough cleaning.
 - 2. Finish color paint as selected by OWNER's Representative where exposed to public view (e.g., corridors, covered passages, offices, etc.). Prime coated panelboard shall be painted to match surroundings after installation in public areas.
 - 3. Manufacturer's standard color in electrical rooms/closets, janitor's, HVAC and storage rooms.
 - 4. Shall be fabricated of sheet steel of the following minimum gauges.
 - a. Full height hinged, locking door. Trim #12 gauge steel; enclosure - code gauge steel.
 - b. Panels installed in indoor dedicated electrical equipment rooms and dedicated electrical equipment closets, omit full height hinged locking panel door. Dead front cover behind omitted panel door shall remain.
 - 5. NEMA-1 Metal Housing, for indoor locations.
 - 6. NEMA-3R Metal Housing, tamper resistant, for outdoor locations.
 - 7. Furnish all panels and terminal cabinets with the manufacturers flush locks and keys except where indicated otherwise herein. Keys and locks shall be interchangeable for all panels.
 - 8. Fasten the trim to panel and terminal cabinets by means of concealed, bolted or screwed fasteners accessible only when the door is open.

- C. Panels 208/120 volt, three phase, 4 wire, S/N or 120/240 volt, single phase, 3 wire, S/N.
Branch circuit panel as manufactured by:
 - 1. Cutler Hammer "Pow-R-Line 1 or 2" Series
 - 2. General Electric "A" Series
 - 3. Square D "NF/NQ" Series
 - 4. Siemens "P1/P2" Series

- D. Branch circuit panels for 480/277 volt, three phase, 4 wire, S/N.
Panelboard as manufactured by:
 - 1. Cutler Hammer "Pow-R-Line 2" Series
 - 2. General Electric "A" Series
 - 3. Square D "NF" Series
 - 4. Siemens "P1/P2" Series

- E. Distribution panels as manufactured by:
 - 1. Cutler Hammer "Power-R-Line 3 or 4" Series
 - 2. General Electric "Spectra" Series
 - 3. Square D "I-Line" Series
 - 4. Siemens "P4/P5" Series

- F. Top and bottom gutter space shall not be less than 6-inches high. Provide 6-inches additional gutter space in all panels where double lugs are required, or where cable ampere size exceeds bus ampere size. Provide 12-inches additional gutter space in all panels for aluminum feeders where used.

- G. Panel dimensions.
 - 1. Panels with buss sizes 50 ampere thru 400 ampere
 - a. Shall be 20-inch wide. Surface or flush mounting as indicated.
 - b. Recess mounted type shall have a 20-inch wide (maximum) recess metal enclosure with overlapping edge trim plate cover extending 1-inch on all sides of enclosure.
 - c. Depth shall be 5.75-inch nominal. Height of panel as required for devices.
 - 2. Panels with buss sizes greater than 400 ampere
 - a. Narrow panels 24-inch (maximum) wide by 6.5-inch (maximum) deep units. Wide panels 25-inch to 44-inch (maximum) wide by 8-inch to 15-inch (maximum) deep units. Nominal 90-inch panel height.
 - b. The wider units shall be used only at locations where the narrow unit is not available with the quantity or size of large-ampere frame branch/subfeed circuit protective devices shown on the panel schedules, or where the main breaker size exceeds the narrow panel maximum.
 - c. Distribution panels shall be floor standing and also supported from behind the panels at walls.

- H. Distribution panels and branch circuit panels maximum load rating
 - 1. Panelboards and Distribution Panels exceeding 800 ampere load rating shall not be permitted.
 - 2. Provide Distribution Switchboards instead of Distribution Panels for bus load and circuit load ratings exceeding 800 ampere.

- I. Panel Auxiliary Cabinets
 - 1. Panelboards shown on the drawings with relays, time clocks or other control devices shall have a separate auxiliary metal barriered compartment mounted above panel..
 - 2. Provide auxiliary cabinets with separate hinged locking door to match panelboard.
 - 3. Provide mounting subbase in cabinet for control devices and wiring terminal strips.

- J. Panels shall have a circuit index cardholder removable type, with clear plastic cover. Index card shall have circuit numbers imprinted to match circuit breaker numbers.

2.2 Short Circuit Rating

- A. Circuit protective devices and bussing as indicated on the drawings. All devices and bussing shall have a short circuit fault withstand and interrupting capacity not less than the maximum available fault current at the panel and as indicated on the drawings, plus a 25-percent additional capacity (safety margin). However, in no case shall the short circuit fault interrupting and withstand capacity be less than the following symmetrical short circuit.

<u>C/B and/or Bus Rating</u>	<u>Circuit Voltage</u>	<u>Short Circuit Amp.</u>
1. 400A and less	240V and below	10,000A
2. 400A and less	over 240V and below 600V	14,000A
3. Over 400A and 800A and below	240V and below	42,000A

- | | | | |
|----|---------------------------------|-----------------------------|---------|
| 4. | Over 400A and
800A and below | over 240V
and below 600V | 30,000A |
|----|---------------------------------|-----------------------------|---------|

B. Panel short circuit fault rating

1. General

- a. Provide a "fully rated" for short circuit fault interrupt and full load ampere main circuit breaker in each branch circuit panel and/or each distribution panel. Provide the main circuit breaker whether or not a main circuit breaker is shown otherwise on the drawings, schedules or diagrams.
- b. The panel main circuit breaker full load ampere capacity rating shall equal the respective panel main bus ampere rating.
- c. The panel assembly, buss and circuit protection devices bolted fault short circuit withstand and bolted fault short circuit interrupt ratings shall not be less than 125-percent greater (including a 25-percent safety margin) than the available utility-source symmetrical and asymmetrical bolted fault short circuit current when "series combined rated" with the panel main circuit breaker. The "utility-source" shall be used to establish the available fault duty values, unless indicated otherwise on the drawings.
- d. The main circuit breaker rated "bolted-fault" short circuit fault interrupt and withstand short circuit rating shall not be less than 125-percent (including a 25-percent safety margin) of the upstream main service entrance "bolted-fault" available (symmetrical and asymmetrical) short circuit current.

2. Distribution Panelboards

- a. Distribution panel, main circuit breaker, all feeder circuit breakers, and all branch circuit breakers shall be "fully-rated" for the available bolted fault short circuit current (including safety margin).
- b. Shall provide time/current tripping coordination with downstream equipment.

3. Branch circuit panelboards 400 ampere buss and smaller; branch circuit panelboards 400 ampere trip circuit breaker and smaller.

- a. The panel main circuit breaker shall be "fully-rated" Current Limiting Circuit Breaker type (CLCB).
- b. The branch circuit panel main circuit breaker shall be "series-rated" with the panel downstream branch circuit devices and panel bussing. "The series-rating" shall provide short circuit bolted fault current withstand protection and short circuit bolted fault interrupt rating protection during a downstream 3-phase line-to-line and/or single-phase line-to-ground short circuit bolted faults.

2.3 PANEL CIRCUIT BREAKERS, CIRCUIT PROTECTION DEVICES

A. Circuit Breakers General, for Distribution Panels and Panelboards

1. NEMA-AB1 and AB3, comply with latest revision.
2. UL-1087, UL-489 and IEC-60.947.2 rated devices, comply with latest revision.
3. Five (5) hertz AC closing and three (3) hertz AC trip and clear.
4. Main circuit breakers for branch circuit panelboards 400 ampere buss and smaller shall be Current Limiting Circuit Breaker type-CLCB.
5. Branch circuit breakers and feeder circuit breakers smaller than 225-ampere trip shall be thermal/magnetic and with instantaneous trip. Molded Case Circuit Breakers type-MCCB.
6. All circuit breakers 225 ampere and larger trip shall employ sensors and solid state digital electronic automatic trip system. Time/current curve shaping field adjustable features. Molded Case Circuit Breaker type-MCCB or Insulated Case Circuit Breaker type-ICCB.
7. Refer to Specification Section 26 4250 for additional circuit breaker requirements.

B. Manufacturer

1. Circuit breakers as manufactured by the following companies only are acceptable:
 - a. Cutler Hammer
 - b. General Electric Co.
 - c. Square D Co.

d. Siemens

C. Configuration

1. Circuit breakers shall be arranged in the panels so that the breakers of the proper trip settings and numbers correspond to the numbering in the panel schedules on the drawings.
2. Circuit numbers of breakers shall be black-on-white micarta tabs or other previously approved method. Circuit number tabs, which can readily be changed from front of panel, will not be accepted. Circuit number tabs shall not be attached to or be a part of the breaker.
3. Panelboard circuit protection devices shall be bolt on type for connection to panel bus.
4. Provide conductor wire terminations (lugs) on each circuit protection device for incoming main feeder, branch circuits and outgoing feeder circuits. Dual rated copper/aluminum and compatible with the respective conductor size, type and quantity.
5. Where two pole or three pole breakers occur in the panels, they shall be common trip units. Single pole breakers with tie-bar between handles will not be accepted.
6. Branch circuit panels shall be field convertible for bottom entry main incoming feeder or top entry main incoming feeder.
7. Each panel section, the feeder and branch circuit protection devices (3-phase and/or 1-phase) shall be "twin-mount", side-by-side double row construction for the following circuit sizes:
 - a. 480/277 volt, 60 ampere circuit size and smaller.
 - b. 240 volt – 208/120 volt, 100 ampere circuit size and smaller.

D. ARC Fault Interrupter Circuit Breaker (AFCI-C/B)

1. AFCI-C/B provide automatic circuit interruption upon detection of any of these conditions: overload, short circuit fault and electric branch circuit arcing protection.
2. The AFCI-C/B shall detect intermittent "arcing" type electrical faults, and provide automatic circuit interruption (tripping).
3. Provide "test-pushbutton" on each C/B for manual AFCI-C/B testing.
4. Single pole, 120 volt, 60 Hz AC UL listed and labeled for installation in panelboard, #14 - #8 AWG solid/stranded AL/CU load conductor.

E. Switch and Fuse Feeder Protective Devices for Distribution Panels

1. Locations where the drawings show distribution panels employing switch-fuse circuit protection devices.
2. Fusible Switches: Quick-make, quick-break type with rejection clips for use with Class "R" fuses current limiting fuses (CLF). Switches with ratings up to and including 100 ampere at 240 volts shall be twins mounted. Switches rated through 60 ampere and 480 volts shall be twins mounted. Provisions for padlocking in the "on" and/or "off" positions. Switches shall be removable from front of panel without disturbing adjacent units or panel bus structure.
3. Fuses shall be time delay current limiting types, U.L. Class RK-1 unless otherwise indicated on the drawings. Provide one spare set of fuses of each size and type in each Distribution Panel.
4. Provide auxiliary contact on switch for remote status (on-off) signaling and monitoring. Provide conductor lugs to accept conductor temperature rating, sizes and quantities shown on drawings.
5. Switch and fuse devices shall be permitted only in distribution panels and only where specifically indicated on the drawings for feeders.

2.4 PANEL BUSSING

A. Bus Material

1. Bussing shall be rectangular cross section tin-plated copper or alternately silver or tin-plated aluminum.
2. Bussing shall be non-tapped, full length of the enclosure.

B. Ground Bus

1. Each panel shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

C. Provisions

1. Provide space and all hardware and bus mounting attachments for future devices as indicated on the drawings.

2.5 TERMINAL and auxillary CABINETS

A. Cabinets

1. Fabricated of code gauge sheet steel for flush mounting (except where noted as surface) of size indicated on the drawings, and complete with hinged lockable doors, provide the quantity of 2-way Feed through conductor terminals required for termination of all conductors, plus 15% spares of each type.
2. Cabinet locks to operate from same key used for panelboards. The trim to cabinets shall be fastened by means of concealed bolted or screwed fasteners accessible behind door into cabinets. All cabinets shall have 5/8" plywood backing, finished with fireproof intumescent primer and finish coat paint. Provide equipment ground bus in each cabinet.
3. Cabinets shall be finished with one coat of zinc chromate and one coat of primer sealer after a thorough cleaning. Where exposed to public view (e.g., corridors, covered passages, offices, etc.) finish color paint to match surrounding and manufacture's standard gray color in switchboard, janitors, heater and storage rooms.
4. Provide grounded metal barriers inside cabinet to isolate and separate line voltage and low voltage from each other inside the cabinet.

B. Cabinet dimensions.

1. Unless indicated otherwise on drawings.
 - a. Shall be 20-inch wide. Surface or flush mounting as indicated.
 - b. Recess mounted type shall have a 20-inch wide (maximum) recess metal enclosure with overlapping edge trim plate cover extending 1-inch on all sides of enclosure.
2. Depth shall be 5.75-inch nominal. Height of cabinet as required for devices, plus 25% spare unused interior space for future use, but not less than 36-inches high.

C. Terminals

1. Non-digital analog circuits; line and low voltage modular signal systems, 15 ampere dual row with isolation barriers, screw-down terminals insulated strips, heavy duty.
 - a. As manufactured by: Molex, or ITT-Cannon, or General Electric.
2. Digital circuits; low voltage signal systems, ANSI/EIA/TIA Category-6, 110-Block or 66-Block gas-tight punch down style, heavy duty.
 - a. As manufactured by: Leviton, or Ortronics, or AMP.

D. Identification (additional requirements)

1. Provide engraved nameplate on each cabinet indicating its designation and system (i.e., "Life Safety System - Panel 2LS", etc.).
2. Identify each terminal landing with unique circuit number and provide corresponding alphanumeric text-index card inside panel access door

PART 3 - EXECUTION**3.1 MOUNTING**

- A. Flush mounted panelboards and terminal cabinets shall be securely fastened to at least two studs or structural members. Trim shall be flush with finished surface.
- B. Surface mounted panels and terminal cabinets shall be secured to walls by means of preformed galvanized steel channels securely fastened to at least two studs or structural members.
- C. Panelboards and terminal cabinets shall be installed to insure the top circuit protective device (including top compartment control devices) are not more than 6'-6" above finish floor in front of the

panel and the bottom device is a minimum of 12" above the floor. Manufacturer shall specifically indicate on shop drawing submittals each panel where these conditions can not be met.

3.2 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

- A. Provide a red and white Bakelite nameplate with 1/2" high letters in each 277/480 volt panel fastened to face of dead-front plate, to read: "DANGER 480 (or as applicable) VOLTS KEEP OUT AUTHORIZED PERSONNEL ONLY".
- B. Manufacturer shall stencil the panel/cabinet number identification on the inside of door to correspond with the designation on the drawings.
- C. Identification plates and numbers shall be attached with screws or twist lock fasteners. Adhesive attachment of any kind shall not be used.
 - 1. Label each breaker in main panelboard with 1/16 inch thick laminated plastic composition material with contrasting color core. Engraved letters shall be 1/4 inch high.
 - 2. Provide typewritten circuit schedules in lighting and distribution panelboards to identify panelboard served by each branch breaker.

3.3 PROTECTION

- 1. Protect panelboards, load centers, and interior components from paint, gypsum board compound, dirt, dust, and other foreign matter during construction.

END OF SECTION
042911/462044

SECTION 26 4250**SWITCHBOARDS****PART 1 - GENERAL****1.1 SCOPE**

- A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
1. Examine all other specification sections and drawings for related work required to be included as work under Division Sixteen.
 2. General provisions and requirements for electrical work.

1.2 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Provide schematic "ladder type" logic control wiring diagrams and "point-to-point control wiring diagrams showing control and protective systems interlocks.
- B. Provide nameplate engraving schedule.
- C. Submit full-scale time/current transparencies on log/log paper for all fuses, circuit breakers, ground fault system devices, and relays. Additionally, provide software to generate time/current curves of each circuit protection device.
- D. SHORT CIRCUIT, COORDINATION AND ARC-FLASH
1. Perform and submit engineered settings for each equipment location, fuse and circuit breaker device, showing the correct time and current settings to provide the coordination within the limits of the specified equipment, per the latest applicable standards of IEEE and ANSI. Provide electrical system short circuit fault analysis, both 3-phase line-to-line and 1-phase line-to-ground calculations as part of the coordination analysis recommendations. Provide Electric ARC-FLASH calculations as part of the coordination analysis recommendations.
 2. The information shall be submitted in both tabular form and on time current log-log graph paper, with an engineering narrative. Written narrative describing data, assumptions, analysis of results and prioritized recommendations, (6) six copies.
 3. The goal is to minimize an unexpected but necessary electrical system outage and personnel exposure to the smallest extent possible within the fault occurrence location, using the specified contract equipment. Shall comply with, but not limited to:
 - a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
 - b. IEEE-399, Recommended Practice for Industrial and Commercial Power System Analysis.
 - c. IEEE-1584, Guide to Performing ARC-FLASH Hazard Study.
 - d. CEC/NEC
 4. Electrical equipment including switchgear, switchboards, electric panels and control panels, motor control centers, combination motor starters, transformers, disconnects, etc., shall each be labeled by the manufacturer with "Electric-ARC-FLASH" warning signs. The signs shall explain a hazard to personnel may exist if the equipment is worked on while energized or operated by personnel while energized. The sign shall instruct personnel to wear the correct protective equipment/clothing (PPE) when working "Live", or operating "Live" electrical equipment and circuits.
- E. Factory Tests: Equipment tests - ANSI C37.20. Certified copies of design tests, production tests, and conformance tests of the equipment shall be submitted and review comments shall be received

before delivery of equipment to the project site. In lieu of the above tests, a report of these tests previously performed on identical units of each rating will be acceptable.

1.3 APPLICABLE STANDARDS

- A. The switchboard [and switchgear] equipment shall be designed, tested and assembled to comply with ANSI, IEEE, and NEMA and U.L.
- B. Equipment components/devices, switchboards, and/or switchgear shall be manufactured by: General Electric; or Cutler-Hammer; or Square-D; or Siemens.

PART 2 - PRODUCTS

2.1 BUSSING

- A. Horizontal and vertical busses shall be full lengths in each equipment section. Buses shall have a minimum withstand rating equal to available fault current indicated on drawings, plus a 25-percent additional capacity (safety margin). However, in no case shall the rating be less than 50,000 amperes, symmetrical.
- B. Provide interconnected full capacity neutral bus in each section with the same ratings and construction as the phase busses.
- C. Provide interconnected ground bus in each section.
- D. Provide space and all hardware and mounting attachments for future devices as indicated on the drawings.
- E. Main horizontal phase bussing shall be full capacity in all equipment sections.
- F. Vertical riser buss may be tapered, to not less than one third the ampacity rating of the main horizontal buss; but in no case shall the vertical buss be of less capacity than the sum of the frame size ampacities of overcurrent devices mounted in the respective sections including any indicated spares and spaces.
- G. The equipment bussing shall be of sufficient cross-sectional area to meet UL Standard 891 on temperature rise. Bus shall be copper with silver plated bus joints or extruded aluminum with tin plated bus joints. The through bus shall have provisions for the addition of future sections. The through bus supports, connections and joints are to be bolted with grade 5 hex head bolts and Belleville washers to minimize maintenance requirements.

2.2 CIRCUIT BREAKERS

- A. General
 - 1. Circuit protective devices as indicated on the drawings. All devices shall have a short circuit interrupting capacity not less than the maximum available fault current at the circuit breaker and as indicated on the drawings, plus a 25-percent additional capacity (safety margin). However, in no case shall the circuit breaker interrupting capacity be less than 30,000 ampere symmetrical interrupting for 480/277 volt devices and 42,000 ampere symmetrical for 240 volt or 208/120 volt devices.
 - 2. Provide padlock-off devices on each device. Breakers shall provide automatic time over-current and instantaneous circuit protection. Shall be suitable for use as "Main" service disconnect, "Feeder" and "Branch-Circuit" functions.
 - 3. Circuit breakers shall employ a self-powered stored energy, quick make-quick break, and trip free operating system on each phase, with common trip. Circuit breakers shall not trip in the event of short term or long term electrical power failure. Dead front cover accessible close-open controls, monitors and visual indicator flags.

4. Circuit breakers noted as "100%" on the drawings shall be tested and rated to carry the breaker full rated (100%) ampere load continuously including the assemblies the circuit breakers are installed into.
 5. Provide conductor lugs for circuit protection devices to accept conductor temperature rating, sizes and quantities shown on drawings. Circuit protection devices shall be UL- listed suitable for normal and reverse feed.
 6. Provide auxiliary contacts on circuit breakers. Auxiliary "DRY" contacts shall provide supervised remote monitoring of "Open-Close-Trip" circuit breaker status. Typical for circuit breakers supplying the following types of connected electrical loads.
 - a. Fire alarm equipment and devices.
 - b. Mass-evacuation equipment and devices.
 - c. HVAC smoke control and smoke evacuation equipment.
 - d. HVAC fire/smoke electrically operated dampers.
 - e. Intrusion detection and access control equipment and devices.
 - f. Elevators and escalators.
 - g. Fire sprinkler pumps.
 7. Plug-in communications port for circuit breaker portable test instrument connects.
- B. Protection performance requirements for circuit breakers conforming to one or more of the following applications:
- 600 Ampere or larger frame size.
 - Larger than 400 Ampere trip.
 - Service entrance in main switchboard or switchgear.
 - Noted as Main or Main Circuit breakers on the drawings.
1. Circuit breaker shall employ current sensors and solid-state static digital electronic automatic trip system. Three phase, or single-phase operation as noted on the drawings. Current carrying components shall be completely isolated from the static trip units. The trip unit shall be independent of external power sources.
 2. Circuit breaker solid state digital trip control functions shall provide the following time/current curve shaping field adjustable features;
 - a. Adjustable ampere setting to vary the long-time continuous current carrying capacity, minimum range of 80% thru 100% of full load trip rating.
 - b. Adjustable long-time delay setting to vary the time the breaker will trip under sustained overload conditions. Minimum of three settings, "minimum - intermediate - maximum".
 - c. Adjustable short-time pickup to vary the level of high current the breaker can carry for short periods of time, minimum range of 2 times thru 8 times of ampere setting.
 - d. Adjustable short time delay to vary the time of the short-time pickup. Minimum of three settings "minimum-intermediate-maximum".
 - e. Short time "I²t" switch to allow a current-squared multiplied by time ramp function in the short-time system. Two position setting "in-out".
 - f. Adjustable instantaneous pickup to vary the breaker ampere setting for immediate (instantaneous) interruption of severe overloads (short circuits). Adjustable minimum range of 2.0 times thru 9 times of circuit breaker ampere sensor rating. Instantaneous selective override trip setting, shall also include "on-off" function. When "off", or "override" is selected, shall then function with the adjustable short time delay and adjustable short time pick-up. (note where the coordination study requires a higher instantaneous setting, change the specified adjustable instantaneous trip to fixed instantaneous trip at 15 times the breaker ampere sensor setting also with on-off function).
 - g. Individual fault trip indicators (flags) shall provide local indication on the breaker for overload and short circuit (and ground fault where applicable) conditions.
 - h. Provide quantity of one, manufacturer's standard test set for solid state trip circuit breakers.

- C. Protection performance requirements for circuit breakers conforming to one or more of the following applications:
- Smaller than 600 ampere frame size.
 - 400 ampere and smaller trip.
 - Larger than 100 ampere frame size.
 - Larger than 100 ampere trip.
1. Circuit breaker shall employ current sensors and solid-state static digital electronic automatic trip system. Time/current curve shaping field adjustable features
 2. Solid state digital trip breakers shall conform to the requirements described above for solid state breakers larger than 400 ampere trip. However, only the following field adjustments are required;
 - a. Long-time ampere setting adjustable minimum range of 80% thru 100% of full load trip rating.
 - b. Short time pickup adjustable minimum range of 2 times thru 8 times of the ampere setting.
 - c. Fixed or field adjustable instantaneous trip. (Depending on the results of the coordination study)
- D. Performance requirements for circuit breakers conforming to the following applications:
- 100 ampere frame size and smaller.
 - 100 ampere and smaller trip.
1. Circuit breaker shall be fixed or adjustable instantaneous current trip with thermal-magnetic trip or with solid-state static digital electronic automatic time/over current automatic trip (Depending on the results of the coordination study).

2.3 SWITCH AND FUSE FEEDER PROTECTIVE DEVICES

- A. Fusible Switches: Quick-make, quick-break type with rejection clips for use with Class "R" fuses current limiting fuses (CLF). Switches with ratings up to and including 100 ampere at 240 volts shall be twins mounted. Switches rated through 60 amperes and 480 volts shall be twins mounted. Switches shall be removable from front of switchboard without disturbing adjacent units or switchboard bus structure.
- B. Fuses shall be time delay current limiting types, U.L. Class RK-1 unless otherwise indicated on the drawings. Provide one spare set of fuses of each size and type in each switchboard.
- C. Provide auxiliary contact on switch for remote status (on-off) signaling and monitoring. Provide conductor lugs to accept conductor temperature rating sizes and quantities shown on drawings.

2.4 GROUND FAULT PROTECTIVE SYSTEM AS FOLLOWS:

- A. One control power transformer rated 480/120 volts of suitable capacity for shunt tripping of the main circuit breaker and subfeed circuit breakers as indicated on the drawings. Fuse transformer on the 480-volt side.
- B. Ground sensor current transformer for each indicated ground fault relay, zero sequence type with integral test winding for each circuit indicated on drawings. (The three phases and neutral conductor shall be brought through the current transformer window per manufacturer's recommendations).
- C. One ground break, solid-state relay, and monitor and test panel for each device indicated on the drawings. Pick-up adjustment shall be continuous 100 through 1200 ampere; time adjustment shall be continuous from instantaneous through 60 cycles. Monitor panel shall indicate relay operation and provide means for system testing with or without interruption of service, and shall not permit system to be inadvertently left in an inactive or off state. Provide resettable trip indicators.

1. Ground fault system shall provide selective trip coordination with other upstream/down-stream ground fault and phase over current circuit protection devices as determined by the coordination study.
 - a. Ground fault protection devices shall incorporate adjustable time/current trip settings.
 - b. Ground fault protection devices shall incorporate adjustable inverse time and very inverse time adjustable/selective settings.
- D. The ground fault system may be integrated into each circuit breaker with solid state trip units, in lieu of the separate specified ground fault relay and monitor panel system. The solid state circuit breaker ground fault system shall provide the identical specified operational features of the described separate system.

2.5 MAIN SWITCHBOARDS

- A. Switchboard shall be floor-mounted, dead-front, dead-rear type, front and rear aligned, self-supporting, consisting of one or more vertical sections with bussing, circuit protective devices, instrumentation, auxiliary devices and control wiring as indicated on the drawings and as specified herein.
 1. Switchboards shall employ mounting configuration for circuit protective devices as follows:
 - a. Group-mount, fixed position, non-drawout switchboards. Front access only, shall not require rear access. Typical for all circuit protective devices, or as indicated on drawings.
 2. Switchboards shall employ circuit breaker types and circuit protection devices as follows:
 - a. All Main circuit breaker of all frame sizes – ICCB type circuit breakers.
 - b. 800 ampere and larger frame size Feeder circuit breakers, ICCB type circuit breaker.
 - c. Smaller than 800 ampere frame size Feeder circuit breakers, ICCB type; or MCCB type circuit breakers.
 - d. CLF with switch and fuse type. CLF with switch and fuse type only where noted on the drawings.
- B. Switchboard shall be designed, built and tested in accordance with applicable portion of the latest editions of NEMA PB-2, Underwriters Laboratories No. UL-891 and the National Electrical Code. Rated for service-entrance operation.
- C. Switchboard sections configuration
 1. Floor standing self-supporting, of the universal frame type using dieformed, 12-gauge steel members bolted and welded together.
 2. Provide removable side and rear plates with formed edges all around.
 3. Provide ventilation openings required for maintaining nominal operating temperature.
 4. Provide removable steel cover plates for all usable device spaces. Provide lifting means and provisions for moving by means of rollers or skids to installation location.
 5. Bolt individual sections together to form a single rigid switchboard assembly.
 6. Provide full height, hinged, vertical wireway metal covers, on each vertical wireway, of each distribution section of the switchboard.
 7. Typical for all switchboards, distribution switchboards and switchgear.
- D. Switchboard shall include, but not be limited to, the following:
 1. Underground pull section as required by the serving utility incoming service.
 2. Metering facilities as required by the serving utility.
 3. Current transformer space.
 4. Main disconnects devices.
 5. Distribution and feeder circuit protective devices.
 6. Owner metering (where indicated on drawings).
 7. Bussing, incoming utility compliant and outgoing distribution.

2.6 DISTRIBUTION SWITCHBOARDS

- A. Switchboards shall be floor mounted, dead-front, dead-rear type, front and rear aligned, self-supporting, consisting of one or more vertical sections with bussing, group mounted circuit protective devices, instrumentation and control wiring as indicated on the drawings and as specified herein. Switchboards shall comply with U.L. Standard #UL-891 and NEMA-PB2.
1. Distribution Switchboards shall employ circuit breaker types and circuit protection devices as follows:
 - a. All Main circuit breakers of all frame sizes - ICCB type circuit breakers.
 - b. 800 ampere and larger frame size Feeder circuit breakers, - ICCB; or MCCB type circuit breakers.
 - c. Smaller than 800 ampere frame sizes Feeder circuit breakers - ICCB; or MCCB type circuit breakers.
 - d. CLF with switch and fuse type. CLF with switch and fuse type only where noted on the drawings.
- B. Distribution switchboards shall include but not be limited to the following:
1. Main disconnect device (where indicated on drawings).
 2. Feeder protective devices.
 3. Owner metering (where indicated on drawings).
 4. Bussing.
- C. Switchboard sections
1. Floor standing, self-supporting, of the universal frame type using dieformed, 12 gauge steel members bolted and welded together.
 2. Provide removable side and rear plates with formed edges all around.
 3. Provide ventilation openings required for maintaining nominal operating temperature.
 4. Provide removable steel cover plates for all usable device spaces. Provide lifting means and provisions for moving by means of rollers or skids to installation location.
 5. Bolt individual sections together to form a single rigid switchboard assembly.
 6. Provide full height, hinged, vertical wireway metal covers, on each vertical wireway, of each distribution section of the switchboard.

2.7 MISCELLANEOUS INSTRUMENTS

- A. Instrument and Control Transformers: ANSI C57.13 and NEMA ST20 as applicable. Transformers shall be specifically designed for use on respective protective relay or metering schemes utilized.
- B. Current transformers meter/relay grade shall be multiratio tap, tap setting as indicated on drawings, (minimum of three field adjustable tap settings) with 5 amp secondary, insulation class, 600 volt, 60 hertz, single ring type, and shall have an accuracy classification of 0.3 with the burden of B.01, B.02 and B.03.
- C. Control and transfer switches shall be of the rotary, oil-tight multiposition, cam-operated, multi-stage type, with dust cover and silver-to-silver contacts rated 600 volts, 20 amp and adequate for the duty performed in excess of 10 amp. Equip each switch with engraved plastic escutcheon nameplate identifying its function and position.

2.8 CONTROL WIRING

- A. Terminal blocks with barriered terminals for each connection shall be provided for all control wiring terminator points. Control wiring shall be run in horizontal and vertical, isolated, internal metal wireways and shall be carried across hinges in laced bundles. Wire terminators shall be crimp-on type spade terminal
- B. Secondary control wiring shall be minimum of 14 AWG stranded copper type SIS 600-volt insulation.

- C. Control circuits shall have circuit number tags at each termination or break in the wire to match circuit numbers on terminal strips and control wiring diagrams.

2.9 WEATHERPROOF EQUIPMENT

- A. Equipment indicated as weatherproof (W.P.) or outdoors should be NEMA 3R, non-walk-in, tamper resistant construction. Provide full height hinged doors with provisions for padlocking the doors in the closed position.
- B. Provide a nominal 300-watt sealed, resistance type, anti-condensation heater in each equipment section. Heaters shall be controlled automatically by Thermostats and Humidstats. A circuit breaker shall be provided to supply switchboard buss voltage to the heaters, all prewired by the Manufacturer to fused terminals.
- C. Finish shall be electrostatically applied finish paint over iron oxide rust inhibitor primer. Finish color shall be [manufacturers standard color], [olive green Munsel #7GY3.29/1.5]. The bottom side and bottom 6 inches of the equipment shall be coated with 4-mil minimum thickness rust inhibitor undercoating over finish paint, on all interior surfaces. Finish withstand test without face corrosion or blistering:
 - 1. Salt spray withstands - 2000 hours ASTM B117.
 - 2. Humidity withstands - 750 hour ASTM D2247.
- D. Exposed Hardware and Hinges Shall be Stainless Steel Type 302 or 304, Tamper Resistant

PART 3 - EXECUTION

3.1 General

- A. Install equipment in accordance with manufacturer's written instructions and applicable portions of NECA's "Standards of Installations" for switchboards, switchgear and motor control centers.
- B. Prior to energizing and testing, manufacturer's field engineer shall visually inspect and verify devices are operational and bus connects complete.

3.2 Anchoring

- A. Bolt equipment to floor and wall where wall exists. Where units are free standing, provide preformed steel channel or angle iron bracing to nearest wall or building structural member.
- B. Equipment anchoring shall be designed for a 1.0 gravity lateral acceleration of the equipment, seismic zone-4. Submit structural calculations and details.

3.3 TESTING AND COMMISSIONING (ADDITIONAL REQUIREMENTS)

Adjustable settings shall be set and tested after the equipment installation is complete, for proper operation at set pickup and/or drop-out points, by an independent test laboratory. Testing shall comply with the equipment manufacturer recommendations. Submit three copies of all test results to OWNER's Representative. Correct any deficiencies and retest.

3.4 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

- A. Provide a red and white Bakelite nameplate with 1/2" high letters in each section fastened to face of dead-front plate, to read: "DANGER 480 (actual volts) VOLTS, KEEP OUT, AUTHORIZED PERSONNEL ONLY".
- B. Manufacturer shall stencil the equipment name on each device and equipment section to correspond to the identification of the drawing.

- C. Devices mounted in equipment controlling protective devices shall be provided with nameplates indicating device controlled or monitored.

END OF SECTION

DIVISION 28: ELECTRONIC SAFETY AND SECURITY

28 3000 DETECTION AND ALARM

28 3134 FIRE DETECTION AND DOOR HOLD-OPEN SYSTEMS

END OF TABLE OF CONTENTS

SECTION 28 3134**FIRE DETECTION AND DOOR HOLD-OPEN SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install detection and door holding devices as described in Contract Documents.
 - 2. Furnish and install raceway, conductors, boxes, and miscellaneous items necessary for complete system.
- B. Products Furnished But Not Installed Under This Section:
 - 1. Door Plates for door hold / release devices.
- C. Related Requirements:
 - 1. Section 06 1100: Installation of blocking for hold / release device.
 - 2. Section 06 2001: Installation of door plates for hold / release devices.
 - 3. Division 26: Quality and installation requirements for electrical wiring, raceway, conduit, and boxes.

1.2 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. System shall meet approval of authority having jurisdiction (AHJ).
 - 2. Equipment, devices, and cable shall be UL or Factory Mutual listed.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Edwards Signaling & Security, Plainville, CT www.edwards-signals.com.
 - b. SimplexGrinnell, Westminster, MA www.simplexgrinnell.com.
 - c. Equal as approved by Architect. See Section 01 6200.
- B. Components:
 - 1. Door Hold / Release Devices:
 - a. Door release units shall be electrically operated magnetic devices which hold doors open until released by smoke detector.
 - b. 120 V, 60 Hz operation.
 - c. Semi-flush mounting of electromagnet.
 - d. Stainless steel armature.
 - e. Acceptable Products:
 - 1) Simplex: 2088-9608.
 - 2) Edwards: 1505-N5.
 - 3) Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install equipment as indicated, in accordance with equipment manufacturer's written instructions, and complying with applicable portions of NEC, NFPA and NECA's 'Standard of Installation.'
- B. Connect smoke detectors and door holders so doors are released when smoke is detected.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Test operation of each detector / hold-open circuit.

3.3 CLOSEOUT ACTIVITIES

- A. Instruction of Owner:
 - 1. Instruct Owner's representative in proper operation and maintenance procedures.

END OF SECTION

