COLORADO
Parks and Wildlife
Department of Natural Resources

Cameo Shooting Range and Outdoor Education Complex Phase 1B Maintenance Building
BIDDING AND CONTRACT INFORMATION

PROJECT I.D. NO. **W225E1-C5**
IFB1: 2020*153
APPR. CODE **PF020PIXE**

PRE-BID CONFERENCE: **February 4, 2020 @ 11:00 am**

BID OPENING: **February 20, 2020**~~**February 18, 2020**~~ **at 1:00 pm**~~**10:00 am**~~

Document Version Date -
Template Version Date – 12/10/14

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W225E1-C5

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*******NOTICE*******

SUBMITTAL OF BID:

You must include as part of the bid documentation the following items:

You must include as part of the bid documentation the following items:

1. Federal Aid Forms ~~(Remove if no Federal Grant is involved)~~
2. Contract Proposal - Pages 1, 2, and 3
3. Bid Schedule - Signed and addendums acknowledged (if any)
4. Bid Bond - Can be a Bond, Certified Check or Cashier's Check only.
5. W9 – Failure to submit will not result in rejection of bid but may result in delay of award.

CONTRACTOR RESPONSIBILITY:

Visit the site and determine to your own satisfaction the amount and type of work to be performed to complete the project in accordance with the drawings, specifications and Contract Documents before submitting your bid. Refer to Specifications for Contractor Responsibility during construction.

IMPORTANT—NOTICE TO BIDDER
On the envelope submitting your bid, it is **imperative**: 1. That it be addressed to: CAPITAL DEVELOPMENT PROGRAM COLORADO PARKS & WILDLIFE 6060 North Broadway Denver, CO 80216 2. That your name and address appear in the UPPER LEFT CORNER 3 That the bottom portion of this label is cut (on dotted line), and attached to the LOWER LEFT CORNER
DATE OF OPENING: **February 20, 2020** ~~**February 18, 2020**~~
TIME OF OPENING: **1:00 pm** ~~**10:00 am**~~
BID FOR: Cameo Shooting Range and Outdoor Education Complex Phase 1B Maintenance Building
SEALED BID

NOTE REGARDING DELIVERY OF YOUR BID: CPW is experiencing delays (currently about 24 hours) in delivery of U.S. Postal Service Express Mail. Contractors must take this into account when sending bid documents.

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INVITATION FOR BIDS

Cameo Shooting Range and Outdoor Education Complex Phase 1B Maintenance Building

Sealed bids will be received by the Capital Program Manager, Colorado Parks & Wildlife, 6060 Broadway, Denver, CO 80216 until **February 20, 2020** ~~**February 18, 2020**~~ **at 1:00 pm** ~~**10:00 am**~~ for the construction of a 70'x120' pre-engineered metal building with interior office space, shop area, enclosed storage and associated exterior improvements

All questions are due by February 11, 2020 @ 4:00 pm.

From Grand Junction head east on I-70 to exit 46. Turn left at the bottom of the ramp and follow the road back to the Cameo Shooting Range and Outdoor Education Complex.

Prior to inspecting the site call the Regional Project Manager, Steve Ryan at 970-255-6190.

Project Address: Cameo Shooting Range and Outdoor Education Complex
3934 9/10 Road
Debeque, CO 81630
Mesa County

Project Coordinates: Latitude: 39° 9'5.00"N
Longitude: 108°19'15.00"W
View Google Map Location – RIGHT CLICK AND EDIT HYPERLINK

Plans and specifications are available for all bidders on the web at: www.colorado.gov/vss

Pre-bid conference: **February 4, 2020 @ 11:00 am** at the project site.
5% bid bond, certified check or cashier's check required with proposals.
Funding Source: 100% Cash

Publication:

www.colorado.gov/vss

Capital Development Program
Colorado Parks & Wildlife
State of Colorado
6060 Broadway
Denver, CO 80216

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Federal Aid Grant Form

Attention Bidders: These instructions, information and required form are being provided because this project will utilize a Federal Aid Grant through the U.S. Fish and Wildlife Service, Department of the Interior. Grant funding is made available through federal funds including Pittman-Robertson Act excise taxes and Dingell-Johnson taxes.

Debarment – Action taken by a (U.S. Department of Interior) agency official to exclude a person from participating in covered non-procurement transactions and transactions under the Federal Acquisition Regulation. A person so excluded is debarred.

Part A: Certification – Primary Covered Transactions. A Primary Transaction is between U.S. Fish and Wildlife Service and any individual, corporation, unit of government or legal entity. This **does not pertain** to contracts between the Colorado Parks & Wildlife and capital project bidders/contractors.

Part B: Certification – Lower Tier Covered Transactions. A lower tier transaction is between a recipient and another entity, including all sub-grants and contracts. This **DOES pertain** to contracts between the Colorado Parks & Wildlife and capital project bidders/contractors and thus, this box is checked.

Part C and D: Certification Regarding Drug-Free Workplace. Part C should be read and checked (checkbox) by bidders who are incorporated, an LLC or otherwise NOT an individual. Part D should be read and checked (checkbox) by bidder who IS an individual (NOT a corporation or other entity).

Part E: Certification Regarding Lobbying and Contracts, Grants, Loans, and Cooperative Agreements. If the contract bid amount exceeds $100,000, this Part E should be read and checked (upper checkbox) by bidders/contractors. The lower checkbox does not pertain.

U.S. Department of the Interior

Certifications Regarding Debarment, Suspension and Other Responsibility Matters, Drug-Free Workplace Requirements and Lobbying

Persons signing this form should refer to the regulations referenced below for complete instructions:

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions - **The prospective primary participant further agrees by submitting this proposal that it will include the clause titled, "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.** See below for language to be used or use this form certification and sign. (See Appendix A of Subpart D of 43 CFR Part 12.)

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions - (See Appendix B of Subpart D of 43 CFR Part 12.)

Certification Regarding Drug-Free Workplace Requirements - Alternate I. (Grantees Other Than Individuals) and Alternate II. (Grantees Who are Individuals) - (See Appendix C of Subpart D of 43 CFR Part 12)

Signature on this form provides for compliance with certification requirements under 43 CFR Parts 12 and 18. The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of the Interior determines to award the covered transaction, grant, cooperative agreement or loan.

PART A: Certification Regarding Debarment, Suspension, and Other Responsibility Matters-Primary Covered Transactions

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CHECK____IF THIS CERTIFICATION IS FOR A PRIMARY COVERED TRANSACTION AND IS APPLICABLE.

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

PART B: Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

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CHECK X IF THIS CERTIFICATION IS FOR A LOWER TIER COVERED TRANSACTION AND IS APPLICABLE.

(1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

PART C: Certification Regarding Drug-Free Workplace Requirements

CHECK___IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS NOT AN INDIVIDUAL.

Alternate I. (Grantees Other Than Individuals)

A. The grantee certifies that it will or continue to provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an ongoing drug-free awareness program to inform employees about--
(1) The dangers of drug abuse in the workplace;
(2) The grantee's policy of maintaining a drug-free workplace;
(3) Any available drug counseling, rehabilitation, and employee assistance programs; and
(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will --
(1) Abide by the terms of the statement; and
(2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

(e) Notifying the agency in writing, within ten calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

(f) Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted --
(1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or
(2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a) (b), (c), (d), (e) and (f).

B. The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (Street address, city, county, state, zip code)

Check___if there are workplaces on files that are not identified here.

PART D: Certification Regarding Drug-Free Workplace Requirements

CHECK___IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS AN INDIVIDUAL.

Alternate II. (Grantees Who Are Individuals)

(a) The grantee certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity with the grant;

(b) If convicted of a criminal drug offense resulting from a violation occurring during the conduct of any grant activity, he or she will report the conviction, in writing, within 10 calendar days of the conviction, to the grant officer or other designee, unless the Federal agency designates a central point for the receipt of such notices. When notice is made to such a central point, it shall include the identification number(s) of each affected grant.

PART E: Certification Regarding Lobbying
Certification for Contracts, Grants, Loans, and Cooperative Agreements

CHECK____IF CERTIFICATION IS FOR THE AWARD OF ANY OF THE FOLLOWING AND THE AMOUNT EXCEEDS $100,000: A FEDERAL GRANT OR COOPERATIVE AGREEMENT; SUBCONTRACT, OR SUBGRANT UNDER THE GRANT OR COOPERATIVE AGREEMENT.

CHECK___IF CERTIFICATION FOR THE AWARD OF A FEDERAL LOAN EXCEEDING THE AMOUNT OF $150,000, OR A SUBGRANT OR SUBCONTRACT EXCEEDING $100,000, UNDER THE LOAN.

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

As the authorized certifying official, I hereby certify that the above specified certifications are true.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL

TYPED NAME AND TITLE

DATE

DI-2010
June 1995
(This form replaces DI-1953, DI-1954, DI-1955, DI-1956 and DI-1963)

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CONTRACT PROPOSAL

PROJECT: **Cameo Shooting Range and Outdoor Education Complex Phase 1B Maintenance Building**
PROJECT NO: **W225E1-C5**

CAPITAL DEVELOPMENT PROGRAM
DIRECTOR, COLORADO PARKS & WILDLIFE
STATE OF COLORADO
6060 Broadway
Denver, CO 80216

1. The bidder has examined the Plans and Specifications and the site of the proposed work to be done.

2. The bidder understands and accepts the condition that the estimate of quantities is approximate only, that the quantities are subject to either increase or decrease and proposes to perform any increased or decreased quantities of work at the unit price quoted in the Proposal, except for alterations provided for under 4.2 "Alterations of Plans or Character of Work and Variations in Plan Quantities" of Section 4, Scope of Work of the General Requirements and Covenants.

3. The bidder shall furnish a BID BOND, CERTIFIED CHECK OR CASHIER'S CHECK REQUIRED IN THE AMOUNT OF 5% OF THE TOTAL BID included with the proposal.

4. The bidder proposes that the Invitation for Bids, Proposal, General Requirements and Covenants, Plans and Specifications, shall form and be part of the Contract to be signed by the bidder if this Proposal is accepted, and if the amount of the Contract exceeds $150,000, the bidder will furnish a Performance Bond and a Labor and Material Bond in a form acceptable to the Director, in a penal sum equal to 100% of the estimated Contract price with Surety or Sureties satisfactory to the Director, to guarantee the completion of the work and also to guarantee that all material and labor on this work, or incidental to the completion of this work, will be fully paid for by the Contractor or his Surety.

5. The bidder hereby proposes to furnish all labor, machinery, equipment and material, and to sustain all the expense incurred in doing the work, and to perform all the work required for the complete and prompt execution of everything described, shown or reasonably implied by the Contract Documents, including the Plans and Specifications for the sum of

   _____

   Dollars that may be awarded the undersigned in pursuance of a certain Advertisement by the Director, a copy of which Advertisement is attached and made a part hereof, and in accordance with the full details, Plans and Specifications as prescribed by Director for the prices named in the Proposal.

6. The successful bidder agrees to and will be required to submit **current certificates of insurance, additional insured endorsements,** and **Statement of Insurance Claims** not later than the time of submission of signed project contract documents, as follows:

   I. The bidder agrees to carry worker's compensation insurance as required by and as provided in the "Worker's Compensation Act of Colorado," articles 40 through 54 of Title 8, C.R.S. (2013), as may be amended.

II. When the bidder is not required to carry worker's compensation as described in 6.I., FURNISH A LETTER CERTIFYING SUCH. In the event that a subcontractor(s) and/or employee(s) is hired by the Contractor to perform any portion of the work provided for herein, the Contractor agrees to furnish the Colorado Parks & Wildlife with proof of worker's compensation insurance which covers all subcontractors' employees utilized in the performance of such work. Such insurance coverage may be provided by the Contractor or the subcontractor; but proof thereof in the form of a certificate of insurance shall be provided to the Colorado Parks & Wildlife prior to commencement of any work by such subcontractors' employees. If such insurance has not yet been obtained and postponement of commencement of the work until the required certificate(s) are available would cause a substantial delay in the performance of the work, proof of application for worker's compensation insurance will suffice pending receipt of the certificate(s).

III. The Contractor agrees to indemnify, save and hold harmless the State, its employees and agents against any liability incurred as a result of any subcontractors' failure to obtain such insurance.

IV. The bidder agrees to carry a comprehensive general liability insurance contract specifying the State of Colorado as an additional insured via endorsement. The limits of liability under the contract shall be no less than $1,000,000 Combined Single Limit bodily injury and property damage, each occurrence. Such insurance shall be "primary."

V. The bidder agrees to carry a comprehensive automobile liability insurance contract. The limits of liability under the contract shall be no less than $1,000,000 Combined Single Limit bodily injury and property damage, each accident.

VI. The bidder agrees and will be required to complete and submit a "Statement of Insurance Claims" on a form provided by the Director.

7. The bidder proposes that any extra work or material which the Director may order in writing is to be paid for either at a lump sum or unit prices agreed upon prior to the work, or the Force Account basis as specified in the Specifications. The Force Account bills shall be checked and signed at the end of each day by the Project Manager or Inspector in charge, and the Contractor's representative, provided that no class or item of work or material for which a unit bid price is provided in the Proposal is to be classed as Extra Work.

8. The bidder hereby proposes to execute the Agreement and Bond on standard forms provided by the Director within fifteen days or such further time as may be allowed in writing by the Director after receiving notification of the award of Contract based on the Proposal. In case he does not, the Director may proceed in any lawful manner he deems advisable, and the accompanying Guaranty shall become forfeited to the State of Colorado as liquidated damages.

9. The bidder hereby proposes to commence the work within the terms of the Notice to Proceed, or such further time as may be allowed in writing by the Director after being awarded the project; also, to complete the same within **120** calendar days from Notice to Proceed date, or from and including such later date as may be designated in writing by the Director.

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10. The bidder hereby certifies that the only persons or parties interested in this Proposal are those named herein, and that no other bidder or prospective bidder has given any information concerning this proposal.

11. It is agreed that in case the Contract is awarded to another, the Proposal Guaranty, unless forfeited as stated herein, will be returned to the Principal on the Bond. It is understood that the State of Colorado reserves the right to reject any or all Proposals, to waive informalities, and to accept any Proposal deemed desirable.

12. **Service Disabled Veteran Owned Small Businesses (SDVOSBs)**. SDVOSBs, who are incorporated or organized in Colorado or maintain a place of business or have an office in Colorado and who are officially registered and verified as a SDVOSB by the Center for Veteran Enterprise within the U.S. Department of Veterans Affairs. (www.vip.vetbiz.gov), may receive a 5% preference on their bid. This preference applies only to the price, and the SDVOSBs must still meet all other qualifications required in the bid. SDVOSBs claiming this preference shall submit documentation of SDVOSB certification Issued through the U.S. Department of Veterans Affairs in their response to the solicitation. Bid submissions without this documentation will not be given a preference.

Respectfully submitted,

PROJECT: **Cameo Shooting Range and Outdoor Education Complex Phase 1B Maintenance Building**
PROJECT NO.: **W225E1-C5**

Street _____ _____
Contracting Firm

P.O. Box _____

By: _____ Title: _____
(president/owner/partner)

City of _____

State of _____ _____
Print Name

Zip Code_____ ATTEST (SEAL)

Telephone (Bus.) _____ By: _____
(corporate secretary)

Soc. Sec. No. _____ Date_____
-or-
Fed. Emp. I.D. No. _____

E-mail_____

Business Web Site Address_____

If the Proposal is being submitted by a Corporation, the Proposal should be signed by a corporate officer. The signature of the officer signing shall be attested to by the corporate secretary and properly sealed. If the Proposal is being submitted by an individual or a partnership, the Proposal shall so indicate and be properly signed by the individual or partner who is authorized to sign such documents.

Bid Schedule

Cameo Shooting Range - Maintenance Building Phase 1B

W225E1-C5

BID BOND, CERTIFIED CHECK OR CASHIER'S CHECK REQUIRED IN THE AMOUNT OF 5% OF THE TOTAL BID (If Bid is greater than $150,000). DO NOT ROUND TO THE NEAREST DOLLAR.

	Unit	Qnty	Description	Unit Price	(Unit x Qty) Total Amount
1	LS	1	Mobilization	$	$
2	LS	1	Overlot Grading	$	$
3	LS	1	Furnish and Install Pre-Engineering Metal Building	$	$
4	SF	10,100	Furnish and Install 6" Exterior Concrete Apron	$	$
5	EA	34	Furnish and Install Steel Bollards	$	$
6	LS	1	Furnish and Install Electrical System Complete	$	$
7	LS	1	Construct Rip-Rap Lined Drainage Channel	$	$
				Base Bid	$

*****ALTERNATE(A) BID ITEMS - The following bid items are to be completed by the bidder and may be substituted by the Owner in any combination to arrive at the selection of the lowest responsible bidder. They are NOT to be included in the TOTAL BASE BID.**

				Alt Items	$

*****OPTIONAL BID ITEMS—The following bid items are to be completed by the bidder, are additional items and are NOT to be included in the TOTAL BASE BID. They may be added in any combination to the contract to arrive at the selection of the lowest responsible bidder.**

8	SF	4,865	Furnish and Install 6" Interior Concrete Slab in Storage Area	$	$
				Opt Items	$

Measurement and Payment

Cameo Shooting Range – Maintenance Building Phase 1B

W225E1-C5

Bid Item 1 - Mobilization

Mobilization will include all items identified in Section 02050 and paid in accordance with that section.

Bid Item 2 - Overlot Grading

This bid item includes all labor, materials, and equipment required to bring the site to final grade as noted on the plans and specifications including the detention pond. This bid item shall include transportation of onsite material as necessary to complete the work. The unit price for this item shall include supplying, placing, and compacting clean fill in accordance with the Drawings and Specifications or as otherwise directed by the Project Manager. The method to bring mixture to optimum moisture and density will not be measured or paid for separately, but shall be included in the unit price for this item. Soil shall be moisture treated and compacted to 95% of standard proctor density.

Bid Item 3 - Furnish and Install Pre-Engineering Metal Building

This bid item includes all material, labor, equipment, independent testing services, and incidental costs connected with the construction of the building at the location shown on the plans. This bid item includes, but is not limited to:

- A complete pre-engineered metal building system, erected on the site as shown in the plans
- All structural and mechanical systems (Including gas distribution and tank) required for a completely functional building
- Water piping, meters and other equipment and supplies necessary for the complete installation of the water system from the existing meter to and including the building plumbing system.
- Structural excavations including over excavation; structural backfill and compaction
- Testing and observation of soil, concrete, reinforcing and structural steel, and other items by the independent testing laboratory.
- Concrete including foundation, floor slabs (In Office/Retail/Shop Areas) and LPG pad. Other concrete flatwork for the storage area and aprons will be addressed in a separate bid items. 6" Class ABC shall be included as part of this bid item for Storage Area.
- Wood Framed Patio Cover
- Building fixed furnishings
- Fine grading and cleanup around the structure upon completion

The building will be measured and paid as a completed building unit in place. Progress payments will be made based on a percentage of the completed work, at the lump sum bid price.

Bid Item 4 - Furnish and Install 6" Exterior Concrete Apron

This bid item includes all labor, materials, equipment, and independent testing services for 6-inch concrete aprons as noted on the plans and specifications. These pay items include, but are not limited to: preparatory earthwork, compacted aggregate base course, fine grading, formwork, dowels, reinforcement, concrete finishing, expansion and control joints, and cleanup. This bid item also includes furnishing and installing the concrete parking blocks, ADA parking lot signage and pavement markings as shown on the drawings. Concrete pads will be measured as an actual finished area. Payment will be made at the contract unit price, in Square Feet, for total area placed.

Bid Item 5 - Furnish and Install Steel Bollards

This bid item includes all labor, materials, and equipment for installation of steel bollards as shown on the plans and specifications. This pay item includes, but is not limited to: pipe fabrication, footing excavation, inspection, placement of concrete and bollard, and painting. Payment will be made at the contract price for each bollard installed.

Bid Item 6 - Furnish and Install Electrical System Complete

This bid item includes all labor, equipment, and materials for electrical service connections from the transformer to the shop (in accordance with Xcel and Mesa County requirements) and all interior wiring and fixtures, including service panels, C.T. cabinet, meter socket, disconnect panels, interior and system grounding as noted in the drawings and specifications.

Bid Item 7 - Construct Rip-Rap Lined Drainage Channel

This bid item includes the grading, culvert (owner furnished), placement of geotextile fabric and placement of owner furnished rip-rap material along the drainage channel identified on the drawings.

*****ALTERNATE BID ITEMS**

*****OPTIONAL BID ITEMS**

Option Bid Item 8 - Furnish and Install 6" Interior Concrete Slab in Storage Area

Measurement and Payment

Cameo Shooting Range - Maintenance Building Phase 1B

W225E1-C5

This bid item includes all labor, materials, equipment, and independent testing services for 6-inch interior concrete slab in the storage area as noted on the plans and specifications. These pay items include, but are not limited to: preparatory earthwork, fine grading, formwork, dowels, reinforcement, concrete finishing, expansion and control joints, and cleanup. Concrete pads will be measured as an actual finished area. Payment will be made at the contract unit price, in Square Feet, for total area placed. 6" Class 6 ABC to be installed as part of base building bid item.

COLORADO
Parks and Wildlife
Department of Natural Resources

Cameo Shooting Range and Outdoor Education Complex Phase 1B Maintenance Building
DIVISION I – SPECIFICATIONS

PROJECT I.D. NO. **W225E1-C5**
IFB1: **2020*153**
APPR. CODE **PF020PIXE**

PRE-BID CONFERENCE: **February 4, 2020 @ 11:00 am**

BID OPENING: **February 20, 2020~~February 18, 2020~~ at 1:00 pm~~10:00 am~~**

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DIVISION 1 - GENERAL REQUIREMENTS

GENERAL CONDITION:

Please read the most current "General Requirements and Covenants" in your possession. They apply to all Divisions of these specifications, accompanying drawings and to this proposed project.

SECTION 01010 - SUMMARY OF WORK

1. LOCATION:

From Grand Junction head east on I-70 to exit 46. Turn left at the bottom of the ramp and follow the road back to the Cameo Shooting Range and Outdoor Education Complex.

Project Address: Cameo Shooting Range and Outdoor Education Complex
3934 9/10 Road
Debeque, CO 81630
Mesa County

Project Coordinates: Latitude: 39° 9'5.00"N
Longitude: 108°19'15.00"W

2. DESCRIPTION OF THE WORK:

The project consists of the construction of a 70'x120' pre-engineered metal building with interior office space, shop area, enclosed storage and associated exterior improvements

All work shall be in compliance with these specifications and construction drawings.

3. CONSTRUCTION COMMENCEMENT:

The Contractor shall be allowed from the date of approval of contract documents through the CONTRACT START DATE (as indicated on the Notice to Proceed letter) to submit shop drawings and product approvals and order and delivery of materials.

4. ADDITIONAL PROVISIONS:

The work and the compensation, therefore, shall be as covered by these specifications consisting of furnishing all plant, labor, equipment and materials required to perform the work shown on the drawings and listed in the bid schedule, unless otherwise stipulated or approved in writing by the Capital Program Manager.

Division field engineering personnel are authorized to supervise the construction of this project in accordance with the previously approved plans and specifications and change orders. All changes in the work shall be approved in writing by the Capital Program Manager before being activated in accordance with Section 4, Item 4.2 of the General Requirements and Covenants.

The specifications included herein are the Specifications for this project. If there should be a difference between the Specifications and the drawings, the Specifications shall govern.

Construction Work Restrictions:

- Internal Building Work Only – April 25th – May 4th (Major Competition)

5. CONTRACTOR RESPONSIBILITY:

Visit the site and determine to your own satisfaction the amount and type of work to be performed to complete the project in accordance with the drawings, specifications and Contract Documents before submitting your bid.

Furnish sufficient qualified help to the Project Manager for setting construction controls.

Before final payment will be made on the completed contract, submit to the Owner all specified warranties, other product warranties and the Minority Business Enterprises Compliance Report.

6. LIQUIDATED DAMAGES:

Liquidated damages for this project shall be a daily charge of **$259.66** for each day beyond the specified contract time. This daily charge will be deducted from any money due the contractor.

7. SUBCONTRACTED WORK:

Contractor shall not subcontract any portion of the work without written consent of the Project Manager, which consent shall not unreasonably be withheld. In cases where such consent is given, the Contractor shall perform with his own organization work amounting to not less than 50 percent of the total contract cost, as determined by the Project Manager, except that any items agreed to by the Project Manager as "specialty items" may be performed by subcontract and the cost of any such specialty items so performed by subcontractor may be deducted from the total cost before computing the amount of work required to be performed by the Contractor with his own organization. However, under no circumstances shall less than 20 percent of the total contract cost be performed by the Contractor's organization after deduction of specialty items.

8. SITE LAYOUT AND STAKING:

Location points for the work will be defined by the Contractor with stakes and/or other means of identification prior to the start of construction. These location points, grades, and elevations are shown on the drawings. The drawings indicate existing and proposed elevations, but may be modified on the site by the Project Manager.

9. CONSTRUCTION LIMITS:

At the commencement of construction, the Project Manager will designate the area allowed for the construction process. Restrict work to that designated area. Any changes deemed necessary shall be discussed with and approved by the Project Manager.

10. MARSHALLING AND ACCESS:

Limits and access to the site for use: before taking possession and use of the site, meet with the Project Manager to determine the marshalling area(s) and access points to be used to execute the work. Limit access and marshalling areas agreed to at that meeting. Obtain written permission from the Division of any changes other than first agreed upon. Upon completion of all work, restore all areas to original or improved conditions.

11. JOB CONDITIONS:

Examine the site, determine the nature of conditions to be encountered and accept the site as found upon the examination. Examination must be made prior to bidding as no additional compensation will be considered after receipt of bids for existing conditions which are required to be worked, adapted, or modified to these specifications.

12. BUILDING CODES:

Local city or county building codes shall be used for all construction. Where there is no local authority and/or code, the current codes required by the Office of the State Architect, State Electrical Board or State Plumbing Board shall be utilized. Appropriate inspections and certificates shall be obtained from the state or local inspector. See relative specification section(s) for additional detail.

13. PROTECTION AND SAFETY PRACTICE:

I. General:

All work shall be carried out in a safe manner in accordance with local codes and the safety requirements of the Colorado State Division of Labor.

II. Provide shoring, sheeting, barricading, bracing to prevent caving, erosion and gullying of side of excavation. The design, engineering, construction and maintenance of all temporary protection, including its adequacy and safety shall be the Contractor's responsibility and shall comply with the Occupational Safety and Health Administration (OSHA).

III. Contactor shall be required to conform to all industry standard safety requirements as well as OSHA requirements (i.e. Confined Space Entry, etc.) in effect at the time of construction.

IV. Existing Utilities:

Colorado SB 93-155 requires that anyone that engages in any type of excavation must provide advance notice to the underground facility owners. Prior to any moving or excavating of earth, the Contractor shall call the Utility Notification Center of Colorado (UNCC) or "Common Ground Alliance" (CGA) – the "Call Before You Dig" number – at 811. Utility owners have three business days to perform locates. If facilities are not marked within the three business days, you are required to call back to UNCC and process a Second Notice Request. UNCC encourages **both Contractors and Sub-Contractors** to obtain a locate ticket. A "no response" from the utility owner does not allow the Contractor to start digging. **Notify the Engineer** when working near utility lines or appurtenances.

V. Surface Drainage:

Provide for surface drainage during the construction period in a manner to avoid creating a nuisance to adjacent properties.

VI. Location Markers:

Carefully maintain and protect all bench marks, corner monuments and other points. If disturbed or destroyed, replace at no cost to the Owner as directed by the Project Manager.

14. MEASUREMENT AND PAYMENT:

Payment for construction shown on the drawings and specified herein shall be made as noted in the Bid Schedule.

15. SALES TAX:

Sales tax shall not be charged on projects for the Department of Natural Resources, through the Colorado Parks & Wildlife.

The Department of Revenue will issue a certificate of exemption (Form No. DR172) to Contractors or subcontractors. C.R.S. 1973 as amended 39-26-114. The Colorado Parks & Wildlife State Sales Tax number is 98-02565. Forms can be obtained from the Recorded Forms Request Line at 303-238-3278, or at "www.revenue.state.co.us".

16. TRAFFIC CONTROL:

I. Signs:

A. Placement of signs should assure signs are:

Within the cone of vision of the viewer so it will command attention.

1. Positioned with respect to the situation to which it applies to aid in conveying the proper meaning.

2. The location, combined with suitable legibility, is such that the driver traveling at normal speed has adequate time to make the proper response.

3. Maintenance of signs shall be to standards to assure that legibility is retained, visibility is adequate, and is removed when no longer needed.

III. Speed Limits:

All posted speed limits shall be followed at all times.

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1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required as additional work for completion of the project.

2. WORK INCLUDED:

   The work shall include unanticipated extra work in excess of the quantities included in the bid schedule.

3. PAYMENT:

   Payment for minor contract revisions shall be made at the contract unit price, negotiated basis or force account in accordance with Section 9.4 of the General Requirements and Covenants.

SECTION 01050 - FIELD SURVEY

1. GENERAL:

   Provide and pay for field survey services required for the project.

2. MEASUREMENTS:

   Quantities shall not be measured for survey labor and materials but shall be included in the mobilization.

3. SURVEY REFERENCE POINTS:

   I. Existing basic control points for the project are those designated on drawings.

   II. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.

   Make no changes or relocations without prior written notice to Project Manager.

   Report to Project Manager when any reference point is lost or destroyed.

SECTION 01100 - ALTERNATE PRODUCTS

Manufacturer's products listed in the Specifications and on the drawings are intended to show the results and standard of quality. Other products may be submitted for approval. Submittals are required for specified products and alternate products in accordance with Section 6 of the General Requirements and Covenants, Control of Material.

SECTION 01200 - CONSTRUCTION MEETINGS

1. PRECONSTRUCTION CONFERENCE:

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The Contractor or his representative after award of the contract shall attend a preconstruction conference to be held at the Colorado Parks & Wildlife regional office, Denver office or other office in proximity to the project as designated by the Project Manager.

SECTION 01202 - ALLOWANCES

1. GENERAL:

Allowance shall be paid on a force account basis in accordance with Section 9.4.(a), (b) and or (c) as determined by the Project Manager - Materials of Extra and Force Account Work of the General Requirements and Covenants or as noted in the bid schedule.

2. ADJUSTMENT OF COSTS:

Should the net cost be more or less than the specified amount of the allowance, the contract sum will be adjusted accordingly by change order.

For work specified under a unit cost allowance, the unit cost shall apply to the quantity listed in the bid schedule.

SECTION 01300 - SUBMITTALS

1. Provide the manufacturer's literature for products specified or approved equal products as stated in Section 6 of the General Requirements and Covenants for Capital Construction.

2. The following is the list of required submittals for this Contract. Refer to each Contract Section for any additional requirements for each submittal.

SECTION	TITLE	SUBMITTAL DESCRIPTION	DATE (RECEIVED)/ RETURNED	STATUS
01310	CONSTRUCTION SCHEDULES	Schedule of Construction		
01720	AS-CONSTRUCTED AND RECORD DOCUMENTS	Construction drawings and technical specifications indicating changes to the original project design		
02200	EARTHWORK	Firm name, address and phone number for Geotechnical Firm used for testing		
		Imported or Select Material Certified Gradation		

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SECTION	TITLE	SUBMITTAL DESCRIPTION	DATE (RECEIVED)/ RETURNED	STATUS
		Imported or Select Material Standard Proctor Test		
02220	STRUCTURE EXCAVATION AND BACKFILLING	Imported or Select Material Certified Gradation		
		Imported or Select Material Standard Proctor Test		
		Imported or Select Material Soil Classification		
02221	TRENCHING AND BACKFILLING	Certified Gradation		
		Standard Proctor Test		
		Soil Classification		
		Relative Density Test		
02275	GEOTEXTILE FABRIC	Manufacturer's Descriptive Literature and Recommended Methods of Installation		
		Manufacturer's Certification that Products Meet Specifications		
		Samples		
02279	WATER QUALITY CONTROL	Copy of Submitted/Approved SWMP		
02453	PARKING BLOCKS	Manufacturer’s Specifications and Drawings		
02545	AGGREGATE BASE COURSE	Certified Gradation and Standard Proctor Test of Aggregate		
02610	PIPE AND FITTINGS	Manufacturer's Descriptive Literature and Recommended Methods of Installation		

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SECTION	TITLE	SUBMITTAL DESCRIPTION	DATE (RECEIVED)/ RETURNED	STATUS
		Manufacturer's Certification that Products Meet Specification Requirements		
02640	VALVES AND GATES	Manufacturer's Descriptive Literature and Recommended Methods of Installation		
		Manufacturer's Certification that Products Meet Specification Requirements		
02845	SIGNS	Shop Drawings		
		Color Chart		
02780	SITE FURNISHINGS	Manufacturer's Descriptive Literature and Recommended Methods of Installation		
02845	SIGNS	Manufacturer's Descriptive Literature and Recommended Methods of Installation		
		Shop Drawings		
03100	STRUCTURAL CONCRETE FORMWORK	Description of Forming System with Complete Details		
03200	CONCRETE REINFORCEMENT	Placing Drawings, Bending and Cut Sheet Schedules		
		Mill Test Reports for Each Shipment of Reinforcement		
03252	INSERTS AND FASTENING DEVICES	Welder Qualifications and Certification by Testing Laboratory		
		Specification and Descriptive Literature for Welding Tools to be Used		

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SECTION	TITLE	SUBMITTAL DESCRIPTION	DATE (RECEIVED)/ RETURNED	STATUS
		Complete Shop Drawings of All Weld Locations, Intersection Details, Support and Forming Details		
03300	CAST-IN-PLACE STRUCTURAL CONCRETE	Firm name, address and phone number for testing agency		
		Certified Concrete Design Mix		
		Laboratory Test Results		
		Aggregate: Gradation Analysis and Specific Gravity		
03600	GROUT	Manufacturer's Application Instructions		
05500	METAL FABRICATIONS	Shop Drawings		
		Welders Qualifications and Experience		
06100	CARPENTRY	Shop Drawings		
		Rough Sawn Lumber Lot Grading Certification		
06240	SOLID SURFACE COUNTER TOPS	Manufacturer’s Data Sheet		
		Color and Material Samples		
07200	INSULATION	Samples of Insulation		
		Testing Agency Reports		
		Manufacturer's Written Certification that Product Meets Specified Requirements		

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SECTION	TITLE	SUBMITTAL DESCRIPTION	DATE (RECEIVED)/ RETURNED	STATUS
		Testing Agency Reports Verifying Proper Density, Distribution and Placement in Proper Thickness		
		Affidavit that Loose Fill Thermal Insulation is Water Repellent		
07310	FIBERGLASS SHINGLES	Manufacturer's Data Sheet		
		Manufacturer's Installation Instructions		
		Sample (provide 2 representative samples)		
		Manufacturer's Executed Warranty		
07621	GUTTERS AND DOWNSPOUTS	Material and Color Sample		
07900	SEALANTS AND JOINT FILLERS	Manufacturer's Data Sheet		
08100	METAL DOORS AND FRAMES	Shop Drawings		
		Manufacturer's Data Sheet		
		Executed Warranty		
08200	WOOD DOORS AND FRAMES	Manufacturer's Data Sheet		
08360	OVERHEAD DOORS AND OPERATORS	Shop Drawings		
		Manufacturer's Data Sheet		
		Selection Samples of Metal Finishes		

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SECTION	TITLE	SUBMITTAL DESCRIPTION	DATE (RECEIVED)/ RETURNED	STATUS
		Installation Instructions		
		Installer Qualifications (minimum 2 years experience installing similar doors)		
		Executed Warranty		
08530	VINYL WINDOWS	Shop Drawings		
		Operating Sample (with all options that will be installed)		
		Manufacturers Data Sheets		
		Test Reports for each window type demonstrating the provided windows meet the specification requirements		
		Window Installation Details		
		Executed Warranty		
08700	HARDWARE AND SPECIALTIES	Manufacturer's Data Sheets on All Hardware		
		Templates		
09310	TILE	Sample of each tile type proposed		
09680	CARPETING	Shop Drawings		
		Standard Manufacturer's Samples w/Color Options		
09900	PAINTING	Color Samples (2 – 12”x12”, material used for sample should be the same as the material the paint will be applied to)		

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SECTION	TITLE	SUBMITTAL DESCRIPTION	DATE (RECEIVED)/ RETURNED	STATUS
		Manufacturer's Application Recommendations		
10200	LOUVERS AND VENTS	Manufacturer’s Data Sheet		
		Shop Drawings		
10800	TOILET AND BATH ACCESSORIES	Manufacturer’s Data Sheet		
		Parts List		
		Installation Requirements		
12390	MANUFACTURED CABINETS	Data Sheets		
		Material Specifications, Parts List, Certification that Product Meets Specification Requirements and Installation Requirements		
13120	PRE-ENGINEERED METAL BUILDINGS	Shop Drawings		
		Foundation Design Calculations and Drawings		
		Color Samples		
		Details of Accessories and Fastenings		
		Data on Assembly and Erection of Building		
		Sequence of Operations and Requirements for Temporary Bracing		
		Manufacturer's Certificate that Materials Meet Specification Requirements		

SECTION	TITLE	SUBMITTAL DESCRIPTION	DATE (RECEIVED)/ RETURNED	STATUS
15266	UNDERGROUND PIPE THERMAL PROTECTION	Manufacturer's Data Sheets		
15400	PLUMBING SYSTEMS	Manufacturer's Data Sheets		
15440	PLUMBING FIXTURES AND TRIM	Manufacturer's Data Sheet		
		Shop Drawings - Submit shop drawings for all scheduled and required equipment showing the dimensions and details and include confirmation that the items fit into the space provided. Indicate the requirements for roughing in the utilities and show the locations, extensions and dimensions.		
		Maintenance Information		
15453	TANKLESS WATER HEATER	Manufacturer's Data Sheet		
		Shop Drawings		
		Manufacturer's Operations and Maintenance Manual		
		Executed Warranty		
15456	LIQUID PETROLEUM GAS SYSTEMS	Manufacturer's Recommended Methods of Pipe Installation		
		Manufacturer's Recommended Methods of Tank Installation		
		Manufacturer's Certification that Products Meet Specifications		

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SECTION	TITLE	SUBMITTAL DESCRIPTION	DATE (RECEIVED)/ RETURNED	STATUS
15500	HEATING AND AIR CONDITIONING	Manufacturer's Data Sheet		
		Shop Drawings – Drawings shall include all fuel, ductwork, vent and electrical connections and schedule of required equipment.		
		Operation and Maintenance Manual		
15750	GAS INFRARED HEATER	Shop Drawings: Submit shop drawings for all fuel, ductwork, vent and electrical connections, scheduled equipment, and required equipment.		
		Operation and Maintenance Manual		
		Executed Warranty		
15872	POWERED WALL EXHAUSTERS	Shop Drawings		
		Manufacturer's Descriptive Literature		
15890	DUCTWORK	Shop Drawings		
		Manufacturer's Data		
15910	OUTLETS AND INLETS	Shop Drawings		
		Manufacturer's Data		
		Certified Test Data		

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SECTION	TITLE	SUBMITTAL DESCRIPTION	DATE (RECEIVED)/ RETURNED	STATUS
16010	GENERAL PROVISIONS	Shop Drawings- Submit the shop drawings showing each item of equipment, whether specified or substituted, to the Project Manager for approval. In addition, submit a complete catalog of product cuts of equipment that will be installed. Include the name or description of the item, the name of manufacturer, the model or type, the catalog number and other pertinent designations.		
		As-Built Drawings		
		Additional Drawings		
		Manufacturer's Data Sheets		
		Operation and Maintenance Manuals		
16400	SERVICE AND DISTRIBUTION	Shop Drawings		
		Manufacturer's Data Sheet		
16410	ENCLOSED SWITCHES AND CIRCUIT BREAKERS	Shop Drawings		
		Manufacturer's Data Sheet		
16500	LIGHTING FIXTURES	Shop Drawings		
		Manufacturer's Data Sheet		
		Manufacturer’s Mounting Details		
		Executed Warranty		

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SECTION 01310 - CONSTRUCTION SCHEDULES

1. CONSTRUCTION SCHEDULE SUBMITTAL:

Submit to the Project Manager, 15 calendar days before commencing construction, a schedule of construction. The schedule shall include provisions for time necessary to acquire and provide shop drawings and product submittals, the allowed period for submittal review, time required for ordering and delivery of materials, a normal time period allowed based on climate, location of project, season of year, weather patterns for temperature, and precipitation conditions which reasonably will hinder or prevent construction progress.

The construction schedule shall be updated within 7 calendar days after starting work or upon issuance of any Contract Modification which substantially affects the scheduling, and monthly thereafter until completion.

Three copies of newly updated construction schedules shall be forwarded to the Project Manager, as directed, immediately upon preparation.

2. PRODUCT DELIVERY:

Order products in a timely, properly sequenced manner so that delivery schedule of products corresponds with anticipated installation periods of these products.

SECTION 01410 - LABORATORY TESTS

1. REQUIRED TESTS:

I. Concrete Testing - provided and paid for by the Contractor.

II. Compaction Tests - provided by the Contractor as specified. Compaction test reports shall be provided to Owner upon completion of tests.

III. Proctor Tests - the Contractor shall provide three (3) samples and tests of on-site material from locations determined by the Project Manager.

SECTION 01500 - TEMPORARY UTILITIES AND CONTROLS

1. FIRE PROTECTION:

Fire Plan:

I. Maintain, at least, two all purpose 10 lb. fire extinguishers at each work zone at the construction site. Maintain the site in an orderly condition to prevent fire hazards.

II. The Contractor (hereafter referred to as the operator) shall do everything reasonable within its power and shall require its employees, sub-contractors and employees of contractors to do everything reasonable within their power to prevent and suppress fires on or near the lands to be occupied under this permit. The

operator is responsible for all suppression costs and resource damage for any fire resulting from its operations and practices.

III. The operator is responsible to insure that each employee, subcontractor, or any other individual or company working on the project site is aware of the provisions of this fire plan, is familiar with the location and proper use of firefighting equipment, and conducts themselves in a fire safe manner.

IV. No material shall be disposed of by burning in open fires.

V. Exhaust systems of vehicles and engine generators shall have an acceptable muffler and shall be in proper working condition. All motorized equipment and machinery shall be equipped with the spark arresters.

VI. Fire extinguishers required, Type ABC:

One 2 lbs. Per pickup, or one 5 lb. For trucks over 1 Ton GW.

One 10 lb. per dozer, motor patrol, scraper or other earthmoving equipment.

VII. Vehicles shall be parked only in cleared, approved areas.

VIII. All smoking shall be done only inside of vehicles or in areas cleared of flammable material.

XI. Blasting: Use of explosives is not authorized.

XIV. Refueling:

Special care will be taken to prevent fires when refueling tractors and other equipment. Preferably, equipment should be moved to an area of mineral soil before refueling.

XVI. Oil Filters, Cartridges and Oily Rags:

Used and discarded oil filters, cartridges and oil rags or waste will be removed from the site. Glass jugs or bottles will not be used for gas, oil or water containers.

XVII. Storage of Inflammables:

Fuels, lubricants and/or other highly inflammable material will be stored either in a separate building, or "job box" type container and/or approved containers. If materials are not stored in a separate building there must be a basin to catch spills. Storage buildings or sites shall be a minimum distance of 50 feet from other structures. Storage buildings shall be adequately posed to warn of the inflammables and to prohibit smoking in or around the building.

XVIII. Burning of material is not permitted.

2. HERITAGE RESOURCES:

All persons associated with operations under this authorization must be informed that any objects or sites of cultural, paleontological, or scientific value such as historic or prehistoric resources, graves or grave markers, human remains, ruins, cabins, rock art, fossils, or artifacts shall not be damaged, destroyed, removed, moved, or disturbed. If in connection with operations under this authorization any of the above resources are encountered, the proponent shall immediately suspend all activities in the immediate vicinity of the discovery that might further disturb such materials and notify the Project Manager of the findings. The discovery must be protected until notified in writing to proceed by the Project Manager. (36 CFR 800.110 &112, 43 CFR 10.4)

3. TEMPORARY WATER:

Potable water shall be provided by the Contractor at Contractor's expense. Potable water is available on the site.

4. TEMPORARY HEAT:

Contractor shall provide, at his own expense, all temporary heat as necessary for the proper installation of all work, equipment, and materials and for the protection of all work and materials against injury from dampness, cold, and freezing. Fuel, equipment, and methods of heating shall be in accordance with federal, state, and local regulations.

5. EXTERIOR STORAGE:

All operations of the Contractor, including storage of materials, shall be confined to areas approved by the Project Manager. Contractor shall be liable for any and all damage caused by him during such use by him of property of the Owner or other parties. Contractor shall save the Owner, its officers and agents, and the Project Manager and his employees free and harmless from liability of any nature or kind arising from any use, trespass, or damage occasioned by his operations on premises of third persons or parties.

6. SECURITY:

The Contractor shall make all necessary provisions and be responsible for the security of the contract work and the work site until final inspection and acceptance of the contract work.

SECTION 01710 - PROJECT CLEANING

All areas shall be cleared and cleaned upon daily completion of work at all construction site locations. All debris and construction materials scattered and blown about the site shall be gathered, returned and secured to their proper location or disposed of during the construction process and upon completion.

SECTION 01720 – AS-CONSTRUCTED AND RECORD DOCUMENTS

1. SCOPE OF WORK:

Maintaining and providing As-Constructed and Record documents for the work described in project drawings and specifications.

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2. WORK INCLUDED:

The work shall include, but is not necessarily limited to, maintaining a clear and concise set of construction documents clearly indicating changes to the original project design. Contractor shall provide all necessary measurements, survey, and product changes to indicate As-Constructed conditions for the each element of the project.

3. PAYMENT:

Payment for As-Constructed and Record documents shall not be made as a line item but shall be included in Mobilization.

4. SUBMITTALS:

Refer to Section 01300 – Submittals, for requirments. Final payment will not be made until As-Constructed and Record documents are received and accepted as complete by the Project Manager.

5. MAINTENANCE OF DOCUMENTS:

I. Store documents in clean, dry area seperate from documents used for construction.

II. Documents shall be made available for inspection by Project Manager upon request.

6. RECORDING:

I. The Project Manager will provide the contractor one set of design drawings and specifications to record information.

II. Label each drawing sheet “AS-CONSTRUCTED” and cover sheet of specifications in neat large printed letters.

III. Record information concurrently with construction progress.

A. Do not backfill work until required information is recorded.

B. Use dark pen or pencil. Ink shall not be water based and lettering shall be legible and not subject to easy smearing.

IV. Mark drawings to record actual construction.

A. Field dimensions, elevations, and details.

B. Changes made by Project Manager in approved modifications.

C. Details not on original drawings.

D. Horizontal and vertical locations of underground facilities (pipelines, electric line, valves, fittings, etc.) and appurtenances referenced to a

minimum of two permanent surface improvements or project coordinates/datum.

End of Section

End of General Requirement

COLORADO
Parks and Wildlife
Department of Natural Resources

Cameo Shooting Range and Outdoor Education Complex Phase 1B Maintenance Building
DIVISION II – DRAWINGS

PROJECT I.D. NO. **W225E1-C5**
IFB1: **2020*153**
APPR. CODE **PF020PIXE**

PRE-BID CONFERENCE: **February 4, 2020 @ 11:00 am**

BID OPENING: **February 20, 2020~~February 18, 2020~~ at 1:00 pm~~10:00 am~~**

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Cameo Shooting Range and Outdoor Education Complex Phase 1B Maintenance Building
W225E1-C5

SECTION 02050 - MOBILIZATION

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to moving onto and off the site all the equipment and personnel required. It also includes cleaning up the site upon completion of the Contract and other items as identified in this section.

3. PAYMENT:

   I. Payment for mobilization will be made on a contract lump sum basis as shown in the Bid Schedule. The lump sum price bid will be paid once only and shall include complete mobilization and demobilization regardless of the number of times the equipment is moved or additional equipment transported to the construction site.

      Of the lump sum price bid, 50% will be paid when 10% of the work is complete. The remaining 50% will be paid when the equipment is removed from the site upon completion.

   II. Mobilization shall include the obtaining of all permits, insurance, and bonds, and the moving onto the site of all plant and equipment; for furnishing and erecting plants, temporary buildings, and other construction facilities; all as required for the proper performance and completion of the work. Such work shall include but not be limited to the following principal items:

      A. Moving onto the site of all the Contractor's plant and equipment required.

      B. Installing temporary construction power and wiring.

      C. Establish fire protection system.

      D. Provide on-site sanitary facilities as specified.

      E. Arrange for and erect the Contractor's work and storage area.

      F. Submit all required insurance certificates and bonds.

      G. Obtain all required permits. Contractor is responsible for providing all additional drawings and documentation as may be required to obtain these permits.

         1. Mesa County Building Permit
         2. Mesa County Electrical Permit
         3. Mesa County Plumbing Permit
         4. Town of Palisade Utility Permit
         5. Stormwater Discharge Permit

6. Xcel Construction Agreements

H. Coordinate with Utilities to extend service to site:

1. Century Link (Communications)
2. Xcel (Electric)
3. Town of Palisade (Water)

I. Have the Contractor's superintendent at job site 50% of the time and available full time via phone.

J. Construction schedule.

K. List of subcontractors.

L. Perform Onsite Utility Locates (Contractor Responsible for hiring private utility locator to locate private utility lines as shown on the drawings prior to construction.)

M. General cleanup of the project area.

N. Shop drawings and product submittals.

O. Maintaining and submitting As-Constructed and Record documents per specifications

End of Section

SECTION 02200 - EARTHWORK

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, earthwork which shall include excavating, filling, compacting, grading and related items.

   Excavate and fill to elevations and dimensions indicated on the drawings and on the site. Allow additional space as required for construction operations.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. QUALITY ASSURANCE:

   I. Classification of Soils: ASTM D 2487 and ASTM D 2488.

   II. Density Relations of Soils: Maximum Dry Density as determined by ASTM D 698 or AASHTO T 99 (Standard Proctor).

   III. Density for Sands and Gravels: Relative Density Method ASTM D 4253 and ASTM D 4254.

   IV. In-place Density Determination: Nuclear Method ASTM D 2922 or Sandcone Method ASTM D 1556.

5. FIELD QUALITY CONTROL:

   Quality control for earthwork shall be provided by the Contractor's independent laboratory. The Project Manager may, at any time, access the work area to perform quality control testing. Contractor shall allow access for such testing. No payment or claim will be granted for lost production during testing activities.

   I. A qualified soil testing lab shall be retained to perform density testing, with field technicians working under the supervision of a Colorado registered professional Project Manager.

   II. Denisty and moisture content testing shall be performed for every 50 cubic yards of in place fill, or at least one (1) test per culvert installation location.

   III. Tests which fail density specification shall be reported verbally to the Project Manager within four (4) hours, either in person or via telephone.

   IV. Soil within the failed area shall be subjected to additional compaction, moisture conditioning with additional compaction, or other corrective measures, and shall be retested. Implementation of corrective measures and retesting shall continue

until the effected soil meets specification.

V. All test results, description of corrective measures, and retest results shall be provided to the Project Manager in writing via e-mail within 48 hours of testing.

VI. Any failed areas for which corrective measures and retesting do not document that the material meets specification shall be removed and replaced to specification at the contractors expense.

6. STRIPPING:

I. General:

Stripping includes removal of topsoil and organic materials, existing subsurface debris and abandoned construction materials.

II. Stripping and Obstructions:

A. Remove the materials and obstructions previously described within the designated clearing limits identified on the drawings to a maximum depth of six (6) inches below the existing natural grade.

B. The stripped topsoil and other organic materials (roots, etc.) shall be stockpiled where designated, on the site.

C. Replace and spread the topsoil on those areas subjected to earthwork operations. Compact with two passes of equipment over the surface after being uniformly spread.

7. EXCAVATION:

I. Classification of Excavation:

Excavation shall be classified as common unless otherwise specified.

A. Common Excavation:

Common excavation consists of grass, sod, humus, peat, earth, clay, sand, silt, gravel, hard and compacted materials, such as hardpan, loosely cemented gravel, soft or disintegrated rock and similar materials that can be removed by hand, heavy ripping equipment such as tracked equipment with a single ripper with a 15,000 pound pry-out force or a hydraulic excavator with a weight in excess of 50,000 pounds and a drawbar pull in excess of 40,000 pounds. Boulders and loose rock less than 1 cu. yd. are also classified as common excavation.

II. Utilization of Excavated Material:

Suitable material removed from the excavations shall be used, as practical, in the earthfill and at other places as directed.

III. Disposal of Surplus and/or Waste Material:

Dispose of surplus and waste material onsite where designated.

Grade areas for draining and a uniform appearance, blending into the surrounding grade.

8. EARTHFILL OPERATIONS:

I. Compacted Fill:

A. Lines and Grades:

Construct fills to the lines, grades, and cross sections as staked. Finished surfaces shall be generally smooth and pleasing in appearance.

B. Quality Assurance:

Maintain and protect fill in a satisfactory condition until completion of work. Replace fill material rendered unsuitable after being placed before final acceptance of the work.

No material shall be placed until the foundation has been inspected and approved.

II. Imported Fill:

Notify the Project Manager when imported material is to be used and indicate where material is to be placed. Do not place imported fill until the Project Manager has determined if tests will be required for the material, compaction or both.

Do not place brush, sod, frozen material or other perishable or unsuitable materials in the fill. Distribute material to avoid lenses differing substantially from the surrounding material.

Deliver material to achieve well and uniformly compacted fill.

Sieve size or designation	Percentage by Weight passing square mesh sieve sizes
2 inch	100
No. 4	30-100
No. 50	10-60
No. 200	5-20

A. In addition, this material shall have a liquid limit not exceeding 35 and a plasticity index of not over 6 when determined in accordance with AASHTO T 89 and AASHTO T 90 respectively.

III. Blading and Shaping:

Blading and shaping consists of grading along existing contours by filling of low areas and removing high spots. Finished surfaces shall be graded to drain, free of abrupt or irregular surface changes, generally smooth and pleasing in appearance.

IV. Density:

Place compacted fill in layers and compact by rolling and tamping to a minimum of ninety-five percent (95%) of maximum dry density as determined by ASTM D 698 or AASHTO T 99 (Standard Proctor).

V. Soil Content:

Material shall be free of sod, brush roots, other perishable material, and stones larger than 6 inches. Should any undesirable material be placed in the fill, remove prior to compaction. No frozen material shall be accepted or used.

VI. Placement:

Maintain the foundation free of water or unacceptable materials.

The distribution of material throughout a fill shall be such that there will be no lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material in the fill. After placement, spread the fill materials by approved equipment in layers before compaction of not more than 8 inches.

Material placed by dumping in piles or windrows shall be moved and spread by blading or other approved methods.

Compacted fill shall not be placed against a slope steeper than one horizontal to one vertical unless otherwise shown on the plans or approved. Do not place fill upon frozen surfaces or coverings of snow and ice.

VII. Moisture Control:

During the compaction operations the surface of the fill, and the material being placed shall be maintained within the moisture content range required to permit proper compaction to the specified density.

VIII. Compaction Process:

A. General:

Prior to fill placement, the subgrade shall be scarified to a depth of 6 inches, moisture adjusted to +/- 2% of optimum, and recompacted to a minimum of 95% Standard Proctor density. Soft areas shall be overexcavated, removed, and replaced with suitable material that is properly compacted.

After each layer of material has been placed, spread, and the required moisture content obtained, compact by passing a roller over the entire layer to the specified density.

Place in 4 inch layers and compact to the specified density with power tampers portions of the fill not accessible to rollers.

9. FINISH GRADING:

Perform finish grading for smooth transition between lines. Grades shall be free of abrupt or irregular changes.

End of Section

SECTION 02210 - FINISH GRADING

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, all cutting, filling, compacting of fills and rough grading required to bring project areas to grade.

3. FILLS:

   Where fill is required to raise the existing grades to the new subgrade elevation indicated on drawings, such fill shall be of earth placed and compacted as specified. The quality of fill material shall be approved.

4. MATERIALS:

   Material for fill shall be reasonably free from roots, wood and other organic material. Fill under surfaced areas shall not contain more than 15 percent clay or loam and no humus. Stones larger than 4 inches, maximum dimension, shall not be used in the upper 6 inches of fill or embankment. Place the material in successive horizontal layers in loose depths as specified, for the full width of the cross section. Deposit fill layers not more than 8 inches thick under surface areas.

5. FINISH GRADING:

   Perform finish grading for transition between lines. Grades shall be free of abrupt or irregular changes.

   Grade between existing and finished grades. Round abrupt change in slopes.

   Stockpiled topsoil shall be used in the areas used for backslopes and other areas exposed through construction and equipment damage.

End of Section

SECTION 02220 - STRUCTURE EXCAVATION AND BACKFILLING

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The earthwork for structures shall include excavation, trenching, filling, compacting and grading.

   Excavate and fill to elevations and dimensions indicated on the drawings and on the site. Allow additional space as required for construction operations.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. QUALITY ASSURANCE:

   I. Classification of Soils: ASTM D 2487.

   II. Density Relations of Soils: Maximum Dry Density as determined by ASTM D 698 or AASHTO T 99 (Standard Proctor).

   III. Density for Sands and Gravels: Relative Density Method ASTM D 4253 and ASTM D 4254.

   IV. In-place Density Determination: Nuclear Method ASTM D 2922 or Sandcone Method ASTM D 1556.

5. FIELD QUALITY CONTROL:

   Quality control for excavation and backfill shall be provided by the Contractor's independent laboratory.

   The Contractor is required to excavate a test pit at each building site where footings and foundations are included as a part of the work. These test pits shall extend at least 24 inches deeper than the deepest footing bottoms included in that project. The Project Manager shall be notified in time to make a field examination of each pit. No footing and foundation work shall proceed until the Project Manager has approved in writing the soils conditions found at each site.

   I. Density and moisture content testing shall be performed for every 500 cubic yards of in place fill, or at least two (2) tests per side of building, or at least one (1) test per culvert installation location.

   II. Tests which fail density specification shall be reported verbally to the Project Manager within four (4) hours, either in person or via telephone.

III. Soil within the failed area shall be subjected to additional compaction, moisture conditioning with additional compaction, or other corrective measures, and shall be retested. Implementation of corrective measures and retesting shall continue until the effected soil meets specification.

IV. All test results, description of corrective measures, and retest results shall be provided to the Project Manager in writing within 48 hours of testing. Facsimile or electronic mail are acceptable forms of providing this information

V. Any failed areas for which corrective measures and retesting do not document that the material meets specification shall be removed and replaced to specification at the contractors expense.

6. MATERIALS:

I. Select Material:

A. Class I: Angular, ¼ to 1½ inches, graded stone including slag, cinders and crushed stone.

B. Class II: Coarse sand and gravels with maximum particle size of ½ inch with no more than 12% passing a No. 200 sieve. Soil Types GW, GP, SW and SP are included.

C. Class III: Fine sand and clayey gravels including sands, sand-clay and gravel-clay mixtures. Soil Types GM, GC, SM and SC are included.

II. Imported Material:

Imported material is defined as material imported by the Contractor for use in place of native material.

III. Relative Density:

Where Class I or Class II select material is used, compaction shall be measured by relative density to the percentages as follows corresponding to the specified Standard Proctor values in these Specifications.

A. 95% Standard Proctor - 75% Relative Density

1. Required beneath all structures, slabs, parking lots, roads, and culverts.

B. 90% Standard Proctor - 70% Relative Density

1. Landscaped areas 10’ and greater from structures, slabs and culverts.

7. EXCAVATION:

I. General:

Excavation shall be open-cut, except as shown or approved.

Excavation may be sloped or kept vertical where sloping of the excavation does not endanger any existing utility or structure.

Excavation shall be performed in accordance with applicable federal, state or local safety codes.

Control grading around the structure so that the ground is pitched to prevent water from flowing into excavated areas or damaging the foundation. Provide pumping to keep excavations clear of water.

II. Underground Obstructions:

Locate utilities prior to excavating. Unless otherwise specified, preserve intact pipe or utilities encountered during construction. If utilities or structures are accidentally damaged, replace immediately to their original condition.

A. Unsuitable Bearing:

Excavate such that uniform bearings are obtained throughout. If suitable bearing is not obtained at the depth indicated on the drawings for the foundations, immediately notify the Project Manager. Do not proceed until further instructions are given.

Completely remove subsurface debris and abandoned construction materials including broken pieces of concrete. Remove such materials within construction lines to 6 inches below the excavation. Dispose of materials where designated.

B. Freezing:

When freezing temperatures are expected, do not excavate to the full depth indicated unless the work can be performed immediately after the excavation has been completed.

C. Dimensions:

Excavate to elevations and dimensions where shown. Allow additional space as required for construction operations and inspection.

III. Shoring:

Shore, sheet pile and brace excavations as required to maintain them secure. Remove shoring as backfilling progresses, but only when banks are safe against caving or collapse.

IV. Classification of Excavation:

Excavation shall be classified as common unless otherwise specified.

A. Common Excavation:

Common excavation consists of grass, sod, humus, peat, earth, clay, sand, silt, gravel, hard and compacted materials, such as hardpan, loosely cemented gravel, soft or disintegrated rock and similar materials that can be removed by hand, heavy ripping equipment such as tracked equipment with a single ripper with a 15,000 pound pry-out force or a hydraulic excavator with a weight in excess of 50,000 pounds and a drawbar pull in excess of 40,000 pounds. Boulders and loose rock less than 1 cu. yd. are also classified as common excavation.

V. Overexcavation:

Excavate so that uniform bearing shall be obtained for the foundation. Do not excavate below the depth specified. If over excavation occurs, backfill with select material.

VI. Unsuitable Foundation:

The foundation is considered unsuitable when after dewatering, the existing soils are unstable. Unstable soils are those that are too soft, provide low load bearing or are otherwise inadequate. Unstable soils include organic soils, fine grain soils saturated with water in excess of their liquid limit, low density fine sands or silts, and expansive soils. Cohesive soils or granular cohesive soils with shear strength measured using ASTM D 2166 or ASTM D 2573 of less than 500 psf or sands with penetration resistance measured using ASTM D 1586 of less than 8 blows per foot are unsuitable.

Where excavation is in shale or rock, or broken concrete occurs, excavate six inches below grade. No rock, shale or broken concrete shall be within 6 inches of the structure.

VII. Dewatering:

Where running water, quicksand, or unsuitable foundation conditions are encountered, push the work with the utmost vigor. Drain water to sumps through well points, underdrains or other approved methods, providing a completely dry foundation. Ensure that subsurface water does not interfere with maintaining proper soil moisture for proper compaction of backfill.

8. BACKFILLING FOR STRUCTURES:

I. General:

Backfill against the structure only after approval. Place and compact backfill materials to minimize settlement and to avoid damage to the structure, waterproofing and connecting construction. Before placing backfill, remove debris subject to rot or corrosion and other detrimental materials.

Water shall not be allowed to rise until the concrete has set a minimum of 24 hours, and the forms have been removed. Water shall not be allowed to rise unequally against unsupported structural walls.

Do not place brush, sod, frozen material or other perishable or unsuitable materials in the fill. Distribute material to avoid lenses differing substantially from the surrounding material.

Deliver material to achieve well and uniformly compacted backfill.

II. Placement:

Place and spread backfill material in 4 in. layers.

Compact backfill to a minimum of 95% of maximum dry density as determined by ASTM D 698 or AASHTO T 99 (Standard Proctor).

III. Concrete Structures:

Do not backfill or place loads against concrete (including patched areas) before the concrete has developed at least 70% of the specified strength, or before 7 days after placing the concrete.

From 7 days to 14 days after placing concrete, backfill operations may be initiated, but no rolling or hauling equipment will be permitted within 2 feet of the structure. At this time, backfill may be placed against concrete surfaces to a thickness of not more than 2 feet if compaction is accomplished by power tampers.

IV. Imported Backfill:

Notify the Project Manager when imported material is to be used and indicate where material is to be placed. Do not place imported fill until approved by the Project Manager.

A. Imported fill shall have the following gradation:

Sieve size or designation	Percentage by Weight passing square mesh sieve sizes
2 inch	100
No. 4	30-100
No. 50	10-60
No. 200	5-20

B. In addition, this material shall have a liquid limit not exceeding 35 and a plasticity index of not over 6 when determined in accordance with AASHTO T 89 and AASHTO T 90 respectively.

C. The material shall be Class III or better: fine sand and clayey gravels including sands, sand-clay and gravel-clay mixtures. Soil Types GM, GC, SM and SC are included.

V. Grading:

Perform finish grading for smooth transitions between lines. Grades shall be free of abrupt or irregular changes.

Grade between existing and final grades not otherwise shown to a uniform slope. Round abrupt change in slopes.

9. INSPECTION:

Backfilling shall not commence until all tests and inspections have been made. Areas to receive backfill are to be cleared of all rubbish and debris.

End of Section

SECTION 02221 - TRENCHING AND BACKFILLING

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The earthwork for the pipe installations shall include excavation, trenching, backfilling, compacting and grading.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. QUALITY ASSURANCE:

   I. Classification of Soils: ASTM D 2487 and ASTM D 2488.

   II. Density Relations of Soils: Maximum Dry Density as determined by ASTM D 698 or AASHTO T 99 (Standard Proctor).

   III. Density for Sands and Gravels: Relative Density Method ASTM D 4253 and ASTM D 4254.

   IV. In-place Density Determination: Nuclear Method ASTM D 2922 or Sandcone Method ASTM D 1556.

   V. Pipe Embedment Materials: ASTM D 2321.

5. MATERIALS:

   I. Select Material:

      A. Class I: Angular, 1/4 to 1-1/2 inches, graded stone including slag, cinders and crushed stone.

      B. Class II: Coarse sand and gravels with maximum particle size of 1-1/2 inch with no more than 12% passing a No. 200 sieve. Soil Types GW, GP, SW and SP are included.

      C. Class III: Fine sand and clayey gravels including sands, sand-clay and gravel-clay mixtures. Soil Types GM, GC, SM and SC are included.

      D. Class IV: Inorganic silts or clays, silty or clayey fine sands, gravelly or silty clays. Soil Types ML, CL, MH and CH are included.

   II. Imported Material:

      Imported material is defined as material imported by the Contractor for use as backfill material when used in place of native material or material used for pipe

embedment where select material is not required by the Plans and Specifications.

III. Relative Density:

Where Class I or Class II select material is used, compaction shall be measured by relative density or Standard Proctor to the percentages as follows corresponding to the specified Standard Proctor values in these Specifications.

A. 95% Standard Proctor - 75% Relative Density

B. 85% Standard Proctor – 65% Relative Density

6. EXCAVATION:

I. General:

Excavation shall be open-cut, except as shown or approved.

Trenches may be sloped or kept vertical where sloping of the trench does not endanger any existing utility or structure.

Trench excavation shall be performed in accordance with applicable federal, state and local safety codes.

Perform grading necessary to prevent surface water from causing damage to the work. Place material compactly on the sides of the excavation so as not to endanger the work. Dispose of surplus material as directed on the site.

II. Dewatering:

Where running water, quicksand, or unsuitable foundation conditions are encountered, push the work with the utmost vigor. Drain water in the trench to sumps through well points, underdrains or other approved methods, providing a suitable foundation with no running or standing water for pipe laying operations. Ensure that subsurface water does not interfere with maintaining proper soil moisture for a suitable foundation and proper compaction of backfill.

Maintain dewatering until the pipe has been installed and backfill has been placed to a height above the water table.

III. Trench Width:

Minimum trench width shall be as shown on the drawings. Use the minimum width only when it provides adequate space for workers to place and join the pipe properly. Use additional width where required for compaction equipment.

IV. Dimensions:

Excavate to elevations and dimensions shown. Allow additional space as required for construction operations and inspection.

V. Obstructions:

Completely remove subsurface debris and abandoned construction materials including broken pieces of concrete. Remove such materials within construction lines to 6 inches below excavation. Dispose of the materials where designated. No blasting will be permitted.

Locate utilities prior to excavating. Unless otherwise specified, preserve intact pipe or utilities encountered. If utilities or structures are damaged, replace immediately to their original condition.

VI. Shoring:

Shore, sheet pile and brace excavations as required to maintain them secure for protection of workmen or work. Remove shoring as work progresses, but only when banks are safe from caving or collapse.

VII. Classification of Excavation:

Excavation shall be classified as common unless otherwise specified.

A. Common Excavation:

Common excavation consists of grass, sod, humus, peat, earth, clay, sand, silt, gravel, hard and compacted materials, such as hardpan, loosely cemented gravel, soft or disintegrated rock and similar materials that can be removed by hand, heavy ripping equipment such as tracked equipment with a single ripper with a 15,000 pound pry-out force or a hydraulic excavator with a weight in excess of 50,000 pounds and a drawbar pull in excess of 40,000 pounds. Boulders and loose rock less than 1 cu. yd. are also classified as common excavation.

VIII. Overexcavation:

Excavate so that uniform bearing shall be obtained for the length of the pipe. Do not excavate below the depth specified. If over excavation occurs, backfill with select material.

IX. Disturbed Foundation:

Where excavation results in the foundation being disturbed, scarify to a depth of 6 inches and compact to a density equal to that of the surrounding earth or a minimum of 95% of maximum dry density, whichever is greater.

X. Unsuitable Foundation:

The trench bottom is considered unsuitable when after dewatering, the existing soils are unstable. Unstable soils are those that are too soft, provide low load bearing or are otherwise inadequate. Unstable soils include organic soils, fine grain soils saturated with water in excess of their liquid limit, low density fine sands or silts, and expansive soils. Cohesive soils or granular cohesive soils with shear strength measured using ASTM D 2166 or ASTM D 2573 of less than 500 psf

or sands with penetration resistance measured using ASTM D 1586 of less than 8 blows per foot are unsuitable.

Where the trench is excavated in shale or rock, or broken concrete occurs, excavate six inches below grade. No rock, shale or broken concrete shall be within 6 inches of the pipe.

XI. Tunneling:

Tunneling will be allowed under water, gas or other pipe when approved.

The width of the excavation, tunnels and subgrade preparation shall be the same as that specified for open trench excavation.

XII. Utilization of Excavated Material:

Suitable material removed from the excavations shall be used, as practical, in the backfill and at other places as directed.

XIII. Disposal of Surplus and/or Waste Material:

Dispose of surplus and waste material where designated.

Grade areas for draining and a uniform appearance, blending into the surrounding grade.

7. BACKFILL:

I. General:

Do not place brush, sod, frozen material or other perishable or unsuitable materials in the fill. Distribute the material to avoid lenses differing substantially from the surrounding material.

Place the material to achieve a well and uniformly compacted fill.

II. Inspection and Approval:

Do not backfill until tests and inspections have been made on work to be covered and approved. Clear areas to receive backfill of rubbish and debris.

III. Imported Backfill:

Notify the Engineer when imported material is to be used and indicate where material is to be placed. Do not place imported fill until approved by the Engineer. Provide laboratory tests for the material.

IV. Moisture Control:

During compaction operations the material being placed shall be maintained within the moisture content range required to permit proper compaction to the specified density.

V. Placement and Methods:

A. General:

Because of varying trench conditions, the materials used and methods applied may vary. Individual trench requirements are specified as follows or shown on the drawings. Backfill only after approval. Maximum depth of lifts shall be 8 inches unless otherwise specified.

B. Foundation:

Where the trench bottom is unsuitable for pipe foundation, remove and replace material with select material. Compact to a minimum of 85% of maximum dry density.

C. Pipe Embedment (Sanitary Sewer):

1. Bedding: Place select material from the bottom of the trench to a minimum of 4 inches or the depth shown on the drawings. Mechanically tamp to a minimum of 85% of maximum dry density.

2. Haunching: Shape the trench bottom to provide firm, stable and uniform support for the full length of the pipe and joints. Dig bell holes to provide a minimum of 1 inch clearance between the bell and the material. Adjust pipe for line and grade and make the joint. Place material carefully and tamp under the haunches of the pipe and in bell holes and sling holes. Place select material from the bottom of the trench to the springline by hand. Tamp thoroughly and equally along each side of the pipe to avoid displacement or damage to the pipe. Compact to a minimum of 85% of maximum dry density.

   Backfill methods shall be approved.

   Haunching material shall be the same material as that used for bedding where Class I or Class II select material is used.

3. Initial Backfill: Compact select material to a minimum (85%) of maximum dry density. Do not drop material or perform compaction directly over the top of the pipe. Place initial backfill from the springline to a minimum depth of 6 inches over the pipe.

4. Compacted Final Backfill: Mechanically compact lifts to a minimum of 95 percent of maximum dry density. Perform in roadways, dikes, or where otherwise shown on the drawings.

VI. Settlement:

Within one year after final acceptance of the project, utilities or other improvements adversely affected by settlement, repair the settled areas to proper grade and condition at no expense to the Owner.

VII. Surface Restoration:

A. Unsurfaced Areas: All surface cuts shall be, as a minimum, restored to a condition equal to that prior to construction. All streets shall be restored in accordance with the regulations and requirements of the agency having control or jurisdiction over the street, roadway, or right-of-way.

B. Surfaced Areas: All surface cuts shall be, as a minimum, restored to a condition equal to that prior to construction. All gravel or paved streets shall be restored in accordance with the regulations and requirements of the agency having control or jurisdiction over the street, roadway, or right-of-way.

VIII. Grading:

Perform finish grading for smooth transitions between lines. Grades shall be free of abrupt or irregular changes.

Grade between existing and final grades not otherwise shown to a uniform slope. Round abrupt change in slopes.

End of Section

SECTION 02222 - EARTHWORK - UNDERGROUND CABLE

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, excavation, trenching, filling, compacting and grading.

3. EXCAVATION:

   Excavating or cutting includes all material encountered to the depth indicated on the drawings.

   Excavate to elevations and dimensions indicated; allow additional space as required for construction operations and inspection.

4. BACKFILL:

   I. Initial Backfill:

      Complete backfill by hand to a minimum depth of 6 inches over the cable. Backfill shall be free of particles in excess of 2 inches.

   II. Compacted Backfill, Traffic Zone:

      Place backfill for trench widths in excess of 6 inches above the cable in 8 inch lifts for the total trench depth. Mechanically tamp lifts to 95 percent of maximum dry density as determined by ASTM D 698 or AASHTO T 99 (Standard Proctor).

   III. Semi-Compacted Backfill:

      Place backfill for trench widths less than 6 inches above the cable to a minimum depth of 6 inches. Mechanically place remaining material to the top of the trench and traverse the trench with not less than two passes of equipment or other approved method, after which mound over with excess earth and traverse with equipment.

5. GRADING:

   Perform finish grading for smooth transitions between lines. Grades shall be free of abrupt or irregular changes.

   Grade between existing and final grades not otherwise shown to a uniform slope. Round abrupt change in slopes.

End of Section

SECTION 02275 - GEOTEXTILE FABRIC

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, placement of a geotextile fabric membrane upon the prepared foundation.

3. SUBMITTALS:

   Refer to SECTION 01300 – SUBMITTALS.

4. MATERIALS:

   I. Soil Retention Blanket:

      A. Fibers used in the manufacture of the geotextiles, and the threads used in joining geotextiles by sewing, shall consist of natural fibers. Geotextile shall be 100% biodegradable double-net with a dense coconut, straw, wood fiber layer. Product shall perform for 12-24 months.

   II. Sythetic Geotextile Fabric:

      A. Fibers used in the manufacture of synthetic geotextiles, and the threads used in joining synthetic geotextiles by sewing, shall consist of long chain synthetic polymers composed of at least 85% by weight polyolefins, polyesters, or polyamides. They shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including selvedges.

   III. Geotextile rolls shall be furnished with suitable wrapping for protection against moisture and extended ultraviolet exposure prior to placement. Each roll shall be labeled or tagged to provide product identification sufficient for inventory and quality control purposes. Rolls shall be stored in a manner which protects them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof cover.

5. SPECIFIC FABRIC PROPERTIES (Synthetic Geotextile Fabric) :

   I. General:

      The property values are not design values but represent the minimum accepted physical characteristics of the geotextile required. The number represents a value to be confirmed by the manufacturer. These values represent minimum average roll values (i.e., any roll tested should meet or exceed the minimum values in the table). Manufactured and field seams shall also meet the tabulated values.

   II. Erosion Control:

PROPERTY	CLASS A	TEST METHOD
Grab Strength, lbs.	200	ASTM D 4632
Elongation, (%)	15	ASTM D 4632
Sewn Seam Strength, lbs.	180	ASTM D 4632
Puncture Strength, lbs.	80	ASTM D 4833
Trapezoid Tear Strength, lbs.	50	ASTM D 4533

Apparent Opening Size, U.S. Standard Sieve	Soil with more than 50% particles by weight passing U.S. No. 200 sieve, AOS less than 0.297 mm (greater than #50 U.S. sieve).	ASTM D 4751
Permittivity	$\Psi > 0.3\ sec^{-1}$	ASTM D 4491
Ultraviolet Degradation at 150 Hours	70 % Strength retained for all classes	ASTM D 4355

6. CONSTRUCTION REQUIREMENTS: (Erosion Control/Drainage Fabric)

Grade the slope to provide a smooth, even surface. If minor natural soil caving occurs, as determined by the Engineer, fill areas with granular material so that the geotextile will not be distorted or torn during material placement. The prepared surface shall be inspected prior to fabric placement.

For placement of the material, care should be taken to avoid puncturing or tearing the geotextile. The material shall be placed over the fabric in sufficient time to prevent UV damage to the fabric as specified by the manufacturer. However, in no case will the fabric remain uncovered or exposed to the elements more than 14 days. Placement of the material should start at the base of the required blanket area, moving up the slope. The material should be placed from the center outward.

Class A geotextile shall be used below rip-rap and concrete where geotextiles are indicated by the drawings.

I. Repair:

A geotextile patch shall be placed over the damaged area and extend 3 feet beyond the perimeter of the tear or damage.

II. Placement:

A. Erosion:

The geotextile shall be joined by either sewing or overlapping. All seams shall be subject to approval.

Overlapped seams shall have a minimum overlap of 12 inches except where placed under water where the overlap shall be a minimum of 3 feet.

Pin overlaps may be used using steel security pins, normally 3/16 inch diameter, 18 inches long, and pointed at one end, and fitted with 1.5 inch diameter metal washer on the other end. Space pins along all overlap alignments at a distance of approximately 3 ft. center to center. No wrinkles or folds will be allowed in the fabric. If seamed, seam strength shall meet the minimum required fabric grab strength criteria listed.

Overlap successive fabric in such a manner that the upstream sheet is placed over the downstream sheet and/or upslope over downslope. In underwater applications, place the geotextile and required thickness of backfill material the same day. Begin backfill placement at the toe and proceed up the slope.

Riprap and heavy stone filling shall not be dropped onto the geotextile from a height of more than 1 foot. Slope protection and smaller sizes of stone filling shall not be dropped onto the geotextile from a height exceeding 3 feet. Replace geotextile damaged during placement as directed.

End of Section

SECTION 02279 - WATER QUALITY CONTROL

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, erosion control, and disposal of water resulting from dewatering operations as specified.

3. QUALITY CONTROL:

   I. The Contractor shall comply with the "Colorado Water Quality Control Act," Title 25, Article 8, CRS "Protection of Fishing Streams", Title 33, Article 5, CRS; "Clean Water Act", 33 USC 1344; regulations promulgated; certifications issued; and to the following requirements.

      A. The Contractor shall provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams, lakes, ponds, or other watercourses or water impoundments areas.

      B. Cut slopes shall be seeded and mulched as the excavation proceeds. The surface area of erodible earth material exposed at one time shall not exceed 750,000 square feet for clearing and grubbing and 750,000 for earthwork operations.

      C. Temporary pollution control shall include conducting required dewatering of excavations in a manner that avoids pollution and erosion. Water from dewatering operations shall not be discharged into natural streams or waterway, into irrigation ditches or canals, or into storm sewers, unless allowed by a point source discharge permit. Discharge into sanitary sewers shall not be allowed unless written permission of the Owner or its controlling authority is obtained and this disposal method is approved by the Project Manager. The water from dewatering operations shall be contained in basins for dissipation by percolation or evaporation, shall be hauled away from the project for disposal in accordance with applicable laws and regulations, or it shall be applied to approved non-wetland vegetated areas and allowed to soak into the soil. Sprinkler or aerial application shall not be used unless approved by the Project Manager. Depending upon the quality of the water, application of water to vegetated areas may require written concurrence from the Colorado Department of Public Health and Environment. The Contractor shall ascertain the water quality, and when applicable, per the Colorado Department of Public Health and Environment's regulations (5CCR 1002-8 and others,) obtain the necessary concurrences.

      D. Temporary pollution control shall include construction work outside the project area where necessary for borrow pits, haul roads and equipment storage sites.

E. The Contractor shall prepare schedules for accomplishing temporary and permanent erosion control work and submit them for acceptance at the preconstruction conference. The schedules for the proposed method of erosion control shall include all construction activities within the project, haul roads, borrow pits, storage and plant sites, and the plan for disposal of waste material. Work shall not be started until the temporary erosion control schedules and methods of operations have been accepted.

F. The Contractor shall incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the accepted schedule. Erosion control features shall be maintained by the Contractor until the project is accepted.

G. In the event of conflict between these requirements and water quality control laws, rules, or regulations of other Federal, State or local agencies, the more restrictive laws, rules, or regulations shall apply.

4. PRODUCTS:

I. Materials:

Mulches may be hay, straw, fiber mats, netting, wood cellulose, corn stalks (shredded or chopped), corn cobs (shredded or chopped), bark, wood chips, or other suitable material, and shall be reasonably clean and free of noxious weeds and deleterious materials.

Slope drains may be constructed of pipe, fiber mats, rubble, portland cement concrete, bituminous concrete, plastic sheeting, or other acceptable materials.

Grass shall be a quick growing species (such as rye grass, or cereal grasses) suitable to the area, which will provide temporary cover and will not later compete with the grasses sown for permanent cover.

Fertilizer and soil conditioners shall be acceptable standard commercial grade.

5. EXECUTION:

I. Water Quality Control:

A. Description:

The water quality control work shall consist of temporary measures needed to control water pollution. These temporary measures shall include the installation of berms, dikes, dams, sediment basins, fiber mats, netting, gravel, mulches, grasses, slope drains, and other erosion control devices or methods, at the locations necessary to control erosion and water pollution.

Temporary pollution controls shall be coordinated with the permanent erosion control features as shown on the plans.

B. Requirements:

1. All reasonable steps shall be taken to insure that the Contractor's provisions for the control of erosion and sedimentation and the protection of water quality comply with applicable standards, permit conditions, and regulations of appropriate agencies.

2. Permanent erosion and sediment control measures shall be installed at the earliest practicable time. One of the first construction activities shall be the placement of permanent and temporary erosion and sediment control measures around the perimeter of the project or the initial work areas.

3. Temporary erosion and sediment control measures shall be coordinated with permanent measures to assure economical, effective, and continuous control throughout the construction phase.

4. Erosion and sediment control measures shall be continuously maintained to perform their intended function during construction of the project.

5. Construction operations in rivers, streams, lakes, or other bodies of water shall be restricted to:

    a. Channel change areas designated on the plans.

    b. Areas designated on the plans which must be entered to construct structures or erosion and sediment control measures; and

    c. Areas where waters must be forded no more than four times per day to facilitate construction. Fording waters more than four times per day will not be permitted; temporary bridges or other structures shall be constructed where more than four crossings per day are required.

6. Pollutant byproducts of construction, solids, sludges, pollutants removed in the course of treatment of wastewater, and material from sediment traps shall be handled, stockpiled, or disposed of in such a manner so entry into any watercourse or impoundment is prevented.

7. The use of chemicals such as soil stabilizers, dust palliatives, sterilants, growth inhibitors, fertilizers, deicing salts, etc., during construction shall be in accordance with the manufacturer's recommended application rates, frequency, and instructions. These chemicals shall not be used within 50 feet of the ordinary high water line of any water course or impoundment.

8. When a project is subject to a water quality permit, the quantities of discharges, locations of discharges, composition of discharges, and quantities of dredging and fills will be stated in the permit. If the Contractor anticipates a change from permit conditions, or if construction activities result in noncompliance with permit conditions, the Contractor shall detail the anticipated changes or noncompliance

in a written report to the Project Manager. The submission of the report shall be within five days from the time the Contractor becomes aware of change or noncompliance. Within 10 days after receipt of the report, the Project Manager will approve or disapprove the request for change, or detail the course of action after noncompliance.

9. Any diversion from, or bypass of, facilities necessary to maintain compliance with the terms and conditions contained in these Specifications is prohibited except, (1) where unavoidable to prevent loss of life or severe property damage, or (2) where excessive storm drainage or runoff would damage the facilities. If diversion or bypass of the facilities occurs, the Contractor shall notify the Project Manager in writing within five days of the occurrence. The Project Manager will assess the damage, if any, resulting from the occurrence, and detail a course of action.

10. Areas where fuels, lubricants, and other petroleum distillants are stored shall be restored to their original condition. Equipment servicing shall occur within approved designated areas.

11. Areas designated on the plans shall be seeded or revegetated at the earliest practicable time to prevent soil erosion.

12. The Contractor shall not place plastic concrete into wetlands, watercourses, or impoundments.

13. The work shall be planned and executed so that, whenever possible, work shall be done from the bank.

14. The construction activities shall not impair Indian tribal rights, including but not limited to, water rights, and treaty fishing and hunting rights.

15. The construction activity shall not disrupt the movement of those species of aquatic life indigenous to the waterbody.

16. Requests for clarification of the permit or certification provisions shall be directed to the Project Manager.

End of Section

SECTION 02453 - PARKING BARRIERS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the furnishing and installation of parking barriers.

3. MATERIALS:

   I. Concrete Wheel Stops:

      A. Dimensions:

         1. Length = 8'-0"

         2. Height = 6 inches

         3. Base Width = 7 inches

      B. Materials:

         1. Reinforcement: 2-#4 (minimum)

         2. Concrete: 4,000 psi (minimum)

4. INSTALLATION:

   Concrete Wheel Stops:

   Concrete wheel stops shall be set as shown on the contract drawings. Wheel stops shall be secured using a minimum of 2-#4 dowels. Dowels shall be a minimum of 2'-0" in length. Top of dowel shall be flush or recessed a maximum of ¼" below top of concrete.

End of Section

SECTION 02545 - AGGREGATE BASE COURSE

1. SCOPE OF WORK:

Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

The work shall include, but is not necessarily limited to, placement of compacted aggregate upon the previously prepared surface.

3. SUBMITTALS:

Refer to Section 01300 - Submittals, for requirements.

4. QUALITY ASSURANCE:

Work covered in this Section shall be in accordance with these Specifications and applicable sections of the Colorado Department of Transportation Standard Specifications specified herein.

I. Density for Sands and Gravels: Relative Density Method ASTM D 4253 and ASTM D 4254.

II. In-place Density Determination: Nuclear Method ASTM D 2922 or Sandcone Method ASTM D 1556.

5. MATERIALS:

Aggregates for base courses shall be crushed stone, crushed slag, crushed gravel or natural gravel conforming to AASHTO M 147 except that the requirements for the ratio of minus No. 200 sieve fraction to the minus No. 40 sieve fraction shall not apply. Aggregates for base material shall meet the grading requirements of the following table and shall also be for material identification.

The liquid limit shall not be greater than 30 and the plasticity index shall not exceed 6 when the aggregate is tested in accordance with AASHTO T 89 and AASHTO T 90 respectively.

The grading requirements of the material, Colorado Department of Transportation, Section 703.03, Aggregate Base Course, are as follows:

I. Class 6:

Sieve size or designation	Percentage by Weight passing square mesh sieve sizes
¾ in.	100
No. 4	30-65

Sieve size or designation	Percentage by Weight passing square mesh sieve sizes
No. 8	25-55
No. 200	3-12

Quality control for earthwork shall be provided by the contractor. The engineer may, at any time, access the work area to perform quality control testing. Contractor shall allow access for such testing. No payment or claim will be granted for lost production during testing activities.

I. A qualified soil testing lab shall be retained to perform density testing, with field technicians working under the supervision of a Colorado registered professional engineer.

II. Denisty and moisture content testing shall be performed for every 50 cubic yards of in place fill, or at least two (2) tests per site.

III. Tests which fail density specification shall be reported verbally to the engineer within four (4) hours, either in person or via telephone.

IV. Base course within the failed area shall be subjected to additional compaction, moisture conditioning with additional compaction, or other corrective measures, and shall be retested. Implementation of corrective measures and retesting shall continue until the affected base coursel meets specification.

V. All test results, description of corrective measures, and retest results shall be provided to the engineer in writing within 48 hours of testing. Facsimile or electronic mail are acceptable forms of providing this information

VI. Any failed areas for which corrective measures and retesting do not document that the material meets specification shall be removed and replaced to specification at the contractors expense.

6. EXECUTION:

I. Preparation:

Grade and compact the subgrade surface to receive aggregate base course to the elevations staked on the site.

Subgrade for all gravel shall be previously prepared to lines, grades and elevations shown on the drawing or as adjusted by the Engineer, and compacted to a minimum of 95% of maximum dry density in accordance with AASHTO T 99 prior to placing gravel.

Do not place material when the prepared grade is wet, frozen, or in the Engineer's opinion, the prevailing conditions are not favorable.

The prepared surface coarse shall be in a plane, pitched and sloped as shown on the drawings.

II. Placement:

Place all aggregate in a single lift for the compacted thickness.

III. Mixing:

When the material used is acquired from two or more sources, the materials shall be mixed while at optimum moisture by approved equipment until the mixture is uniform throughout.

IV. Shaping and Compacting:

Continue compaction until a density of not less than 95 percent of the maximum density determined in accordance with AASHTO T 99 has been achieved. Maintain the surface during the compaction operations such that a uniform texture is produced and the aggregates firmly keyed. Water shall be uniformly applied during compaction in the amount necessary for proper consolidation.

Back dragging of a bucket is not an acceptable method of preparing the surface for compaction and is not allowed. Wheel rolling or the use of passes of loaded equipment is not an acceptable method of compaction.

End of Section

SECTION 02610 - PIPE AND FITTINGS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the furnishing and installation of all components required for a complete installation.

   Refer to Section 15400 for water system piping materials.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. PIPE INSPECTION AND INSTALLATION:

   I. Alignment:

      Alignment of pipe shall be maintained to the staked lines and grades.

   II. Placement:

      Lay pipe, fittings and accessories with proper equipment and in a manner to prevent damage.

      Any defective pipe materials found during the inspection, prior to placing within the trench, shall be replaced.

      All foreign matter or dirt shall be removed from the interior of the pipe before lowering into position in the trench. Pipe shall be kept clean during and after completion of laying.

      Clean the sealing surfaces of the pipe immediately before assembly, and assembly shall be made as recommended by the manufacturer. Check the completed piping to assure joints are intact.

      Prior to the placement of earthfill or other material around the pipe, observe pipe for leakage. Repair any leaks. Repeat the procedure until the pipe is watertight (The pipe joints shall show no leakage).

      When pipe laying is not in progress, seal the open ends of installed pipe to prevent entrance of water into the line. Whenever water is excluded from the interior of the pipe, place enough backfill on the pipe to prevent floating. Remove any pipe that has floated from the trench and restore the bedding. No pipe shall be laid when the trench conditions or the weather are unsuitable for proper installation as determined by the Project Manager.

   III. Handling:

Haul and handle the pipe in a manner that will avoid damage.

Remove any damaged pipe from the project site and replace. Pipe shall not be repaired for installation unless approved.

IV. Pressure Testing:

A. Perform testing in the presence of the Project Manager prior to backfilling. Furnish water for testing.

B. Place sufficient backfill prior to filling with water and testing to prevent lifting of the pipe. If it is necessary to partially backfill the line prior to testing to hold the line in place, the initial backfill shall cover only the body of the pipe with joints and connections left uncovered for inspection. When local conditions require that the trenches be backfilled immediately after the pipe has been laid, the testing may be carried out after backfilling has been completed, but before placement of permanent surface.

C. Fill each section of the pipe slowly with water and expel air by means of taps at high points. Apply the specified test pressure by means of pump connected to the pipe in an approved manner. Maintain the test pressure by additional pumping if necessary for the specified time during which the system and exposed pipe, valves and fittings, shall be carefully examined for leakage. Repair or remove and replace all defective elements and repeat the test until all visible leakage has been stopped and the allowable leakage requirements have been met. Monitor pressure drops and inspect the pipeline in its entirety while the maximum working pressure is maintained.

D. Simultaneous pressure and leakage tests may be conducted, or separate pressure and leakage tests may be performed on the installed system on the criteria specified in Table I.

TABLE 1 -- WATER SYSTEM TEST METHODS

Procedure	Pressure	Duration of Test
Simultaneous pressure and leakage tests	Normal operating pressure * at lowest elevation plus 50 psi or Pressure rating of pipe plus 50 psi, whichever is least	Two hours
Separate pressure test	Normal operating pressure at lowest elevation plus 50 psi or Pressure rating of pipe plus 50 psi, whichever is least	One hour
Separate leakage test	Average test pressure of segment tested	Two hours

*Highest normal operating pressure for this water line will be 100 psi.

E. Furnish the gauges and measuring device for the leakage test, pump, pipe,

connections and all other necessary apparatus, and furnish the necessary personnel to conduct the test. The duration of each leakage test shall be two hours, unless otherwise specified, and during the test the main shall be subjected to the quantity of water that must be supplied into the newly laid pipe, or any specified leakage test pressure after the pipe has been filled with water and the air in the pipeline has been expelled. No installation will be accepted if the leakage is greater than determined by the formula:

$$L = \frac{N\,D\sqrt{P}}{7400}$$

L is the allowable leakage, in gallons per hour; N is the number of joints in the length of pipeline tested; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge.

F. Filling:

The line shall be slowly filled with water with adequate provision made for the release of air to bleed all entrapped air during the process. The pressure shall be slowly built up to the maximum design working pressure. Pressurization should take a minimum of ten (10) minutes for pipes four (4) inches and smaller in a test section of 1,000 feet and proportionally longer for increased diameters and lengths.

V. Sterilization:

A. General

Flush and sterilize the completed waterline with chlorine before acceptance for domestic service in the presence of the Project Manager.

Chlorinate the finished pipeline upon completion of hydrostatic testing.

B. Health and Procedure Standards:

Flushing and sterilization of line shall be performed in accordance with the requirements of the Colorado State Board of Health, and AWWA C 601 for the chlorinating agent and the method of application.

C. Equipment, Materials and Procedure:

Furnish all equipment, material, qualified personnel and water for sterilization and flushing of waterline.

Liquid chlorine or Hypochlorite (H.T.H.) may be used, and shall conform to Federal Specifications O-C-114, Type II, Grade B.

If chlorine tablets are used for disinfection, tablets shall be attached to the inside top of each section of pipe with Loctite Permatex No. 1 just prior to the pipe installation in the trench.

The number of 5-g tablets required for each pipe shall be $0.0012d^2L$ rounded to the next higher integer.

The pipe shall remain full of chlorinated water for 24 hours. After the 24-hour period the water shall be tested by the local county health authority or their designated representative to insure a residual chlorine content of not less than 25 mg/1. Thoroughly flush the pipeline to remove the chlorinated water.

D. Care shall be taken in flushing the pipeline to prevent property damage and danger to the public.

Samples of water may be collected for bacteriological examination and residual chlorine content before the pipe is put into service.

5. MATERIALS AND INSTALLATION:

I. PVC Pipe:

A. General:

PVC pipe shall be manufactured by Certainteed, Diamond Plastics Corp., J-M Manufacturing, Ipex Inc., or approved equal.

1. Pressure Pipe:

Pipe and fittings shall be made from Class 12454-A or 12454-B virgin compounds in accordance with ASTM D 1784.

2. Sewer Pipe:

Pipe and fittings shall be made from Class 12454-B, 12454-C, or 13364-B virgin compounds in accordance with ASTM D 1784.

B. Joints:

1. Bell and Spigot: Pipe joints, complying with ASTM D 3139, shall be made using an integral bell with an elastomeric gasket push-on type joint or using machined couplings of a sleeve type with rubber ring gaskets and machined pipe ends to form a push-on type joint. Rubber ring gaskets shall conform to ASTM F 477. Adequate gasket lubricant shall be furnished for all of the pipe and fittings connections.

2. Solvent Weld: The joints shall meet ASTM D 2672. Only for approved indoor applications.

C. Schedule PVC Pipe:

Schedule pipe requirements shall meet ASTM D 1785 using PVC 1120, 1220 or 2120. Socket type fittings for solvent welded joints shall conform to

ASTM D 2467 for Schedule 80, ASTM D 2466 for Schedule 40 and ASTM D 2464 for the threaded type. The solvent cement shall comply with ASTM D 2564.

D. PVC Sewer:

PVC sewer pipe and fittings manufactured by Certainteed, or approved equal, shall conform to ASTM D 3034 and ASTM F 679, SDR-35. Joints shall comply with ASTM D 3212 for bell and spigot joints using flexible elastomeric seals.

Pressure pipe joints shall have elastomeric seals that comply with ASTM F 477.

II. Associated Fittings and Adapters:

A. Adapter Flange: Adapter flanges shall be ductile iron complying with ASTM A 536. The flange shall meet ANSI B16.1 125 lb. flanges and with cast iron flanges (ANSI B16.1), forged steel flanges (ANSI B16.5), and steel plate flanges (C207).

1. PVC: Uni-Flange Corp. Series 900, EBAA Iron Series 8500, or approved equal.

2. Ductile Iron: Uni-Flange Corp. Series 400, EBAA Iron Series 1000 "EZ", or approved equal.

Set screws shall comply with AISI 4140 steel tensile, 190,000 psi minimum heat treated and zinc plated.

B. Blind Flanges: All blind flanges shall be manufactured of ductile iron in compliance with AWWA C 110 (ANSI A21.10), drilled and faced in accordance with ANSI B16.1 Class 125.

Handles for removal of blind flange shall be 5/8-inch diameter reinforcing bars (two in all) welded in place.

C. Flange Hardware: Flange gaskets shall comply with ANSI A21.10 and AWWA requirements. The 1/8-inch thick gaskets shall be of SBR or neoprene rubber complying with ANSI requirements.

Flange bolts and nuts of high carbon, heat treated steel shall comply with ANSI B18.2.1 standard and be zinc chromate plated.

D. Compression Couplings: APAC, Dresser, Romac compression coupling, or approved equal. The coupling shall be of the type necessary for connecting the type and diameters of pipe required.

E. Modular Water Seals: Concrete penetration seals shall be "Link Seal" from Thunderline Corporation, (www.linkseal.com), supplied by HD Supply, (www.hdsupply.com).

F. Compact Ductile Iron Fittings: Mechanical joint, transition gasket shall comply with AWWA C 104 (ANSI A21.4), NAPPCO, Class 350 or approved equal.

G. PIP to IPS Adapter: Gasketed adapter by Head, 125 psi, or approved equal.

H. PVC Fittings: Unless otherwise noted on drawings or in the specifications, fittings for PVC pipe shall be PVC and certified for the pressure rating of the associated pipe. Elbow fittings shall be standard angles, a combination of standard angles, or angles fabricated to the nearest one degree for PIP, IPS, and sewer pipes.

III. Miscellaneous:

A. Unions: Unions shall be rated for Schedule 80 PVC materials and fittings and comply with ASTM D 1784 for PVC Type 1, Grade 1. Threaded fittings shall conform to ASTM D 2464.

6. PIPELINE MARKERS:

I. Place markers at all angle points, intersections, and at 500' intervals along pipelines.

II. Stamp:

A. Waterline: The pipe cap shall be stamped "W" and painted blue.

B. Sewer: The pipe cap shall be stamped "S" and painted yellow.

C. Gas: The pipe cap shall be stamped "G" and painted red.

D. Air: The pipe cap shall be stamped "A" and painted white.

E. Communications: The pipe cap shall be stamped “C” and painted orange.

III. Buried Detection Tape:

The detection tape shall be "Magnatex" detectable underground warning tape by Empire Level (www.empirelevel.com), or approved equal. The tape shall consist of a flexible plastic sheath, permanently color coded (impregnated) containing a solid aluminum foil core. The tape legend shall read "Buried type of utility Below" upon the 2-inch wide material.

End of Section

02640 – VALVES AND GATES

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to the furnishing and installation of specified items.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. MATERIALS AND INSTALLATION:

   I. Valve Boxes:

      Valve boxes shall be Tyler, Series 6500 for 2 inch and smaller or approved equal. The valve box for the 2 inch and smaller valves shall be supported with bricks or other items next to the valve on both sides.

   II. Furnish an extension key for two inch square operating nuts.

   III. Curb Stops and Valves:

      A. Cast bronze valves with a tee head, ¾" to 2" shall be Mueller, or approved equal.

      B. Extension Service Box: Tyler Series 6500 with enlarged base, screw adjustment extension tube and cover lid, or approved equal.

         An operation rod with guide ring shall be attached to the curb stop tee and project within the box to a point near the lid.

         Furnish a combination key for removing lid and valve operation.

End of Section

SECTION 02780 – SITE FURNISHINGS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, providing materials, methods and systems necessary for the complete installation of the specified site furnishings.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. DELIVERY, STORAGE AND HANDLING:

   Deliver the material in the original unopened containers and store under cover.

5. PRODUCTS:

   I. Bear Proof Trash Can:

   Bear proof (rodent resistant) trash can and recycle bin shall be a double compartment powder coated steel (color: black) with a minimum 30 gallon capacity on each side. Unit shall include rigid liners provided by the manufacturer. One side shall be labeled trash and the other side labeled recycle. Labeling shall be manufacturer installed.

   II. Bench:

   Bench shall be a backless 6’ x 2’ with a seating height of 18.5”. The bench shall be powder coated in one of the manufacturer’s standard colors. Color to be selected by Engineer. Bench shall have a natural theme/style such as the “Tallgrass Backless Bench” as manufactured by Sitescapes (www.sitescapesonline.com), 402-421-9464 or approved equal.

6. INSTALLATION:

   Install in strict accordance with manufacturer’s recommendations.

End of Section

SECTION 02845 - SIGNS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the furnishing and installation of designated exterior signs.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. Traffic Control Signs:

   I. Traffic signs shall be designed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), latest revision.

   II. Materials:

      A. Signs:

         Shall be fabricated on 0.080/50-52 H 38 anodized aluminum blanks with standard radius corners.

         Facing shall be fabricated using 3M diamond grade retroreflective sheetings or approved equal. Sign facings shall be covered with 3M #1160 protective overlay or approved equal.

      B. Posts:

         Shall be on 1¾", 12 ga, perforated square tube 10 foot hot-dipped galvanized support assemblies.

         Signs support bases shall be "V-Loc, VS2" base, by Tapco or approved equal, installed so that 1" +/- ½" protrudes above ground level.

      C. Fasteners:

         Signs shall be mounted to posts using 5/16" galvanized bolts

      D. Installation:

         Signs located adjacent to roadways or sidewalks shall be installed in accordance with MUTCD.

5. INTERIOR SIGNAGE:

A. Materials:

Signs shall be constructed of corten steel 1/8" thick minimum, weathered prior to installation. Provide black powder coated ½" offsets for installation. All edges/corners shall be rounded to eliminate sharp edges. Lettering and symbols shall be cut with machine operated cnc plasma or laser cutters to provide a clean finished look.

B. Locations:

1. Bathrooms:

Signs shall be 8"x8" and include unisex symbols with ADA accessibility symbol and the word restroom under the symbol. Symbols shall be 5" high minimum. Braille portion shall be raised on sign face.

2. Offices/Storage Areas:

Each room shall have a 4"x12" sign mounted horizontally with room title and room number. Letters shall be 3" high minimum.

C. Installation:

Signs shall be installed such that the middle of the sign is at 6'-0". Install with black fasteners and wall anchors sufficient to support the sign.

End of Section

SECTION 03100 - STRUCTURAL CONCRETE FORMWORK

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the construction of formwork for concrete structures.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. QUALITY ASSURANCE:

   I. Standards:

      A. “Recommended Practice for Concrete Formwork", ACI 347

      B. “Building Code Requirements for Structural Concrete”, ACI 318-08

      C. "Chapter 19", International Building Code.

      D. U.S. Product Standard PS 1-74 for Plywood.

      E. Standard Grading and Dressing Rules No. 167 of the West Coast Lumber Inspection Bureau.

5. MATERIALS:

   I. Plywood:

      Plywood shall be new or in new condition "B-B Plyform Class 1 Exterior" grade plywood, 5/8 inch minimum thickness.

   II. Steel Panels:

      Steel panels shall be flat steel sheet or plate of sufficient thickness, or braced sufficiently, to prevent noticeable deflection from pressure of concrete. Steel forms shall be galvanized and/or coated to prevent rust and staining.

   III. Framing, Studding, and Bracing:

      Framing, studding and bracing shall be "Standard" or "Construction" grade West Coast Species lumber.

   IV. Form Ties:

      A. Form ties shall be of a cone-type snap-tie configuration type or as approved

by the Engineer. They shall have a minimum working strength when fully assembled of 3,000 pounds. Ties shall be adjustable in length permitting complete tightening of forms and of a type that leaves no metal closer than 1 inch to the surface. Wire ties will not be permitted.

B. Ties used in structures designed to contain water shall be Superior Concrete Specialties, Inc., 3M Waterseal Snap Tie or approval equal.

V. Form Coatings:

Coat surfaces of formwork prior to each pour with "Symons Magic Kote" form coating, by Symons Manufacturing Company, Des Plaines, Illinois, or approved equal, compatible with the forming system. Do not place concrete in forms until inspected and approved.

VI. Chamfer Strips:

Chamfer strips shall be (for all exposed edges) ¾ inch, 45° bevel wood strips or reusable plastic triangular strips.

6. FORM CONSTRUCTION:

I. Construct forms to slopes, lines and dimensions shown, plumb, straight and sufficiently tight to prevent leakage, ACI 347, Chapter 2, Construction.

II. Securely brace, frame and shore forms to prevent displacement and to safely support construction loads, APA Form V 345.

III. Provide temporary openings in formwork, when needed, for concrete placement.

IV. All exposed external corners shall have chamfers of ¾ inch.

7. EXECUTION:

I. Defective Work:

Any form movement or deflection during construction or finished surface variations in excess of the tolerances specified will be basis for rejection of cast-in-place product and requirement for replacement of same.

II. Removal of Forms:

A. Do not remove forms and supports until concrete has attained sufficient strength to support anticipated loads.

B. The listing below serves only as a guide in determining the minimum length of time required before removal of forms and is based on the use of Type II Portland Cement. When high early strength Portland Cement is used, the length of time listed below may be reduced to not less than one-third time listed, but not less than 1 day. Unless otherwise indicated the minimum length of time prior to removal of forms shall be 48 hours.

C. Use methods of form removal which will not cause overstressing of the concrete. Remove supports to permit the concrete to uniformly and gradually take the stress due to its own weight. Do not use high impact methods to remove supports.

D. Break back ties after concrete has cured sufficiently to maintain unbroken bond with steel rod.

III. Reuse of Forms:

A. Reused forms for exposed concrete work shall be reconditioned to "like new" condition. Reused forms shall be cleaned, repaired, and recoated before each reuse.

IV. Blockouts:

A. Where pipes, castings, or conduits pass through the walls, place such pipes or castings in the forms before pouring the concrete, or in special cases, with the express consent of the Engineer or as specified, build accepted boxes in the forms to make cored openings for subsequent insertion of such pipes, castings or conduits. Provide boxes or cores with continuous keyways and waterstop all the way around, and with slight flare to facilitate grouting and the escape of entrapped air during grouting.

End of Section

SECTION 03200 - CONCRETE REINFORCEMENT

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the furnishing and placement of reinforcing for structural concrete.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. QUALITY ASSURANCE CONTROL:

   I. Manual of Standard Practice for Detailing Reinforced Concrete Structures, ACI 315.

   II. Manual of Standard Practices, Concrete Reinforcing Steel Institute.

5. PRODUCT DELIVERY, STORAGE AND HANDLING:

   I. Deliver reinforcement to project site in bundles marked to coordinate with placement drawings.

   II. Handle and store to prevent contamination from dirt, oil and other materials which will affect bond.

   III. Store a minimum of 6" above ground and in locations where the material will not be subject to abuse.

6. PRODUCTS:

   I. Reinforcing Bars:

      Bars shall be deformed in accordance with ASTM A 615, ASTM A 616 and ASTM A 617 and formed of either intermediate or hard grades of steel unless otherwise specified. Steel shall have a 60,000 psi minimum yield point. Reinforcement shall be clean and free from loose rust, scale or other coatings that will reduce bond.

   II. Tie Wire: Steel, black, annealed, 16-gauge minimum.

   III. Metal Accessories:

      Include all spacers, chairs, bolsters, ties, and other devices necessary for properly placing, spacing, supporting and fastening reinforcement in place.

Metal accessories shall be galvanized or plastic coated where legs will be exposed in finished concrete surfaces. Accessories shall conform to requirements of the Concrete Reinforcing Steel Institute (CRSI) *"Manual of Standard Practice for Reinforced Concrete Construction."*

Chairs and other accessories fabricated from concrete, ceramic or plastic may be used in place of metal accessories when approved by the Project Manager.

IV. Reinforcing Fibers:

Shall be Propex (www.propexinc.com), "Novomesh 950" or approved equal. Any approved equal shall be designed to resist both shrinkage and temperature cracking as well as flexural strength. Fiber-reinforcement shall be installed in all slabs in accordance with manufacturer's recommendations. Fibers shall be used in concrete as indicated on the drawings.

7. EXECUTION:

I. Splices:

A. Do not splice bars except at locations shown or noted on the shop drawings or as otherwise approved.

B. All effort shall be made to minimize the number of splices on the project. When splices are used, splices shall meet Type B, ACI 318 requriements.

C. Tie lap splices securely with wire to prevent displacement of splices during placement of concrete.

D. Perform welded splices in accordance with AWS 12.1.

II. Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that may reduce bond with concrete.

III. Keep reinforcing in proper position during concrete placement.

IV. Maintain minimum concrete cover over reinforcement as specified in ACI 318 or as noted.

V. Reinforcing Fibers:

Add ~~1.~~5 pounds of reinforcing fibers per cubic yard of concrete at the plant or site, as directed by the Project Manager. Fibers shall be uniformly distributed throughout the concrete by mixing at the rated time and speed.

End of Section

SECTION 03252 - INSERTS AND FASTENING DEVICES

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the furnishing and placement of all inserts and fastening devices in structural concrete.

3. GENERAL:

   Sufficient time between erection of forms and placing of concrete shall be given to the various trades to permit the proper installation of their work. See drawings and other Sections of the Specifications for extent, location and details of items to be embedded or placed in the concrete. Inserts shall be cast into the concrete with care to avoid misalignment or damage.

   All inserts shall be maintained in position and protected until the concrete placement is completed.

4. SUBMITTALS:

   Refer to Section 01300- Submittals for requirements.

5. MATERIALS:

   I. Joint Filler

      Isolation joint filler shall be cellulose fibers securely bonded together with a uniform impregnation of bituminous binder and preformed into strips. The joint filler shall comply with ASTM D 1751.

   II. Anchor Bolts:

      Bolts and nuts shall comply with ASTM A 307 and ASTM A 563 for bolt and nut materials. All nuts, bolts and washers shall be galvanized.

6. EXECUTION:

   I. Embedded Materials:

      A. Coordinate the location and placement of all items to be embedded in concrete.

      B. Coat any embedded aluminum with asphalt paint.

      C. Cadmium or aluminum coated steel materials shall be coated with asphalt paint.

II. Drilled In Grouted Anchors and Dowels:

In lieu of embedding anchor bolts and when approved (Contractor shall be responsible for providing Engineering Stamped submittals identifying loads and embedment depth requirements), drill holes in hardened concrete and install the anchor bolts and other items with special mortars. Drill with diamond boring or coring bits. Bonding mortar shall be epoxy grout type. Blow holes clean and dry before installation of embedded items. Before insertion, coat both hole and the item to be embedded with bonding compound. Studs of equal size and length may be substituted for anchor bolts if nut fasteners are used. Drilled in studs or anchors utilizing mechanical expansion locking in any process areas shall not be used.

End of Section

SECTION 03300 - CAST-IN-PLACE STRUCTURAL CONCRETE

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the construction of concrete structures.

3. MEASUREMENTS:

   I. General:

      Quantities for the concrete foundation shall not be measured but shall be included as part of the related construction and described in the bid schedule and bid items descriptions.

      Quantities for the interior and exterior concrete slabs shall not be measured but shall be included as part of the related construction and described in the bid schedule and bid items descriptions.

      Quantities for concrete associated with other miscellaneous structures shall not be measured separately but shall be included as part of the related construction.

   II. Structures:

      Quantities shall not be measured for reinforcing steel, formwork, installation of various inserts, required earthwork and hot and cold weather concreting, but shall be included in the related construction.

   III. Dimensions:

      Measurements for concrete shall be to the neat lines shown on the drawings or as altered to fit field conditions.

4. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

5. COMPLIANCE WITH STANDARD AND INDUSTRY SPECIFICATIONS:

   Concrete work shall conform to all requirements of ACI 301, Specifications for Structural Concrete for Buildings, except as modified below.

6. QUALITY ASSURANCES:

I. Allowable Tolerances:

A. Variations from the plumb in lines and surfaces of columns, piers and walls for a height of up to 10 feet shall not be greater than ¼ inch per location and a cummulative of one inch maximum for entire length.

B. Variation from the level and grades of floors and slabs in any 10 foot of length shall not be greater than ¼ inch and cummulative of ¾ inch maximum for entire length.

Variation in thickness of slabs:

Minus	¼ inch
Plus	½ inch

II. Control Tests:

A. Testing Laboratory: Retain the services of a testing laboratory under the direction of a professional engineer and pay all costs to take samples, make tests. The testing laboratory shall be independent of both the contractor and the supplier.

Field technicians shall be ACI certified as a Concrete Field Testing Technician. Laboratory technicians shall be ACI certified as either Concrete Strength Testing Technician or Concrete Laboratory Testing Technician.

B. Extent of Tests: Take samples and make tests for each 25 cubic yards of fresh concrete or fractional amount placed, but not less than one set for each day's concreting. Take air entrainment and slump tests for each batch or truck of concrete delivered.

1. Compression and Strength Tests: Each test shall consist of four standard cylinders (either 6”x12” or 4”x8”). Cylinder diameter shall be at least three (3) times the nominal maximum size of the coarse aggregate. One cylinder to be tested at the age of 7 days and two cylinders at the age of 28 days. Test one cylinder at 56 days if the other two 28 day cylinders do not meet the required strength. Secure samples for compression test specimens in accordance with ASTM C 172. Cure specimens in accordance with ASTM C 31. Additional test of specimens cured entirely under field conditions may be utilized to check the adequacy of curing and protection of the concrete as directed. Strength tests shall be made in accordance with ASTM C 39. Core tests may be required in the event that compression tests fail to meet the specifications. Core testing shall be in accordance with ASTM C 42 and evaluated in accordance with ACI 301, Chapter 17.

2. Slump Tests: Tests shall be made in accordance with ASTM C 143.

3. Air Entrainment Tests: Tests shall be in accordance with ASTM C 231, ASTM C 173, or ASTM C 138 for normal weight concrete.

4. Temperature: Determine temperature for each set of slump and air entrainment tests.

5. Unit Weight Tests: Tests shall be in accordance with ASTM C 138.

C. Acceptance of Concrete:

1. Cylinders: The average of all sets of three consecutive strength tests shall equal or exceed the specified strength f_c', and no individual strength test result shall be less than the specified strength f_c' by more than 500 psi.

2. Core Tests: The average compressive strength must be equal to or greater than 85 percent of specified strength f_c' and no single core shall be less than 75 percent of the specified strength f_c'.

D. Enforcement of Strength Requirements: When the compressive strength of cylinder falls below the specified strength, the Project Manager may order additional curing for that portion of the structure where the concrete has been placed.

If such additional curing does not give the strength required, the defective parts shall be removed and replaced.

Submit ready-mix delivery tickets per ASTM C 94 if requested.

III. Environmental Requirements:

A. Concrete when deposited shall have a temperature not below 40°F. and not above 90°F. During periods not defined as cold weather but when freezing temperatures are foreseen or occur provide suitable means for protecting the concrete from freezing the first 24 hours after placing.

B. The methods and recommended practice as described in Standard Specification for Cold Weather Concreting, ACI 306.1 and ACI Report 306R shall be followed for cold weather concreting.

C. Cold weather is a period when for more than 3 successive days the average daily outdoor temperature drops below 40°F. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. When temperatures above 50°F occur during more than half of any 24 hour duration, the period shall no longer be regarded as cold weather.

D. The methods and recommended practice as described in ACI Report 305R shall be followed for hot weather concreting.

E. Hot weather is defined as any combination of high air temperature, low relative humidity, and wind velocity at which the evaporation rate exceeds 0.2 $lb/ft^2/hr$. In excess of this rate, precautions against plastic shrinkage cracking are required. Minimum precautions require the application of an evaporation retardant.

F. The use of salt, chemicals or other foreign materials shall not be mixed with the concrete without approval.

G. Prevent the discharge of wet concrete into any stream or lake.

IV. Delivery and Placement:

A. Concrete that is completely mixed in a truck mixer shall receive 70 to 100 revolutions at the mixing speed prior to placement.

B. Discharge of the concrete shall be completed within 1½ hours, or before the drum has revolved 300 revolutions, whichever comes first, after the introduction of the mixing water to the cement and aggregates or the introduction of the cement to the aggregates. These limitations may be waived by the Project Manager if the concrete is of such slump after the 1½ hours or 300-revolution limit has been reached that it can be placed, without the addition of water, to the batch.

C. Concrete delivered in cold weather shall have the following minimum temperature as placed and maintained during the protection period. The period shall be for a minimum of 3 days.

	Section Size, Min. Dimension (inches)			
	12 or less	12 to 36	36 to 72	72 and greater
Min. Temp.	55°F	50°F	45°F	40°F

D. Termination of Protection: At the end of the protection period, the concrete shall be allowed to cool gradually. The maximum decrease in temperature measured at the surface of the concrete in a 24 hour period shall be as follows:

	Section Size, Min. Dimension (inches)			
	12 or less	12 to 36	36 to 72	72 and greater
Max. Temp. Drop	50°F	40°F	30°F	20°F

7. INSPECTION:

I. Assure that excavations and form work are completed, and that ice and excess water are removed from all surfaces.

II. Check that reinforcement is secured in place and forms are thoroughly wetted or oiled.

III. Verify that anchors and other embedded items are secured in position.

IV. Inspection and approval shall be attained before any concrete is placed.

8. PRODUCTS:

Concrete materials shall conform to the requirements of Section 700 of the latest version of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, and subsequent revisions thereto.

I. Portland Cement:

Type II, low to moderate alkali, shall conform to CDOT 701.01 (ASTM C 150).

Low to moderate alkali cement will not be required upon approval of submittals certifying the use of non-reactive aggregate.

II. Admixtures:

A. Air-entraining admixture shall meet CDOT section 711.02 (AASHTO M 154).

B. Water reducing admixtures shall meet CDOT section 711.03 (AASHTO M 194).

C. Permeability reducing admixture for hydrostatic conditions shall meet CDOT section 711.03 (AASHTO M 194) and ACI 212.3.

D. Approved fly ash may be substituted for portland cement up to a maximum of 10 percent Class C or 10 percent Class F by weight. Fly ash shall conform to ASTM C 618. Fly ash must be a pre-approved product from a source listed on the Colorado Department of Transportation's Approved Products List.

III. Aggregate:

A. Fine Aggregate:

Shall conform to CDOT 703.01 (AASHTO M 6).

B. Coarse Aggregate:

Shall conform to CDOT 703.02 (AASHTO M 80), except crushed hydraulic-cement concrete shall not be allowed.

Regular, CDOT Class D, concrete shall be made with ¾ inch nominal sized course aggregate.

IV. Mix Proportioning:

Concrete materials shall conform to the requirements of the Section 600 of the latest version of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction, and subsequent revisions thereto.

Concrete shall meet all of the following:

A. Regular Concrete:

1. CDOT Class D - Except as otherwise specified, concrete shall have a 28 day compressive strength of 4,500 psi, minimum.

2. Minimum cement content: 615 to 660 pounds of cement per cubic yard.

3. Maximum water to cement ratio, including aggregate surface moisture but excluding water of absorption of aggregate: 0.44.

4. Air entrainment content: 5 to 8 percent. Air content of trowel-finished interior concrete floors shall not exceed 3.0 percent

5. Slump: The maximum slump of the delivered concrete shall be the slump of the approved concrete mix design plus 1.5 inches.

B. Patching Mixture:

The patching mixture shall be made of the same materials and of approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than 1 part cement to 2½ parts sand by damp, loose volume. The quantity of mixing water shall be no more than necessary for handling and placing. The patching mortar shall be mixed in advance and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing.

V. Water Quality:

Mixing water shall be clean and free of oil, acid and injurious amounts of vegetable matter, alkalies and other impurities.

VI. Joint Sealant:

The material shall be Sikaflex 1-A, Mameco weatherproofing sealant Vulkem 116 or approved equal. The material shall be a one-part moisture curing, gun-grade polyurethane sealant suitable for continual immersion in water of a limestone color conforming to ASTM C 920. Vulkem primer 171 or Sikaflex primer 429 shall be applied to the concrete when joint will be immersed in water.

VII. Joint Backer: extruded closed-cell polyethylene foam by Hercules, or approved equal.

VIII. Evaporation Retardant:

SikaFilm, "ConFilm", or approved equal.

IX. Isolation Joint:

Isolation joint expansion filler shall be closed cell superior grade polyethylene or non-extruding PVC such as "Foamjoint" or "Conflex" available from Sweeney Materials, Inc. or approved equal.

Joint Spacing (feet)	10-20	20-30	30-50	50-70	70-100
Filler Thickness (inches)	½	3/8	½	¾	1

X. Acid Staining and Sealant:

Eagle IFP Company, "Concrete Acid Stain" or approved equal. All other products associated with the Stain Application should be in accordance with Manufacturer's Recommendations.

XI. Sealer Traction Additive:

Traction additive shall be added as part of the concrete sealant process on sections identified for Acid Staining and Sealant. Traction Additive shall be SEAL-KRETE, "Clear Grip" or approved equal.

9. INSTALLATION:

I. Placing Concrete:

A. Place concrete only in the presence of the Project Manager. Remove and replace concrete placed in his absence unless otherwise accepted.

B. Convey concrete from mixer to final position by method which will prevent separation or loss of material.

C. Maximum height of concrete free fall 5 feet unless otherwise allowed.

D. Regulate rate of placement so concrete remains plastic and flows into position.

E. Deposit concrete in continuous operation until section is completed.

F. Place concrete in horizontal layers 18 inches maximum thickness.

G. Do not retemper or use set concrete.

H. Water shall not be added to concrete after test samples have been taken.

I. Prevent the discharge of wet concrete into any stream or lake.

II. Consolidating Concrete:

A. Use mechanical vibrating equipment for consolidation. Contractor is encouraged to have a spare vibrator in case of failure.

B. Do not use vibrators to transport concrete in forms.

C. Insert vibrators vertically and quickly. Withdraw slowly to remove entrapped air pockets.

D. Vibration spacing shall be such that the radius of action overlaps that of previously vibrated concrete.

E. Special attention and effort shall be used next to hardened concrete, embedded items and corners.

F. Unreinforced slabs less then 8-inches thick do not require consolidation.

III. Repairing Formed Surfaces of New Concrete:

A. After removal of forms inspect all concrete surfaces, repair any joints, voids, stone pockets, tie holes or other defective areas before the concrete is thoroughly dry. Defective areas shall be chipped away to a depth of not less than one inch with the edges undercut to the surface. The area to be repair and a space at least 6 ins. wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar. Do not repair any concrete in freezing weather.

B. Unexposed formed surfaces of concrete shall be repair as directed.

C. Where approved, the bonding of the patching mortar to the acceptable concrete after necessary cutting and removal of porous or otherwise unacceptable concrete is completed may be done by the use of an approved bonding agent applied in accordance with the printed directions of the manufacturer. Filling and finishing of the patch shall be completed as herein specified.

IV. Slabs On Subgrade:

Place the concrete slab over material compacted to a minimum of 95% of maximum dry density as determined by ASTM or AASHTO T 99 (Standard Proctor). Place concrete of the required thickness and strike off at the proper levels.

V. Control Joints:

Control joints shall be provided at spacing as noted on the drawings.

Floor joints shall be a maximum ¼ inch wide. Wall joints can use chamfer strips with a maximum width of ¾ inch. Depth shall be ¼ the thickness of the wall or slab.

Timing of joint creation is critical and depends on the method used. Conventional saw-cut joints should be made as soon as possible without raveling the concrete -- 4 to 12 hours after placement is common, but never more than 24-hours after placement. Soft-cut joints are normally made one to four hours after completion of finishing operations. Tooled joints should be run early in the finishing process and repeated later to provide esthetically-pleasing joints and eliminate any possibility of groove bond.

All joints shall be filled with flexible liquid joint filler within 7 days of concrete placement. Refer to Section 07900 – Sealants and Joint Fillers for additional information.

VI. Acid Stained Finish:

Where indicated on the drawings the floor shall be acid stained and sealed in accordance with stain manufacturer's recommendations and requirements. As part of the sealing process the Contractor shall add a traction additive in accordance with the manufacturer's recommendations. Contractor shall pour (4) 2'x2'x2" test slabs at the same time using the same material being supplied for the interior concrete slabs. The contractor shall use these slabs to apply the proposed colors and sealant for final selection by the Project Manager prior to performing the final finish on the main building slab.

10. CONCRETE FINISHES AND TOLERANCE:

I. General Finish:

A. Finish surfaces to conform with the following table unless otherwise noted on the drawings.

B. Formed Surfaces: System:

1. Exterior - Below Grade F1

2. Exterior - Exposed, Rough F2

C. Unformed Surfaces: System:

1. Top of Forms U1

2. Interior Slabs AS/U2

3. Driving and Exterior Walking Surface U7

II. Formed Surfaces:
Finishes for formed surfaces shall be as designated below:

A. Finishing for F1 and F2 finishes consists of concrete repairing within 48

hours after forms are removed.

B. Finish F1: Rough formed surface with defective concrete repaired and form tie holes and other holes over ½ inch deep filled. Forms may be built with a minimum of refinement and form sheathing may be any material that will not leak mortar or yield beyond specified tolerances when the concrete is vibrated.

C. Finish F2: Smooth, formed concrete surface with all fins, projections and loose material removed, and defective concrete, form tie holes, air bubble holes, surface pits, holes from defective forms, nail head holes and similar surface defects repaired and filled. Forms in contact with concrete shall be plywood or steel.

III. Unformed Surfaces:

A. Working on unformed surfaces in various finishing operations shall be held to the minimum required to produce the desired finish. Use of any finishing tool in areas where water has accumulated will not be allowed. Work in these areas shall be delayed until the water has been absorbed, evaporated, or removed by draining, mopping, dragging off with a loop of hose, or other means. In no case, shall cement or mixture of cement and sand be spread on the surface to absorb excess moisture or shall such materials or water be added to facilitate troweling. Joints and edges, unless specified otherwise, shall be carefully finished with edging tools.

Finishes for unformed surface shall be as designated below:

B. Finish U1: Even, uniform finish. Consolidate, level, screed, and bull-float (darby) concrete for an even, uniform surface. Concrete shall be removed immediately after consolidated by striking with a sawing motion of a straightedge or template across wood or metal strips, set as guides. When the surface is curved, use screed strips at approved intervals. For long, narrow stretches of curved surfaces such as on invert paving, a heavy slip form may be used. In the case of extensive flat paving, a paving and finishing machine is preferred. Use the bull-float or darby to fill in voids and eliminate ridges. Use magnesium or aluminum on air-entrained concrete. Bull-float immediately after screeding and before bleed water appears on the surface. Do not perform any finish operation while there is bleed water or excess water on the surface.

C. Finish AS/U2: Steel Trowel finish with Acid Staining and Seal Coat. Follow treatment for U1 by steel troweling by hand, or power driven equipment. Troweling to be started after some stiffening has taken place in the surface concrete and the bleed water, excess moisture and "shine" has disappeared. Work the concrete no more than necessary to produce a surface known as "Steel Trowel Finish" that is uniform in texture and free of screed marks. Do any necessary cutting and filling during the floating operations. Use a magnesium or aluminum float on air-entrained concrete.

D. Finish U7: Drive and Exterior Walking Surface. Immediately after the

concrete has been placed and consolidated, strike off the surface with a finishing machine or hand-operated screed until the required surface is obtained. The use of "jitterbugs" or similar devices is not permitted. The strike-off method and equipment shall be approved. Approval shall be withdrawn for unsatisfactory performance. The equipment shall be capable of finishing within the specified surface tolerances. Improper adjustment and operation that results in unsatisfactory consolidated and smoothness shall be corrected immediately. Unsatisfactory performance may be cause for rejection of the equipment and removal of the concrete.

Following completion of the strike-off, float the slab surface to a smooth, uniform surface using floats 10 feet or longer. Use adequate floats to remove roughness and minor irregularities left by the strike board or finishing machine and to seal the concrete surface. Excessive working of the concrete surface will not be permitted. All floats shall be used so that each transverse pass overlaps the previous pass by at least one-half the length of the float.

When hand-operated float boards are used they shall be from 12 feet to 16 feet long, ribbed and trussed as necessary to provide a rigid float, with adjustable handles at each end. The float shall be wood at least 1-inch-thick and 8 inches wide. Provide adjusting screws between the float and the rib no more than 24 inches apart. Maintain the float board free of twist and true.

Operate hand-operated float boards from transverse finishing bridges. The finishing bridges shall completely span the area being floated, and a sufficient number of finishing bridges shall be provided to permit operation of the floats without undue delay. Not less than two transverse finishing bridges shall be provided when hand-operated float boards are used. When a finishing machine is used for longitudinal floating, one finishing bridge equivalent to the transverse finishing bridge specified herein shall be furnished for use by the Project Manager.

All finishing bridges shall be of rigid construction, free of wobble and spring when used by the operators of longitudinal floats, and easily moved.

After floating is complete, but while the concrete is still plastic, test the surface of the concrete for trueness with a 10-foot straightedge. The straightedge shall be held in contact with the surface in successive positions parallel to the slab centerline and the whole area gone over from one side of the slab to the other. Advancement along the slab shall be in successive stages of not more than one-half of the length of the straightedge. Any depressions found shall be filled immediately with freshly mixed concrete, and any high areas shall be cut down. The surface shall be struck off, consolidated, and refinished. Special attention shall be given to ensure that the surface across joints fully meets the requirements for smoothness. The straightedge testing and refloating shall continue until the entire surface is found to be free from

observable departures from the straightedge and the slab has the required grade and crown.

As soon as the concrete has hardened sufficiently, the surfaces shall be given a further test for trueness using a 10-foot straightedge or other specified device. Areas showing high spots of more than ~~1/8~~ ¼ inch shall be marked and immediately ground down with a diamond-faced, saw-type cutting machine, capable of cutting through mortar and aggregate without breaking or dislodging the aggregate or causing spalls, to an elevation where the area or spot will not show surface deviations in excess of ~~1/8~~ ¼ inch when tested with a 10-foot straightedge.

Provide the 10-foot straightedge and perform the straightedge testing while the Project Manager is present.

Traction Aids on travel surface:

Where shown in the plans and specifications, concrete surface traction enhancement shall be bead type additive and approved by the Project Manager prior to purchase and installation by the contactor. The product shall have demonstrated traction improvement without diminished concrete sealant performance. An example of such a traction enhancement may include:

"Seal Krete, Clear Grip" Micronized Polymeric Aggregate

IV. Tolerances:

A. Unless otherwise required, allowable tolerances for concrete surfaces shall be in accordance with the following table. Surface irregularities are classified as either "abrupt" or "gradual".

Offsets caused by displaced or misplaced form sheathing, lining, or form section or by defective form lumber shall be considered as abrupt irregularities. All others are classed as gradual irregularities. Gradual irregularities shall be measured with a template consisting of a straight edge for plane surfaces and its equivalent for curved surfaces.

B. The length of the template for testing formed surfaces is 5 feet. The length of the template for unformed surfaces is 10 feet. Maintain a 5-foot length and 10-foot length steel template on the site.

C. Maximum allowable irregularities in concrete:

	Irregularity in Inches	
Finish Designation	Gradual	Abrupt
F1	1	½
F2	½	¼
U1 through U8	~~1/8~~ ¼	~~1/8~~¼

11. CURING:

I. Apply curing and sealing compound, BASF "MasterKure CC 180 WB" or approved equal, to the concrete by spraying. Apply one coat for curing (apply a second coat for sealing and dustproofing). For vertical surfaces application shall be made as soon as the forms have been stripped, the surfaces have been rubbed and patched, if applicable. Store and handle the curing compound and apply in recommended surface coverages in compliance with the Manufacturer's printed instructions. Curing compound shall be a liquid membrane and meet ASTM C 309, Type I-D and applied at a rate of not greater than 200 square feet per gallon for the first coat unless otherwise approved. Coating shall be kept undamaged or repaired for 7 consecutive days.

II. Curing Compound Effect:

If curing compound will interfere with any sealers, grouts or other materials to be placed on the concrete, obtain approval of another curing method from the Project Manager.

12. STRUCTURE BONDING:

I. Materials:

A. Hardened Concrete and Other Materials to Hardened Concrete:

The material shall meet ASTM C 881, Type I with a minimum bond strength of 1,500 psi, be of a grade suitable for the required temperature and of the lowest suitable viscosity. An acceptable product is KEMCO by ChemCo Systems, Inc. or approved equal.

B. New Concrete to Hardened Concrete:

The material shall meet ASTM C 881, Type II with a minimum bond strength of 1,500 psi, be of a grade suitable for the required temperature and of the lowest suitable viscosity. An acceptable product is BASF "EPOGRIP" or approved equal.

II. Installation:

A. General:

Follow the manufacturer's printed instructions to obtain the proper blend and consistency when mixing the resin and hardener together.

B. Hardened Concrete and Other Materials to Hardened Concrete:

Apply bonding agent to surfaces of hardened concrete and materials to be bonded. Hold the bonded pieces in place with weights, clamps or other suitable methods until the epoxy has hardened.

C. New Concrete to Hardened Concrete:

Thoroughly cover the entire surface to be bonded. Immediately place the concrete. If the bonding agent is allowed to set, remove and reapply.

13. BOND BREAKER:

I. Materials:
The material shall meet ASTM C 309, Type I. An acceptable product is Burke "Super Tilt Bond Breaker" or approved equal.

II. Installation:

Apply in a uniform manner by spraying or rolling at a rate of 200 square feet per gallon.

14. CONCRETE PATCHING:

Patching Mortar:

The mortar mixture shall be composed of a two component system polymer-modified Portland cement appropriate to the thickness required. The mortar shall be Sika "MonoTop 611", BASF “ALL-CRETE 5”, or approved equal.

Sand shall be clean and graded with 100 percent passing a No. 8 standard sieve; not more than 5 percent retained on a No. 16 standard sieve; from 10 to 30 percent passing a No. 100 standard sieve; and not more than 5 percent passing a No. 200 standard sieve.

End of Section

SECTION 03600 - GROUT

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the placement of nonshrink grout beneath building columns and anchor bolt installation as approved by the Project Manager.

3. INSPECTION:

   Assure that all of the items have been leveled, plumbed, centered and that all the nuts have been completely tightened.

   Inspection and approval by the Project Manager shall be obtained before the grouting begins.

4. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

5. DELIVERY, STORAGE AND HANDLING:

   Deliver the material in the original unopened containers and store under cover.

6. PRODUCTS:

   I. Pumps and Mechanical Equipment:

      A. The non-shrink, hydraulic cement-based aggregate grout shall be Masterflow 928 by BASF Building Systems, Mike Sausser, 303-378-3000 or approved equal.

      B. Volume change requirements shall comply with ASTM C 1107.

      C. Compressive Strength:

         The material shall have a 28 day minimum compressive strength at a fluid consistency cured laboratory samples) of 8,000 psi complying with ASTM C 109.

      D. Material Yield:

         One 55 lb. bag of packaged grout mixed with 10 lbs. of water will produce approximately .43 cubic feet of grout.

      E. Setting Time:

The grout shall be workable for a period of 5.5 hours (prior to initial set of the material) in compliance with ASTM C 191.

F. Tensile Strength:

Tensile strength developed after 3 days shall be 300 psi in accordance with ASTM C 190.

II. Anchor Bolts:

A. The two-component liquid epoxy grout shall be BASF Building Systems, or approved equal.

B. Design Strength:

Minimum design strength shall be determined by Professional Engineer responsible for the foundation and anchor bolt design and shall be included as part of the design submittal.

7. INSTALLATION:

I. General:

Non-shrink grout shall be placed between building column base plates and concrete foundations once building installation is complete. Non-shrink grout shall be placed such that is completely fills the voide between baseplate and concrete foundation.

II. Preparation:

Locate all tools and materials as close as possible to the area to be grouted. All surfaces in contact with the grout shall be entirely free of oil, grease, laitance, and other foreign substances. Roughen the concrete surfaces to insure good bond of grout to the existing concrete. Clean thoroughly with liberal quantities of water, leaving the surface wet but free of excess water.

III. Mixing and Placing:

Mix the grout according to the manufacturer's recommendations.

Place the grout from one side of a base plate only, to avoid entrapping air.

IV. Protection and Curing:

Protect the placed cementitious grout from rapid drying. Spray apply a curing compound to the exposed surfaces complying with ASTM C 309, Type I, such as Master Builders MB-429 curing and sealing compound, or approved equal.

End of Section

SECTION 05500 - METAL FABRICATIONS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to the fabrication, furnishing and installation of specified items.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. COMPLIANCE WITH STANDARD AND INDUSTRY SPECIFICATIONS:

   Any material or operation specified by reference to the published specifications of a manufacturer, The American Society for Testing and Materials (ASTM), the American Iron and Steel Institute (AISI), The American Institute of Steel Construction (AISC), The American Hot Dip Galvanizers Association (AHDGA), The American Welding Society (AWS), or other published standard shall comply with the requirements of the current specification of standard listed. In case of conflict between the referenced specification and the project specifications, the project specifications shall govern unless written approval is obtained from the Project Manager.

5. MATERIALS:

   I. Structural steel shall conform to ASTM A 36 unless otherwise specified.

   II. Structural steel pipe and tubing shall conform to ASTM A 53 unless otherwise specified.

   III. Aluminum shall conform to heat treatable alloy 6061-T6 or 6063-T6, Federal Specifications QQ-A-200/8c for sharp cornered angles and round alloy 5052-H32, Federal Specifications QQ-A-250 18 for formed fabricated pieces.

   IV. Stainless steel shall conform to ASTM A 240 with an AISI No. 304 composition and a No. 1 finish.

6. CRAFTSMANSHIP:

   Craftsmanship, fabrication and shop connections shall be in accordance with American Association of State Highway and Transportation Officials (AASHTO) "Standard Specification for Highway Bridges", and the applicable national associations, ASTM, ANSI, AISC, AISC, AHDGA and AWS.

7. HOT-DIPPED GALVANIZING:

   Perform in accordance with ASTM A 123 available at North American Galvanizing Co., 4400 E. 61st Ave., Commerce City, CO 80022 (303) 288-6631. Material shall be sandblasted and

pickled prior to galvanizing as appropriate. The surface shall not be shop primed unless specifically required.

Damaged material shall be redipped unless the damage is local and can be repaired by applying two coats of zinc dust-zinc oxide paint when approved. Where such repair is permitted clean the damaged area by wiping with clean rags saturated with mineral spirits or xylene followed by hand wire brushing. After wire brushing, clean the area with solvent to remove residue and apply two coats of zinc dust-zinc oxide paint. Members on which the galvanized coating becomes damaged after having been dipped twice shall be rejected.

8. FABRICATED METAL APPARATUS:

I. Methods:

Perform welding in accordance with AWS D1.1/D1.M.

Shop splices shall be full penetration welds in accordance with AWS specifications.

II. Preparation:

Metal surfaces shall be clean and free from mill scale, flake rust and rust pitting for steel, well formed and finished to shape and size with sharp lines and angles and smooth surface. Shearing and punching shall leave clean true lines and surfaces. Weld permanent connections.

III. Materials:

Thickness of metal and details of assembly and supports shall give ample strength and stiffness.

Welding electrodes shall have the same strength or greater, and the same weathering characteristics as the metal welded.

IV. Finishing:

Finish welds flush and smooth on surfaces that will be exposed after installation.

After grinding and finishing welds, removing splatter and crust, paint unplated, exposed surfaces.

Work shall be free of blemishes or defects of any type which would affect durability or strength. Fabrications shall be complete in every detail and approved.

9. PRODUCTS:

I. Steel Pipe:

The pipe shall be Schedule 40 and galvanized according to ASTM A 120.

II. Bar Type Welded Grating:

A. General: Type I grating, parallel bearing bars with right angle cross

member.

B. Material:

1. Steel: Rolled or drawn carbon steel meeting ASTM A 569.

C. Manufacturer: Keene-Bufnel, Kerrigan, Blaw-Knox, Kemp, McNichols, Arrowhead, or approved equal and available at Peterson Company, 4949 Colorado Boulevard, Denver, CO, 80216, 303-388-6322.

D. Grating Dimensions and Spacing: The Contractor shall provide shop drwaings for all window gratings and associated connecting hardware. All bearing bars and the round cross bars shall be as shown on the shop drawings.

E. End Banding Bars: The end-banding bars as the grating shall be of the same size as the bearing bars.

F. Cross Bars: The cross bar members shall not be less than 7/64 inch in nominal thickness. Welded cross bars shall not be less than 1/16th square inch in cross-sectional area.

G. Deflection: The grating shall have a deflection of less than ¼ inch for uniform loads of 100 pounds per square foot.

H. Tolerances: The following tolerances are permitted:

Length: ± ¼ inch regardless of length dimension.
Depth: ± 1/32 inch (measured from top of serration when present).
Width: ± ¼ inch.

Weight: Maximum weight deviation less than published minus 5 percent. Plus 10 percent will be permitted on the maximum weight of any individual grating when banding bars, fasteners or both are part of the grating.

I. Fasteners: Fastening systems shall be tamper proof and not be accessible from the exterior side of the building. The use of stainless steel vandal proof fasteners will be permitted.

J. Finish:

1. Steel: Powder-coated after fabrication. Color to be selected by Project Manager.

K. Fastener Finish:

1. Steel: All steel hardware and steel fasteners shall be completely zinc coated in accordance with ASTM A 153 or constructed of stainless steel.

L. Welding: Welding shall be in accordance with the manufacturer's standard procedure.

M. Workmanship: The grating bars shall be parallel, have no broken or cracked members, and free from sharp edges or corners. Welded parts shall be clean from flux. Grating shall be free of loose scale, dirt, oil and grease before the finish is applied.

III. Fixed Metal Ladder:

Fixed steel walk-through access ladder shall provided as shown on the drawings. Ladder shall be constructed of steel and shall have a yellow coating applied by the manufacturer.

IV. Aluminum Channel Guides:

A. General:

Furnish and install extruded aluminum channel guides for placement where shown on the drawing for channel board and screen inserts.

B. Fabricated:

Channel guide materials, both single and double wide, shall be constructed of 5052-H32 .125 inch sheet aluminum after shape forming and welding attachment of 1/2 in. aluminum bars.

The rods are bent cleats welded on the channel guide at 12 in. o.c. (min.) and embedded into concrete, anchoring the channel guides.

C. Extruded Aluminum Members:

Extruded pieces shall be 6061-T6 or 6063-T6 aluminum as supplied by Ryerson, Denver, 287-0101, Triple A Steel, Colorado Springs, (719) 471-9912 or approved equal. Provide extra pieces produced due to the minimum amount of aluminum required for an extrusion run.

D. Installation:

Set finished channel guides into correct positions and alignment when setting forms for the various structure walls.

V. Expansion Type Anchor Bolts:

Insert Hilti, "Kwik-Bolts", or approved equal, of high grade carbon steel with spring steel wedges, into holes drilled of the same nominal diameter dimension. Set each bolt by tightening the nut. All bolt components shall be galvanized.

VI. Bolts:

A. Structural Steel:

Unless otherwise shown bolts used in structural components shall conform to the provisions of AISC specification for structural joints using ASTM A 325 or ASTM A 490 bolts or ANSI B18.2.1. Nuts shall conform to ASTM A 563 or ANSI B18.2.2. Washers shall be installed in accordance to the AISC specification and conform to ASTM F 436.

Galvanized bolts shall be A325.

1. Bearing Connections:

When assembled, joint surfaces shall be free of scale (except tight mill scale), burrs, dirt, and other foreign material that would prevent solid seating of parts. Paint is permitted in bearing type connections (connection Types N and X).

B. Anchor Bolts:

Anchor bolts and similar applications shall conform to ASTM A 307 or as noted on drawings. Tie rods and similar applications shall conform to ASTM A 36 or as noted on drawings.

ASTM specified material for anchor bolts, tie rods and similar applications can be obtained from either specification for threaded bolts and studs normally used as connectors or for structural material available in round stock that may then be threaded.

Suitable nuts by grade may be obtained from ASTM A 563.

VII. Expanded Metal (Vault Walls):

Expanded metal shall be constructed of flattened carbon steel with maximum open area of 80%. Sheets shall have a minimum thickness of 0.077".

10. DELIVERY AND INSTALLATION, STRUCTURAL STEEL:

Deliver the materials to the erection site, unless otherwise specified.

Unload the steel from the truck at the time of arrival. Notify the Project Manager in advance of the expected time of arrival at the site.

Care must be taken to prevent damage to the finishes. Touch-up all "dinged", scratched and scraped areas with finish paint.

The contractor shall provide the necessary structural mounting support for the fixed ladder during the wall construction. The use of expansion wall anchors will not be acceptable for the mounting of the ladder. Contractor shall also verify all clearances between overhead door and ladder prior to ordering and installation.

End of Section

SECTION 06100 - CARPENTRY

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to framing and finish carpentry.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. QUALITY ASSURANCE:

   Store materials in such a manner as to insure proper ventilation and drainage and to protect against damage and the weather with tarpaulin.

   Keep all material clearly identified with all grade marks legible; keep all damaged material clearly identified as damaged and separately store to prevent its inadvertent use.

   Do not allow installation of damaged or otherwise noncomplying material.

   Use all means necessary to protect the installed work and materials of all other trades.

   Do such work as is necessary to cover and protect all carpentry work or materials from damage of any kind.

5. MATERIALS:

   I. General:

      All materials to be used shall be consistent with grade specified. Lumber shall be protected from weather until actually used. All lumber shall be of a quality equal to or superior to the minimum required for the specified grade.

   II. Standards:

      A. General:

         All pieces shall bear the official manufacturer's association grade mark. For rough sawn lumber, lot grading certifications are acceptable. All lumber for finish millwork, trim, etc., to be properly kiln-dried to a maximum of seven (7) percent moisture content. For rough sawn lumber greater than two inches thick, "S-Grn" accepted. For 2 inch thick rough sawn and S4S lumber, the moisture content shall be a maximum of nineteen (19) percent, (S-Dry) unless otherwise noted.

      B. Western Wood Products Association (WWPA)

C. Standard Grading Rules, California Redwood Association (CRA)

D. Standard Grading Rules and the American Plywood Association (APA)

III. Wood Types:

A. Structural Framing:

Structural framing includes studs, posts, beams, joists, purlins, rafters, etc.

B. General Framing:

1. Stud Wall Framing (2" to 4" thick, 2" to 4" wide)
Douglas Fir-Larch or Hem-Fir
Grade: Stud, Standard or better
F_b = 550 psi
F_c = 800 psi

2. Structural Light Framing (2" to 4" thick, 2" to 4" wide)
Douglas Fir-Larch or Hem-Fir
Grade: No. 2 or better
F_b = 850 psi
F_c = 825 psi

3. Structural Joists and Planks (2" to 4" thick, 5" and wider)
Douglas Fir-Larch or Hem-Fir
Grade No. 2 or better
F_b = 850 psi

4. Beams and Stringers (5" and thicker, width more than 2" greater than thickness)
Douglas Fir-Larch or Hem-Fir
Grade No. 2
F_b = 850 psi

C. General Purpose Boards:

Common boards shall be WWPA, all species, (1" and thicker), Grade 3 Common or better.

D. Plywood:

1. Wall sheathing shall be Douglas Fir conforming to APA CD grade.

2. Floor sheathing or sub-floor shall be tongue and groove Douglas Fir conforming to APA C-D interior grade with exterior glue.

E. Oriented Strand Board (OSB) – Walls Only:

Shall be "inner-seal OSB" sheathing as manufactured by Louisiana-Pacific, or approved equal. The sheathing shall be back stamped with American Plywood Association Performance Rating Standard PRP108 or HUD/FHA

Material Release 1060 Structural Requirements. Structural 1 rated sheathing shall conform to National Evaluation Report NERQA397. Installation shall conform to the manufacturer's instructions and to A.P.A. procedures.

F. Trim and Mouldings:

Baseboard Moldings and Interior Door Trim shall be hardwood (i.e. basswood) with a basic radiused corner top and bottom. Trim shall be a minimum 5/8" thick by 5" tall. Trim shall be stained and clear coated prior to installation. Stain color to be approved by Project Manager.

IV. Preservative Pressure Treatment:

All pressure treatment shall be in accordance with American Wood Preservers' Association (AWPA) Standards, unless otherwise noted.

Ammoniacal Copper Quat (AQC), Copper Boron Azole (CBA), Copper Azole (CA-B) are allowed. Preservative products shall be applied according to AWPA standards for the selected use.

"Wolman" salts CCA (chromated copper arsenate, Type C) are allowed where AWPA allows their use. CCA shall not be used in residential applications.

A. No earthen or fresh water contact: 0.25 lb./cu. ft. (ACQ & CCA)
0.20 lb./cu. Ft. (CBA)
0.10 lb./cu. Ft. (CA-B)

V. I-Joists:

I-Joists are designed for 125 psf live load +10 psf dead load. Size and type to be as identified on the construction drawings. Acceptable manufacturer's include Boise-Cascade, Roseburg, I-Level or approved equal.

All joists shall be clearly stamped with the manufacturer's information including joist classification.

Intermediate bracing/blocking shall be provided in accordance with manufacturer's recommendations.

6. TEMPORARY BRACING:

Provide and maintain all temporary bracing for door frames. Furnish and maintain all necessary scaffolding, ladders, etc.

7. METAL FRAMING CONNECTORS:

Metal framing connectors shall be furnished and installed where specified or as necessary for completion of work to anchor carpentry and millwork to adjoining construction.

I. Products:

Structural framing connectors shall be by Simpson Strong-Tie., or approved equal.

A. Rafter ties, Type H.

B. Joist hangers (Type LU) (Type LUS, double shear).

C. Strap ties, Type SA.

Install in accordance with the manufacturer's recommendations.

Connectors used with treated wood shall be hot dipped galvanized according to ASTM A653, A123 or A153. Simpson Strong-Tie "ZMAX" or "HDG" or approved equal. Stainless steel is also acceptable. Do not use galvanized materials with stainless steel materials.

II. Fasteners:

Fasteners shall be provided and of the type recommended by the manufacturer,

A. Column cap and base bolts, complying with ASTM A 307 for bolt and nut materials. All hardware shall be galvanized or plated with another acceptable corrosion resistant material.

B. Nails shall have a corrosion resistant coating.

C. Fasteners for treated lumber shall be hot dipped galvanized, ASTM 153, or stainless steel, Type 316L. Electro-platted fasteners shall not be used. Use only hot dipped galvanized or stainless steel connectors and fasteners. Do not use hot dipped galvanized with stainless steel.

8. WORKMANSHIP AND INSTALLATION:

Woodwork shall be properly framed, closely fitted and accurately set to required lines and levels and shall be rigidly secured in place. Panels shall be set loose and so secured as to prevent checks and warps.

Caulk the perimeter of moldings.

No carpentry work shall be covered until inspection has been made.

9. EXECUTION:

I. Selection of Lumber Pieces:

A. Carefully select all members; select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making proper connections.

B. Cut out and discard all defects which will render a piece unable to serve its intended function, lumber may be rejected whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.

II. General Framing:

A. At a minimum all framing shall be done in accordance with the 2009 International Building Code.

B. Top plates shall be doubled on all stud walls.

C. Cripples under headers shall be continuous to sill plate.

D. Block all stud walls as required for sheathing.

E. Beams, girders, and joists supporting bearing walls or other concentrated loads, shall not be notched. Joists, except as above, may be notched no deeper than ¼ the depth, at top edge only, provided such notch is located within $^1/_8$ to ¼ of span from face of support. Sawcuts for notches shall not overrun depth of notch. Holes in joists, beams and girders shall not be larger in diameter than 1/10 the depth of member and shall be located within center half of the span. All holes shall be centered within depth of member. Holes and notches in studs shall be located within 1/3 of height from either top or bottom but no closer than 3² form plates. Holes and notches in studs shall not exceed 1² in diameter or depth. Studs in exterior walls shall not be notched.

F. Joists, rafters, and decking shall not be cut and headed or displaced to provide for openings in roofs or floors, except as detailed on drawings.

G. Install all horizontal members with crown up.

H. All members in bearing shall be accurately cut and aligned so that full bearing is provided without use of shims. Bearing posts shall have full blocking or support under.

I. All rafters shall be notched for full bearing at all supports.

J. All joists shall have a minimum of 3½² bearing on wood or metal supports. Lapping joints shall have 6² laps centered over interior supports.

K. Stud wall sill plates shall be pressure treated and shall be adhered to the concrete slab with a continuouse application of construction adhesive and powder actuated fasteners at a maximum of 32" O.C. A powder actuated fastener shall be installed within 12 inches of the end of each wall section.

L. All plywood and OSB wall sheathing shall be applied as follows: Center vertical joints over studs and center horizontal joints over 2² blocking or plate. Nail top of panels to double top plate, and nail bottom of panels to anchored sill plate.

Plywood and OSB sub-floor and roof sheathing: Install with face grain at right angles to supports, continuous over two (2) or more spans. Allow

minimum space 1/16-inch between end joints and $^{1}/_{8}$ inch at edge joints for expansion and contraction of panels.

III. Fasteners:

A. General:

All structural timber connections using bolts, lag screws, nails, spikes and wood screws shall have a pilot hole bored into the timber joint prior to the connector insertion in accordance with the National Design Specification for Wood Construction. Nails and spikes may not be pre-bored unless the integrity of the joint is not damaged in any way. All fasteners exposed to weather shall be noncorrosive.

B. Nailing:

1. Rough Framing: Use only common nails or spikes as required to properly fasten members. Avoid nailing into end grain of wood and use toe nailing whenever possible.

2. Treated Lumber: All fasteners used with Treated Lumber shall be hot dipped galvanized.

3. Wood Stops and Trim: Nail with appropriate size non-corrosive finish nails.

4. Plywood and OSB: Use only non-corrosive coated common nails to properly fasten panels. Nail 6 inches o.c. along panel edges and 12 inches at the intermediate supports, except that when supports are spaced at 48 inches o.c. or more, space nails 6 inches o.c. at all supports.

C. Bolts:

Bolts shall be ASTM A 307. Bolt threads must not bear on wood; use washer under head and nut where both bear on wood; use washers under all nuts. All bolts and associated hardware shall be galvanized.

D. Screws:

Lag screws shall be ASTM A 307 and wood screws shall be of sufficient strength to cause failure in the wood rather than in the screw. Screw, do not drive, all lag screw and wood screws.

IV. Powder Actuated Fasteners:

For masonry or concrete, powder actuated fasteners shall be Ramset or approved equal.

10. TRIM INSTALLATION:

Finished woodwork shall be dressed and sanded, free from machine and tool marks, abrasions, raised grain or other defects on surfaces exposed to view in the finished work. Joints shall be tight and so formed as to conceal shrinkage. All nail heads in finished work shall be sunk with nail punch and holes filled with putty similar to the finish color. Woodwork shall be properly framed, closely fitted and accurately set to required lines and levels and shall be rigidly secured in place. Insure that the completed work will remain in place without warping, splitting or opening of joints.

End of Section

SECTION 06240 – SOLID SURFACE COUNTER TOPS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the furnishing and installation of counter tops where shown on the drawings.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. MATERIALS:

   I. Counter Top Back-up:

      Provide and fabricate the counter top back-up (core) of exterior rated plywood with waterproof adhesive only.

   II. Adhesive and Sealant:

      Adhesive for Bonding to Other Products: One component silicone to ASTM C920.

      Sealant: A standard mildew-resistant, FDA/UL® [and NSF/ANSI 51 compliant in Food Zone area,] recognized silicone color matched sealant or clear silicone sealants.

   III. Solid Surfacing Material:

      Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment; not coated, laminated or of composite construction; meeting following criteria:

      A. Flammability: Class 1 and A when tested to UL 723.

      B. Finish: Semi-gloss, with a 60° gloss rating of 25 – 50.

      C. Color: To be from Manufacturer's Standard Colors.

      D. Material: Countertops that will be installed outdoors shall be certfied for outdoor installation. All sealants and adhesives shall be per the manufacturer's recommendations for such installation.

      E. Manufacturer's:

         1. Corian® by DuPont; www.corian.com

2. Samsung Chemical USA; www.staron.com

3. Wilsonart Contract; www.wilsonartcontract.com

5. INSTALLATION:

I. Install components plumb, level, rigid, scribed to adjacent finishes in accordance with reviewed Shop Drawings and Product installation details.

II. Fabricate field joints using manufacturer's recommended adhesive, with joints being inconspicuous in finished work. Exposed joints/seams are not permitted. Keep components and hands clean when making joints. Reinforce field joints as specified herein. Cut and finish component edges with clean, sharp returns.

III. Route radii and contours to template. Anchor securely to base component or other supports. Align adjacent components and form seams to comply with manufacturer's written recommendations using adhesive in color to match work. Carefully dress joints smooth, remove surface scratches and clean entire surface.

IV. Install countertops with no more than 1/8" sag, bow or other variation from a straight line.

V. Adhere undermount/submount/bevel mount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.

VI. Seal between wall and components with joint sealant as specified by the manufacturer of the countertop material, as applicable.

VII. Provide backsplashes and endsplashes as indicated on Drawings. Adhere to countertops using a standard color-coordinated silicone sealant. Adhere applied sidesplashes to countertops using a standard color-matched silicone sealant. Provide coved backsplashes and sidesplashes at walls and adjacent millwork. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on reviewed Shop Drawings. Adhere to countertops using manufacturer's standard color-coordinated joint adhesive.

VIII. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Ensure components are clean on date of Substantial Completion of the Work.

6. REPAIR

I. Repair minor imperfections and cracked seams and replace areas of severely damaged surfaces in accordance with manufacturer's "Technical Bulletins".

7. SITE QUALITY CONTROL

I. Non-Conforming Work: Replace damaged work which cannot be satisfactorily repaired, restored or cleaned, to satisfaction of Architect at no cost to Owner.

8. CLEANING

I. Remove excess adhesive and sealant from visible surfaces.

II. Clean surfaces in accordance with manufacturer's "Care and Maintenance Instructions"

9. PROTECTION

I. Provide protective coverings to prevent physical damage or staining following installation for duration of Project.

II. Protect surfaces from damage until date of Substantial Completion of the Work.

End of Section

SECTION 07200 - INSULATION

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to furnishing, installation and application of insulation materials.

3. SUBMITTALS:

   Refer to Section 01300 – Submittals for requirements

4. PRODUCT DELIVERY, STORAGE AND HANDLING:

   I. Delivery:

      Deliver material to the site in unopened packages, with identification labels intact. Identify contents, manufacturer, brand name, thermal values and applicable standards. Use all means necessary to protect insulation before, during, and after installation and to protect the installed work and materials of all other trades.

   II. Storage:

      Insulation must be stored under water resistant cover, protected from weather and direct sunlight or sparks and stacked on pallets. Material not stored in this manner will be immediately removed from job site at the Contractor's expense and not used.

5. QUALITY CONTROL:

   All work of this Section shall be done in accordance with manufacturer’s recommendations and in such a manner as to avoid gaps or voids at the insulation plane.

6. PRODUCTS:

   I. Fibrous Insulation (Pre-Engineered Metal Building):

      Two part insulation systems utilizing thermal blocks (R3.5 continuous minimum) for roofing and white painted, galvanealed banding, white vapor barrier support fabric and two layers of unfaced fiberglass blanket insulation laid perpendicular to each other with the upper layer placed between the secondary support members and the building wall/roof panels and the lower layer placed between the framing members.

      Provide fibrous glass insulation batts complying with ASTM C 665, Type II, Class C, by Owens Corning, Johns-Manville, Certainteed, or approved equal. Thermal resistance shall be of the thickness or R-value shown on the drawings.

Vapor retarder (perm rating of 0.02 or lower) shall consist of polypropylene film, fiberglass reinforcing yarn and a metalized polyester film laminated together with flame retardant adhesive.

Material shall meet the following standards:

Mold and mildew resistance ASTM D-2020
Flammability UL 723
NAIMA 202-96 (Rev. 2000)

Insulation Rolls delivered to the job site shall have the NAHB certification label for metal buildings clearly marked on the packaging.

II. Fibrous Insulation (Perimter Office Walls and Ceiling):

Provide fibrous glass insulation batts complying with ASTM C 665, Type I, (unfaced), Type II, Class C, (Kraft faced), "Flexible Fibrous Glass Insulation", by Owens Corning, Johns Manville, Certainteed, or approved equal. Thermal resistance shall be of the thickness or R value shown on the drawings for walls and shall be minimum R-13 in the ceiling.

III. Sound Insulation (Interior Office Walls):

Provide stone wool insulation batts of “Safe N’ Sound” by Rockwool or approved equal. Provide batt thicknesses to match wall sections where sound insulation is indicated.

IV. Extruded Polystyrene Insulation (Foundation Walls):

A. Material:

Material shall be "STYROFOAM SM" brand extruded polystyrene insulation board manufactured by the Dow Chemical Company or approved equal meeting ASTM C1621, with a compressive strength of 30 psi and a minimum R-value of 5.0. A protective coating shall be applied from 6-inches below finished grade and up to the top of panel above the finished grade.

B. Installation:

Insulation panels shall be installed in accordance with manufacturer’s recommendations. Panels shall be attached to foundation wall with the use of construction adhesives and the contractor shall provide mechanical support of the insulation insuring that the panel is fully pressed against the foundation wall and the adhesive until the adhesive has fully cured.

Abut each piece of insulation against adjoining pieces. Fit the insulation panels closely around penetrations. Lay insulation flat and tight against the outside concrete wall.

7. EXECUTION:

I. Vapor Retarder:

A. Vapor retarder shall not be torn or damaged. Any sections that have been damaged shall be removed from the jobsite.

B. Vapor retarder shall be placed continuously on the interior side of the building. The vapor barrier shall not be placed between the secondary steel and wall or roof panels but shall pass across the interior face of all secondary framing members. Joints shall be sealed in accordance with the manufacturer's recommendations to provide a continuous vapor retarding barrier.

C. Strapping shall be placed in accordance with manufacturer's recommendations to adequately support the vapor retarder and insulation. Additional strapping may be required by the Project Manager if there are areas of unacceptable sagging of the vapor retarder.

D. Pentrations through the vapor retarder shall be adequately sealed using sealing tapes provided by the vapor retarder manufacturer.

II. Fibrous/Sound Insulation:

A. Install insulation according to manufacturer's specifications and NAIMA's (www.naima.org) *"Recommendations for Installing Fiber Glass Insulation in Metal Buildings"*.

B. Fit the insulation batts snugly between framing members per the manufacturer's specification.

C. Maintain integrity of insulation over entire area to be insulated.

D. Insulate small areas between closely spaced framing members.

E. Carefully cut and fit insulation around pipes, conduits and other obstructions.

F. Do not install insulation on top of or within 3 inches of recessed light fixtures, unless the fixtures are approved for such use.

8. CLEANUP:

I. Remove adhesive splatters and smears.

II. Remove and dispose of excess materials, litter, and debris; leaving work areas in a clean condition.

End of Section

SECTION 07310 - FIBERGLASS SHINGLES

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the installation of flashings, roofing underlayments, and fiberglass shingles.

3. MEASUREMENT:

   Quantities shall not be measured for underlayments (base felt or ice and water shield), drip edge, and flashing, but shall be included into the related construction.

4. SUBMITTALS:

   Refer to Section 01300 – Submittal for requirements.

5. MATERIALS AND INSTALLATION:

   I. Fiberglass Shingles:

      A. Product:

         The shingles shall be GAF "Timberline, Barkwood", Tamko "Heritage Rustic Slate Premium" or approved equal with a minimum 40 year warranty.

      B. Requirements:

         Shingles shall comply with ASTM D 3018 Type I, self-sealing, ASTM D 3161 and ASTM D 3462.

         1. UL Fire Resistance: Class A.

         2. UL Standards and ASTM D 7158 test for wind resistance (110 mph).

      C. Inspection:

         Insure that roof construction and work penetrating roof surfaces have been completed to the extent that shingles can be applied.

         Examine surfaces to receive shingles to assure they are rigid, even, and free of debris.

         Check that flashing has been installed.

         Do not apply materials over wet sheathing.

Do not proceed with installation of underlayments and shingles until defects are corrected.

D. Roof Application:

Installation and fastening shall be in accordance with the manufacturer's printed instructions for **high wind** applications.

II. Underlayment - Base Felt:

30 lbs. (min.) asphalt saturated base felt with a U.L. 55A rating and complying with ASTM D 226 shall cover entire exposed roof deck, flashing and other sheet metal.

Lap each sheet not less than two inches over preceding ply. End laps shall not be less than six inches.

Nail along lap of base felt.

III. Underlayment – Ice Shield:

A. Product:

The ice and water shield shall be Grace "Ice & Water Shield", or approved equal.

B. Application:

Ice and water shield underlayment shall be installed along all eaves to a minimum distance of 3 feet from the roof edge, along the ridge to a minimum distance of 3 feet down each side of the ridge. Shall also be installed along valley sections at roof interfaces and interfaces between roof sections and walls and around existing roof vents as identified on the drawings.

IV. Drip Edge:

Provide galvanized metal drip edge to bottom (fascia edge) and ends (gable ends) of roof. "F" Style edge shall be used for bottom and "C" Style for gable or rake edge. Refer to Section 07620 – Flashing for additional information.

Ice and water shield shall be installed over bottom drip edge. Gable or rake drip edge shall be installed over ice and water shield.

V. Fasteners:

Use hot galvanized steel or aluminum sharp-pointed conventional barbed shank 10 to 11 gauge roofing nails with at least 3/8" penetration through plywood sheathing.

6. CLEANUP:

Upon completion of the installation of the roofing materials, the site shall be cleaned of all roofing materials, nails and other related debris and disposed of off State property.

End of Section

SECTION 07621- GUTTERS AND DOWNSPOUTS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, installation of new prefinished seamless gutters and downspouts.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. MATERIALS AND INSTALLATION :

   Remove existing gutters and downspouts and install new prefinished seamless products formed of 26 gauge steel sheet material. Width shall be 6^2 and shall be attached to fascia with strap type anchors or other types as approved by the Engineer. Finish color shall be approved by the Project Manager.

5. CLEANUP:

   Dispose of existing gutters and downspout materials, hangers, nails or other debris caused by their removal, off state property.

End of Section

SECTION 07900 - SEALANTS AND JOINT FILLERS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to furnishing, installation and application of construction sealants and joint fillers.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. GENERAL:

   The color shall closely match that of the material being caulked where it is not to be painted. Seal around all wall, ceiling and roof penetrations.

5. MATERIALS:

   I. Concrete Construction Joints:

      Provide self-leveling, 1-part polyurethane sealant such as Sika “Sikaflex-1c SL” or approved equal.

   II. Silicone Caulking (Waterproofing):

      Provide a waterproof silicone caulking General Electric "Silicone II Gutter and Flashing Caulk” or approved equal. The material shall meet ASTM C 920.

   III. Acrylic Latex:

      Provide an acrylic latex caulk Pecora AC-20 or approved equal for general purpose interior and exterior applications where slight to moderate movement may be expected. The caulk shall be suitable for latex paint and meet ASTM C 834.

6. INSTALLATION:

   The surfaces receiving the sealant (joint filler) shall be thoroughly cleaned before the application of the sealant.

   For control joints concrete shall have cured a minimum of 14 days prior to application. All joints shall be clean using compressed air and no water shall remain in the joint prior to application.

   Apply the sealant with a caulking gun or air pressure equipment. There shall be no voids throughout the entire joint cross section. Remove the excess sealant from the surfaces and clean off all smears and streaks before the material sets.

End of Section

SECTION 08100 - METAL DOORS AND FRAMES

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to the furnishing and installation of flush metal doors and metal door frame for the building.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. FLUSH METAL DOORS AND FRAMES:

   I. Materials:

      Framing members, adapters and mountings shall be steel. All screws, miscellaneous fastening devices and internal components shall be corrosion-resistant materials of sufficient strength to perform the functions for which they are used.

      The door shall be reinforced, stiffened, sound-deadened and insulated with a fiberglass, polyurethane, polystyrene, or kraft honeycomb core completely filling the inside.

   II. Manufacturer:

      Shall be Steelcraft, Model F-16 (16 gauge) steel frames or approved equal and Model L-18 (18 gauge), galvanealed, 1-¾" flush exterior steel door (Doors to exterior and to shop shall have polyurethane insulation).

      The door frame shall have unitized weather stripping of synthetic rubber.

   III. Steel Frame Performance Under Uniform Loading:

      When tested in accordance with ASTM E 330, the maximum deflection of the head member shall not exceed 1/175 of its span and when the load is removed, there shall be no evidence of permanent deformation or damage when tested under a load of 30 psf.

   IV. Window:

      Doors identified on drawings to have windows, shall have a ½" thick insulated wire reinforced glass with minimum dimension of 22" wide x 30" tall.

   V. Finish:

Shall be painted. All exposed framing members shall be free of scratches and other surface blemishes. Submit paint color and product for approval by Project Manager. All door frames shall be trimmed using wood trim on interior section (see Section 06100 – Carpentry) of frame and metal trim (provided by building manufacturer) on exterior.

VI. Erection:

The door shall be set in its correct locations as shown in details and shall be level, square, plumb and at proper elevations and in alignment with other work.

All joints shall be tightly caulked in order to ensure a watertight job. All materials shall be screwed in placed using backfilling, masonry plugs, or anchor straps as required. When frame members are joined, they shall be accurately cut and fitted to result in a tightly closed joint.

After erection adequately protect exposed portions of framing from damage by plaster, lime, acid, cement, or other harmful compounds.

VII. Cleaning:

Remove protective materials and clean with plain water, or water with soap or household detergent. The area shall be cleaned of all debris and left in an acceptable condition as determined by the Project Manager.

5. VAULT DOORS AND FRAMES:

I. Materials:

Framing members, adapters and mountings shall be steel. All screws, miscellaneous fastening devices and internal components shall be corrosion-resistant materials of sufficient strength to perform the functions for which they are used.

The door shall be reinforced, stiffened, sound-deadened and insulated with a fiberglass, polyurethane, polystyrene, or kraft honeycomb core completely filling the inside.

II. Manufacturer:

Shall be Sportsman Steel Safe Co, Crown Vault Door with wood grain finish. Door shall be 2” step system door with a minimum of a 2-hour fire rating. Door shall have an internal release (panic room handle) with an exterior 5-prong banker wheel and digital lock. Vault door shall have an 18-bolt perimeter locking system.

The door frame shall be a ¾” steel pry resistant frame.

III. Finish:

Shall be painted with a semi gloss paint. Color to be approved by Project Manager

IV. Erection:

The door shall be set in its correct locations as shown in details and shall be level, square, plumb and at proper elevations and in alignment with other work.

All joints shall be tightly caulked in order to ensure a watertight job. All materials shall be screwed in placed using backfilling, masonry plugs, or anchor straps as required.

After erection adequately protect exposed portions of framing from damage by plaster, lime, acid, cement, or other harmful compounds.

V. Cleaning:

Remove protective materials and clean with plain water, or water with soap or household detergent. The area shall be cleaned of all debris and left in an acceptable condition as determined by the Project Manager.

End of Section

SECTION 08200 - WOOD DOORS AND FRAMES

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to the furnishing and installation of a pre-hung, flush wood door and frame with hardware.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. QUALITY ASSURANCE:

   I. Qualified to affix each door with National Woodwork Manufacturers' Association (NWMA) Seal of Approval or quality certification stamp.

   II. Testing Requirements:

      A. Adhesives: NWMA 1.S.1. certificate of compliance.

         1. Waterproof bond test for Type I exterior doors.

         2. Water resistant bond test for Type II interior doors.

      B. Warp: NWMA 1.S.l. compliance.

   III. Allowable Tolerances For Fabrication:

      A. Size: Prefit: ±1/32 inch overall dimensions.

      B. Maximum Warp: ¼”

      C. Squareness:

         The length of the diagonal measured on the face of the door from the upper right corner to the lower left corner between the length of the diagonal measured on the upper left corner to the lower right corner: maximum difference of 1/4 inch.

      D. Prefitting and Premachining For Hardware:

         NWMA Standard Procedures and Recommendations for Factory Machining Architectural Wood and Plastic Faced Flush Doors for Hardware.

      E. Factory Finish Thickness: Minimum 1 mil, cured.

      F. Show-through (Photographing):

1/100 inch deviation from the true plane in any 3-inch span on the door face.

5. PRODUCT DELIVERY, STORAGE AND HANDLING:

I. Delivery:

Deliver prefinished doors in manufacturer's original unopened protective material or container, clearly marked with the manufacturer's name, brand name, size, thickness and identifying symbol on covering.

II. Storage:

Store door in area where there will be no great variations in heat, dryness, and humidity.

III. Handling:

Do not drag doors across any surface.

6. MATERIALS:

I. Door Standards: NWMA I.S.1 and AWI Flush Door Standards.

II. Wood: Species: Oak.

III. Adhesives: CS 171. Type II interior.

IV. Core: Solid wood core, framed block, unglued.

V. Water Repellent Preservatives: CS 262 or NWMA 1.S.4.

VI. Glazing: 3/16 inch float grade tempered obscure glass.

7. FABRICATION:

I. Moisture Content: For all wood material, 12% maximum at time of fabrication.

II. Thickness: 1-3/8 in. minimum.

III. Solid Core:

Framed block, unglued core type: Core blocks 2½" maximum width, not bonded together, end joints staggered in adjacent rows.

IV. Frames:

A. Depth: 4-9/16 in. at head and jambs unless greater depth required.

B. Finish: All wood components are kiln-dried oak, toxic treated, and unfinished for custom finishing after installation.Each side of the frame

shall be constructed of a single piece of wood, finger joints shall not be used. Frames shall be stained to match doors and trim and sealed with a polyurethane.

V. Hardware Preparations:

Rout the hinge edge for three hinges symmetrical on center lines and 29¾" on center. Steel reinforcement security plates shall be factory installed. A standard cover plate shall be furnished for the second strike mortise if a deadbolt is not used.

VI. Door:

A. Doors shall be trimmed with oak trim on both sides and along header. Oak trim shall be stained to match door and finsihed with a polyurethane coating.

VII. Factory Preparations:

A. Prefitting:

1. Swinging doors: Standard clearance allowances of 1/8 inch at top, 1/8 inch at each side, and ½" from bottom to finished floor.

2. Bottom clearance allowance of doors with threshold: ¼" from bottom of door to top of threshold.

B. Premachining:

1. Bevel on vertical edges of single door: 1/8 inch in 2 inches.

2. Locate hinge mortise from top of door to top of hinge, 1/32 inch clearance in height and width, with depth sufficient to provide a flush surface when installed.

3. Locate locks mortise from top of door to center line of knob.

4. Mortise for face plates: 1/64 in. larger in width and height, depth to provide a flush surface when installed.

C. Lock clearances:

1. Mortise and integral locks: 1/16 inch overall height and width, and 1/8 inch depth.

2. Unit, mono, or slot-type locks: ¼ inch overall.

3. Bored lock: 1/16 inch clearance for bore diameter for latch bolt.

4. Bored lock: 1/8 inch clearance for bore diameter for lock case.

8. INSPECTION:

Verify that door frames are of the type required for the door and are installed as required for proper installation of doors.

9. INSTALLATION OF DOORS:

   I. Install in accordance with requirements of NWMA Standard Door Guarantee.

   II. Clearances: Maximum of 3/16 inch at the jamb and head for prefit doors.

   III. Adjust and Clean:

      A. Replace or rehang doors which are hingebound and do not swing or operate freely.

      B. Refinish or replace job finished doors damaged during installation.

10. HARDWARE:

Provide and install hardware and accessories as specified in Section 08700 - Hardware and Specialties.

   I. Installation:

      Installation shall be in compliance with manufacturer's instructions to insure proper operation. Center line of door pulls shall be installed 3'-2" above finished floor.

   II. Protection:

      Trim plates and door stops shall not be installed until after painting is completed. Other hardware shall be loosened prior to painting and retightened after painting is completed. All hardware shall be masked or otherwise protected during painting operations.

11. FINISH:

The door and frame shall be finished on all faces and edges as specified in Section 09900 -Painting. All exposed framing members shall be free of scratches and other surface blemishes.

End of Section

SECTION 08360 - OVERHEAD DOORS AND OPERATORS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to furnishing and installation of new insulated sectional overhead steel doors, automatic operators and all associated hardware.

3. SUBMITTALS:

   Refer to Section 01300 – Submittals, for requirements.

4. MATERIALS AND INSTALLATION:

   I. Manufacturer and Supplier:

      A. Rolling Steel Service Doors:

         The doors shall be commercial rolling steel service door, “Series 620”, uninsulated, as manufactured by Overhead Door Compnay or approved equal. Door shall be constructed of a minimum 20 ga galvanized steel.

      B. Sectional Steel Overhead Door:

         The doors shall be a commercial sectional steel overhead door, type “Insulated”, “Series 593” as manufactured by Overhead Door Company, “Series 3715” as manufactured by Clopay Garage Doors (www.clopay.com), or approved equal.

      C. Automatic Garage Door Operator:

         The automatice garage door operator shall be manufactured by LiftMaster “Model 3265”, or approved equal. Door operators shall be supplied with an exterior keypad remote entry at each door location and a push button control on the interior at each door. Operators shall also include two remote openers.

   II. Overhead Sectional Door Fabrication:

      A. Insulated:

         Panel thickness shall be $1^{5}/_{8}$” thick (minimum), roll formed from commercial quality hot dip galvanized steel per ASTM A 525 and ASTM A 526. Door sections constructed of 0.016” galvanized steel interior and exterior skins mechanically interlocked and pressure bonded with an expanded polyurethane or polystyrene core that shall have a minimum R-

value rating of 11. End stiles shall be minimum 16 gauge; hinges and fixtures will be galvanized steel.

III. Door Finish:

Exterior and interior of door sections shall be pre-coated prior to roll forming with a two coat process of baked on polyester enamel finish over epoxy primer, color to match exterior of building. Submit paint color and product for approval by the Project Manager.

IV. Windows:

Overhead garage doors shall have insulated double strength glass windows installed as shown in the drawings.

V. Weatherstripping:

Doors shall be furnished with a complete weatherstripping system to reduce air infiltration. The top of the door shall be provided with adjustable EPDM rubber sealing strip. The bottom of the door shall have flexible U-shape vinyl seal encased in extruded aluminum retainer to conform to irregularities in the floor. Weatherstripping shall be replaceable without removal of track, angle mounting, or door hardware.

VI. Overhead Sectional Door Tracks:

The tracks shall be 2". Tracks shall be continuous angle mounted and fully adjustable for sealing door to jamb. Track Rollers: diameter consistent with track size, with hardened steel ball bearings.

VII. Hardware: All hinges and brackets shall be made from galvanized steel. Track rollers shall have ten ¼" diameter hardened steel balls per roller.

VIII. Overhead Sectional Door Spring Counterbalance:

Heavy duty oil tempered wire torsion springs on continuous ball bearing cross header steel shaft. Galvanized aircraft type lifting cables with minimum safety factor of 5 to 1.

IX. Locks: An interior dead bolt shall be provided with a hole to receive a padlock. (padlock by others)

Wind Load: Doors shall withstand minimum of 20 lbs. per square foot.

5. WARRANTY:

Warranty Document (10-year minimum on delamination).

End of Section

SECTION 08530 - VINYL (PVC) WINDOWS

1. SCOPE OF WORK

   Furnish all labor, materials and equipment required to complete the work of the noted Divisions of this Section described herein and on the drawings.

2. WORK INCLUDED

   This item shall include all work and materials necessary for the installation of vinyl windows in accordance with the building manufacturer's standard details and those details contained within this design package. The work shall include but is not necessarily limited to the following: furnishing and installing of new framed vinyl windows, screens, sealants, fasteners, blocking, interior trim and painting.

3. CODES, REGULATIONS, STANDARDS AND PERMITS:

   I. AAMA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights

   II. NFRC 100 - Thermal Properties; National Fenestration Rating Council.

   III. NFRC 200 - Solar Heat Gain; National Fenestration Rating Council.

   IV. ASTM D 3656 - Standard Specification for Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Fiber Yarn.

   V. ASTM D 3678 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Interior Profile Extrusions.

   VI. ASTM D 4028 - Standard Specification for Solar Screening Woven from Vinyl-Coated Fiber Glass Yarn.

   VII. ASTM E 774 - Standard Specification for Sealed Insulating Glass.

   VIII. IGCC - Classification of Insulating Glass Units; Insulated Glass Certification Council.

   IX. U.S. Department of Energy - Energy Star Windows Program.

4. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

5. DELIVERY, STORAGE AND HANDLING:

   I. Deliver windows to project site in undamaged condition; handle windows to prevent damage to components and to finishes.

   II. Store windows out of contact with ground; protect windows from weather and construction traffic in well-ventilated area.

6. WARRANTY:

I. Furnish manufacturer's standard warranty against deficiencies in materials or fabrication. Warranties shall be for a minimum ten (10) years on commercial installations.

7. PRODUCTS:

I. Manufacturers:

A. Acceptable Manufacturers:

1. Alside / Windows, Web: www.alside.com

2. Jeld-Wen Windows and Doors, Web: www.jeld-wen.com

3. Pella Windows, Web: www.pella.com

4. Approved Equal

B. Window Product Requirements:

1. Grade: Shall conform to AAMA 101/I.S.2/A440; exceeding grade requirements as follows:

a. Thermal performance (U-Value), in accordance with NFRC 100, shall not exceed 0.38.

b. Solar Heat Gain Coefficient, in accordance with NFRC 200, shall not exceed 0.48.

2. Glazing: Low-E sealed insulating glass unit, ¾ inch unit thickness; U.S. Department of Energy, Energy Star conformance labeled for Northern Climate Zone.

3. Sealed Insulating Glass Units: Conform to ASTM E 774, Level CBA.

4. Color: White

II. Fabrication: Window/Door Units: Assemble units completely in factory, including operating hardware and glazing.

8. EXECUTION

I. Examination:

A. Verification of Conditions: Openings are in correct location, and of correct size, in accordance with approved shop drawings and manufacturer's installation instructions.

B. Installer's Examination:

1. Have installer of this section examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable.

2. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.

3. Beginning construction activities of this section indicates installer's acceptance of conditions.

II. Installation:

A. Install products specified in this section square, plumb and level, in accordance with approved shop drawings and manufacturer's installation instructions.

B. Installation of joint sealers is specified in Section 07900.

III. Adjusting:

A. Adjust operating hardware for correct operation in accordance with manufacturer's installation instructions.

IV. Cleaning:

A. Clean interior and exterior surfaces free of labels, mortar, plaster, paint, joint sealers, and other foreign matter to prevent damage to weatherstrip, and to prevent interference with operation of hardware.

V. Protection:

A. Protect ventilators and operating parts from dirt and damage caused by subsequent construction activities.

B. Replace units damaged by subsequent construction activities.

END OF SECTION

SECTION 08700 - HARDWARE AND SPECIALTIES

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the furnishing and delivery of finish hardware, and templates for the doors.

3. SUBMITTALS:

   Refer to Section 01300 – Submittals for requirements

4. PRODUCT HANDLING:

   The supplier shall furnish all hardware items to the Contractor with tags attached indicating manufacturer, catalog number and specific intended location within the building.

5. INSTALLATION:

   Installation shall be in compliance with manufacturer's instructions to insure proper operation.

   Center line of door pulls shall be installed 3'-2" above finished floor.

6. PROTECTION:

   Trim plates and door stops shall not be installed until after painting is completed. Other hardware shall be loosened prior to painting and retightened after painting is completed. All hardware shall be masked or otherwise protected during painting operations.

7. HARDWARE SCHEDULE:

   The hardware listed in the following schedule shall be furnished as designated or approved equal.

   The hardware schedule is to include every item of finish hardware necessary to complete the work. Suppliers shall carefully examine the schedule and the drawings for omissions or discrepancies. If found, they should be brought to the attention of the Project Manager prior to bidding.

   Substitute new hardware schedule list which shall include product line changes and all hardware item omissions or discrepancies.

   I. Counter Swing Door Hardware:

      A. Hinges:

         Service Counter Swing door shall be attached using rising butt hinges

constructed of stainless steel and securely fastened to the support riser as well as swing gate in accordance with manufacturer's recommendations.

B. Desktop Cable Grommet:

Provide a desktop grommet where shown on the drawings. Grommets shall be constructed of steel and satin chrome plated. Grommets shall be a minimum of 2" in diameter and come with cover.

II. Exterior Door Hardware:

A. Latch Sets:

1. Manufacturer:

Yale Commercial Solutions 1800 Series Exit Device and 420F Entry Series Core Locking system or approved equal.

2. Finish:

Satin Chromium

B. Door Closer:

Norton 1601BF (ADA Compliant) or approved equal.

C. Door Stop and Holder:

Ives 449 series or approved equal.

D. Kick Plate:

Anodized aluminum 0.050, No. 628, 12" height, available from Master Manufacturers, Inc., 1229 Quivas, Denver, CO 80204 or approved equal.

E. Door Shoes:

Pemko, Model No. 221 AV or approved equal.

F. Threshold: (Exterior Doors)

Pemko Model No. 270A or approved equal.

G. Weatherstripping (Exterior Doors and Between Hallway and Main Storage Garage):

Pemko, Model No. 303 AS with S3 Silicon Steel or approved equal.

H. Door Sweep:

Pemko, Model No. 307 AV or approved equal.

III. Interior Door Hardware:

A. Latch Sets:

1. Manufacturer:

Schlage, S-Series Keyed Lever Locks or approved equal

Office/Bathroom/Shop/Storage Areas – Entrance Style Lock. Unlocked by key from outside when out lever is locked by ~~turn~~push-button on inside lever. Inside lever always unlocked and shall deactivate lock when turned. Office shall be keyed to also access main entrance door. Bathroom shall be keyed to match entrance doors. Hallway lever sets shall be installed with keyed portion facing into the wallway.

2. Finish:

Satin Chromium

B. Door Shoes (Between Hallway and Main Storage Garage Only):

Pemko, Model No. 221 AV or approved equal.

End of Section

SECTION 09250 - GYPSUM WALLBOARD

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the furnishing, fabrication and installation of gypsum wallboard.

3. ACCEPTABLE MANUFACTURER AND STANDARDS:

   All materials and products shall be similar to United States Gypsum, Gold Bond or approved equal. All installation and finish criteria shall conform to their specifications and recommendations. U.S.G. is specified to indicate the quality standard and to identify compatible components. Any other system used shall maintain the component compatibility as specified.

   All work shall meet the requirements and recommendations of the applicable portions of the standards listed.

   I. American Society for Testing and Materials - ASTM C 840 (for application and workmanship).

   II. Gypsum Association - GA 216.

   III. Gypsum Drywall Contractor's International - GDCI.

4. HANDLING:

   All products shall be delivered to the site in original, unopened containers and stored in a place protected from exposure to the elements.

5. MATERIALS:

   I. Wallboard:

      Standard gypsum wallboard shall be thickness as identified on the drawings and 8 or 12 foot lengths. The long edges shall be tapered.

   II. Fasteners:

      Fasteners shall be metal buglehead, Type "W", corrosion resistant screws specially designed for application of gypsum panels to wood framework or dry wall nails, GWB-54 or cooler type, and shall be the length and pattern recommended by the manufacturer of the gypsum panels used.

   III. Metal Cornerbead and Trim:

      A. Corner bead: USG "Dur A Bead" No. 103, galvanized steel

B. End Trim: USG No. 400, galvanized steel as required.

IV. Joint Compound: As recommended by manufacturer.

V. Topping Compound: As recommended by manufacturer.

VI. Reinforcing Tape: USG "Perf-A-Tape" per manufacturer's recommendations.

VII. Other Materials:

All other materials, not specifically described but required for a complete and proper installation of gypsum wallboard, shall be approved.

6. EXECUTION:

I. Installation:

A. General:

Install all panels plumb, level and with all vertical joints on support members.

B. Cutting:

1. When cutting gypsum wallboard is required, cut by scoring and breaking or by sawing, working from the face side.

2. Smooth all cut ends and edges of panels as necessary to obtain a smooth joint.

3. For cutouts in panels for pipes, fixtures, and other small openings, make holes and cut outs by sawing or by such other methods as will not fracture the core or tear the covering and with such accuracy that plates, escutcheons, or trim will cover the edges.

4. For moisture-resistant board, coat all raw edges with approved water resistant adhesive.

5. Repair Areas:

Accurately cut and place gypsum wallboard within the properly framed and blocked repair areas. Shim as required to bring surface of wallboard in proper plane with existing wall surface.

C. Fastening:

Properly space all fasteners with heads driven slightly below the surface for proper cementing but without breaking the paper cover. Stagger all end joints and the joints between panels to achieve a maximum of bridging and a minimum of continued joints.

1. Nailing: Double nailing shall be used in the field with a maximum spacing between sets of 12 inches. The second nail shall be within 1½" to 2" of the first. Perimeter nailing shall be spaced at a maximum of 7" on ceilings and 8" on side walls with a minimum of 3/8" and a maximum of ½" from edges.

2. Screws:

   a. Screws shall be spaced a maximum of 12" on ceilings and 16" on walls for framing spacing of up to 12 inches.

   b. Screws shall be spaced a maximum of 12" for framing spacing of up to 24 inches.

II. Installing Metal Trim:

A. The drawings do not show nor was there intent to show all metal trim required; verify with the Project Manager locations and types of trim to be used, if there is any question.

B. Install all trim in strict accordance with manufacturer's recommendations, paying particular attention to make all trim installation plumb, level and true to line, with firm attachment to supporting members.

III. Taping and Finishing:

A. Environmental Conditions:

Control heating and ventilating during finishing operations to insure the maintenance of 50°F minimum temperature.

B. Tape Application (Hand Application):

1. Spread compound evenly over all joints, using suitable tools designed for the purpose.

2. Center the reinforced tape on the joint and press into the fresh compound wiping down with sufficient pressure to remove excess compound but leaving sufficient compound under the tape for proper bond.

3. Fold reinforcing tape along its centerline and apply to all interior angles following the same procedure as for joints. Leave surface free from blisters or tape wrinkles.

C. First Coat:

1. Apply joint compound to all joints over the tape approximately 3" on each side of the tape and feathering out at the edges.

2. Fill all joint recesses and metal trim.

3. Apply compound to all fastener recesses, leaving flush with the adjacent surfaces.

D. Second Coat:

1. Lightly sand the dry compound with fine sandpaper to remove all irregularities.

2. Apply a second coat of compound to all joints, feathering approximately four inches beyond the preceding coat.

E. Third Coat:

1. Sand to remove ridges and apply third coat of topping compound and feather to a smooth uniform surface.

2. Over taped edges do not allow finished joint to protrude beyond the plane of the surface.

3. Recoat fastener recesses to assure complete fill. No dimples shall remain.

4. Lightly sand to provide a smooth surface ready for painting.

F. Prime Coating:

Apply primer seal coating prior to texturing operations according to Section 09900 - Painting, for interior gypsum wallboard.

G. Texturing:

1. Upon completion of the taping and finishing operations, apply a textured finish over the entire area using a ready mixed texturing compound to obtain a double brush texture, medium stipple effect.

2. The finished pattern shall be uniform, with no heavy concentrations of texture or open areas not covered.

3. Repair areas shall match the texture of the existing wall surfaces. Walls containing numerous repair areas may require retexturing of the entire wall if a satisfactory texture match cannot be obtained.

7. COMPLETION:

At the completion of the wallboard installation, clean the area of all debris leaving it in an acceptable condition determined by the Project Manager.

End of Section

SECTION 09310 –TILE

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the furnishing and installation of tile flooring within selected areas.

3. SUBMITTALS:

   Refer to Section 01300 – Submittals, for requirements.

4. GENERAL PROVISIONS:

   I. Installation Qualifications:

      The tile installers shall be required to have a minimum of three years experience.

   II. Product Delivery and Storage:

      Deliver materials to the project site in manufacturer's original, unopened containers with labels indicating brand names, colors and patterns, and quality designations legible and intact.

      Do not open containers or remove markings until materials are inspected and accepted.

      Store and protect accepted materials in accordance with manufacturer's directions and recommendations.

      Unless otherwise directed, store materials in original containers at not less than 50°F for not less than 24 hours immediately before installation.

   III. Environmental Requirements:

      Maintain minimum temperature of 50° F 24 hours prior to installation and continuously after flooring is installed.

5. PRODUCTS:

   I. Manufacturer’s:

      Provide a glazed porcelain tile product such as Marazzi “Vesale Stone Rush”, Dal-tile “Ayers Rock, Bronzed Beacon”, or approved equal.

   II. Tile:

~~A. Shower:~~

~~Tiles shall be 12”x12” glazed porcelain or ceramic designed for use within shower areas with a minimum thickness of 5/16 inches. Color to be approved by Engineer from manufacturer’s standard colors.~~

~~B. Flooring:~~

Tiles shall be 12”x12” porcelain with a minimum thickness of 1/3 inches and shall be a slate style consisting of earth tones. Base cove shall be provided at the interface between wall and acid stained concrete flooring and shall be a 3/8” aluminum satin tile edging. Use Schulter Dilex-Ahka Cove Base 3/8” or approved equal. ~~The tiles shall have a minimum slip resistance/coefficient of friction rating of 0.6 (wet), 0.7 (Dry). Tiles shall have a water absorption of 0.5% or less.~~ Contractor to provide samples of color and style to be approved by Engineer.

III. Setting Materials:

A. Mortar Bed: In accordance with Manufacturer’s Recommendations.

B. Grout: In accordance with Manufacturer’s Recommendations. Color to be submitted to Engineer for approval.

C. Sealant: In accordance with Manufacturer’s Recommendations. Color to be submitted to Engineer for approval. Sealant should be colored to match grout or tile as appropriate.

D. Waterproofing Membrane: Fluid-Applied elastomeric membrane.

6. EXECUTION:

I. General:

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.

B. Lay tile to pattern indicated. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than ½ width is used. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

E. Form internal angles square and external angles bullnosed.

F. Install anodized aluminum smooth sloped transition between tile and carpet locations.

G. Install thresholds where indicated.

H. Sound tile after setting. Replace hollow sounding units.

I. Apply sealant to joints.

J. Allow tile to set for a minimum of 48 hours prior to grouting.

K. Grout tile joints. Use standard grout unless otherwise indicated.

L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

M. Do not permit traffic over finished floor surface for 72 hours after installation.

II. Inspection of Surfaces:

Examine the substrate for un-evenness which would prevent proper execution and impair the quality of the laminate flooring installation.

Do not proceed with the installation of the tile flooring until the defects have been corrected except where correction is indicated under Preparation in this Section.

III. Preparation:

Remove dirt, oil, grease, or other foreign matter from surfaces to receive floor covering materials.

IV. Cleaning:

Upon completion of the installation of floor covering, adjacent work, and after materials have set, clean surfaces with a neutral cleaner as recommended by the manufacturer for the type of floor covering material installed.

Protect completed work from traffic and damage until acceptance by the Owner has been obtained.

End of Section

SECTION 09680 - CARPETING

1. SCOPE OF WORK:

Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

The work shall include, but is not necessarily limited to, the furnishing and installation of commercial quality carpeting within selected areas.

Furniture and other non-permanent items shall be moved prior to the carpeted area preparation and placement.

3. SUBMITTALS:

Refer to Section 01300 - Submittals, for requirements.

4. MATERIALS:

I. Carpet: The carpet shall meet or exceed the following specifications:

Construction	Mulit-level pattern loop
Yarn	Eco Solution Q SD Nylon
Machine gauge	1/10 inch
Stitches per inch (minimum)	10
Pile height tufted	.188 inch high, .125” low
Dye method	100% solution dyed nylon
Density	5,818
Tile Size	24”Wx24”L
Wear warranty	Lifetime Limited Warranty
Protective Treatment	SSP Shaw Soil Protection

The carpet shall be "Color Pop, I0381" by Patcraft, or approved equal. Color to be selected from the Manufacturer’s standard color choices.

II. Wood Base Trim: All base shall have wood trim installed around the perimeter of the area receiving carpeting. See Section 06100 – Carpentry.

III. Adhesive: All adhesives used shall be non-flammable adhesives as recommended by the carpet manufacturer.

IV. All materials shall be new.

5. INSTALLATION AND WORKMANSHIP:

Install carpet in accordance with Manufacturer’s specifications and recommendations.

6. ACCESSORIES:

Install edge strips, moldings, binder bars, and carpet grippers following manufacturer's written instructions and recommendations.

7. CLEANING:

Remove spots and smears of cement from carpet immediately with manufacturer's suggested solvent. Remove rubbish, wrapping paper, selvedges, and scraps less than 2 ft. sq. or less than 8 in. in least dimension. Upon completion, vacuum carpet with a commercial beater bar vacuum cleaner. After each area of carpet has been installed, protect from soiling and damage.

End of Section

SECTION 09900 - PAINTING

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   Complete painting, staining, finishing of wood, unfinished metal or other surfaces as specified.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. GENERAL:

   I. Related Work Described Elsewhere:

      Section 07900 - Sealants and Joint Fillers.

   II. Product Handling:

      A. Delivery:

         Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at the time of their use.

      B. Protection:

         1. Store only the approved materials at the job site, and store only in a suitable and designated area restricted to the storage of paint materials and related equipment. Protect floor with drop cloths or building paper during execution of the work.

         2. Use all means necessary to insure the safe storage and use of paint materials and the prompt and safe disposal of waste.

   III. Extra Stock:

      Upon completion of this portion of the work, deliver to the Project Manager an extra stock of paint equaling approximately 10% of each color used and each coating material used, with all such extra stock tightly sealed in clearly labeled containers.

   IV. Equipment:

      Furnish tools, ladders, scaffolding, other equipment necessary for work completion.

   V. Specifications:

Examine specifications for various other trades; become familiar with their provisions regarding their painting; paint or finish surfaces that are left unfinished by requirements of other Sections.

VI. Methods:

If woodwork, metal or any other surface to be finished cannot be put in proper condition for finishing by customary cleaning, sanding, puttying operations, notify the Project Manager in writing; or assume responsibility for and rectify the unsatisfactory finish resulting.

5. MATERIALS:

I. Manufacturer's Standards:

All application and finish criteria shall conform to the manufacturer's specifications and recommendations.

II. Compatibility:

All paint materials and equipment shall be compatible in use: finish coats shall be compatible with prime coats; prime coats shall be compatible with the surface to be coated; all tools and equipment shall be compatible with the coating to be applied. Thinners, when used, shall be only those thinners recommended for that purpose by the manufacturer of the material to be thinned.

III. Paint and Stain Material:

Paint and stain finishing materials shall be as specified for the different applications and of the highest quality for the appropriate use as recommended by the manufacturer. The application of second and third coats shall be made at the time intervals recommended by the manufacturer. The paint, unthinned, shall not be applied in excess of the rate specified on the label.

6. EXECUTION:

I. Surface Conditions:

Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that such work is complete to the point where this installation may properly commence.

II. Preparation of Surfaces:

A. Protection:

Prior to all surface preparation and painting operations, completely mask, remove or otherwise adequately protect all hardware, accessories, machined surfaces, plates, lighting fixtures, and similar items that may

come in contact with painted surfaces or may be subject to overspray, but not scheduled to receive paint.

B. Metal:

For steel surfaces, all surfaces must be free of dirt, rust, oil, grease, water, mill scale or other observed contamination. Make certain that the substrate is dry.

Rusted or new metal surfaces must be cleaned and primed properly.

Follow Steel Structures Painting Council Specifications SSPC SP 2-63 for hand cleaning (especially wire brushing, scraping, chipping, and sanding).

C. Wood:

The substrate must be dry (also the moisture content must be below 5%). Cover knots and resinous areas with shellac before painting. Putty nail holes flush with the surface. Exposed wood surfaces to be painted or stained shall be sanded, free of raised grain, hammer marks or sanding swirls.

D. Gypsum Wallboard:

Surfaces to be coated must be dry and clean, free of dirt, oil and grease. Cracks, gouges, or other surface imperfections shall be repaired by spackling or puttying, depending on the surface.

Remove oil or grease with Pittsburgh "Leptyne" Paint Thinner or any other high quality paint thinner.

III. Painting, Exterior Sheet Metal:

A. Prime Coating:

Apply 1 coat of Pittsburgh, "Sun-Proof" universal primer, Type I-70, an oil alkyd with a flat finish.

B. Finish Coatings and Application:

Apply 2 coats of Pittsburgh, "Speedhide" Alkyd Gloss Enamel a modified alkyd resin.

IV. Painting, Interior and Exterior Steel:

A. Prime Coating:

Apply 1 coat of Pittsburgh Inhibitive Metal Primer, an epoxy ester resin film type.

B. Finish Coatings and Application:

Apply 2 coats of Pittsburgh, "Speedhide" Alkyd Gloss Enamel a modified alkyd resin.

V. Staining -- Exterior and Interior:

Apply Olympic Stain, semi-transparent, or approved equal.

A. Exterior application shall be 3 coats.

B. Interior application shall be 2 coats.

VI. Painting, Interior Wood:

A. Prime Coating:

Prime with 1 coat of Pittsburgh, Quick-Drying Enamel Undercoater an alkyd-resin.

B. Finish Coatings and Application:

Apply 2 coats of Pittsburgh, "Speedhide" Interior Alkyd Flat Enamel, an alkyd resin type.

Apply by brush or airless spray equipment. Stir (or agitate) thoroughly before, and occasionally while using. Do not apply at air, surface or product temperatures below 50°F.

VII. Painting, Interior Gypsum Wallboard:

A. Prime Coating:

Apply 1 coat of Pittsburgh, "Speedhide" Quick-Drying Emulsion Sealer.

B. Finish Coatings and Application:

Apply 2 coats of Pittsburgh, "Speedhide" Acrylic Latex Flat Interior Wall Paint, an acrylic emulsion film type.

Use roller, brush or airless spray equipment for application. Stir the paint thoroughly (without whipping). Apply at air, surface and product temperatures above 55°F.

VIII. Painting, Interior Gypsum MR Wallboard:

A. Prime Coating:

Apply 1 coat of Pittsburgh, "Speedhide" Quick-Drying Emulsion Sealer.

B. Finish Coatings and Application:

Apply 2 coats of Pittsburgh Quick Dry Alkyd Enamel an alkyd resin type.

IX. Paint Touch-Up:

Upon completion of all work and before occupancy, touch up paint surfaces that are marred or damaged.

7. COMPLETION:

I. Atmospheric Conditions:

Paints other than water-thinned coatings shall be applied only to surfaces that are completely free of surface moisture as determined by sight or touch. While painting is being done, the temperature of the surfaces to be painted and of the atmosphere in contact therewith shall be maintained at or above 50°F for water-thinned coatings and 45°F for other coatings or as permitted by the Project Manager.

II. Cleanup:

Cleaning cloths and other waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work, staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint spots, oil, or other stains on adjacent surfaces shall be removed and the entire job left clean and acceptable.

End of Section

SECTION 10200 - LOUVERS AND VENTS

1. SCOPE OF WORK:

Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

The work shall include, but is not necessarily limited to, the furnishing and installation of the items specified below and shown on the drawings.

~~3. MEASUREMENTS:~~

~~Quantities shall not be measured separately for the gable end wall ventilation fan, shutters, associated control wiring, switches, supports and fasteners but shall be included as part of the Furnish and Install Pre-Engineered Metal Building bid item as identified on the bid schedule.~~

~~Quantities for the bathroom vent fan shall not be measured separately but shall be included within the Furnish and Install Mezzanine and Office bid item as identified on the Bid Schedule.~~

~~Quantities for associated electrical wiring, sensors, switches and other supplies needed to connect to the electrical system shall not be measured separately but shall be included as part of the Furnish and Install Electrical Distribution System bid item as identified on the bid schedule.~~

~~4.~~3. SUBMITTALS:

Refer to Section 01300 - Submittals, for requirements.

~~5.~~4. MATERIALS AND INSTALLATION:

I. Bathroom Exhaust Fan Louver (EF-1):

Bathroom exhaust fan shall be a Broan “Ultra Silent”, Panasonic “WhisperGreen” bath fan or approved equal having a minimum capacity of 80 cfm.

II. Wall Louver (WL-1):

Install extruded aluminum motorized louver (damper) with 6” x 0.080”, drainable blades and insect mesh. Louver shall be coated in a powder coated finish. Color to be selected by Engineer. Louver shall be inter-connected with exhaust fan unit so that louver opens only when exhaust fan is enabled.

III. Wall Ventilators (EF-2):

Refer to Section 15872 – Powered Wall Exhausters.

IV. Wall Ventilator Control(T-1):

The wall ventilator shall be controlled by a programmable thermostat with weekday/weekend programs and a minimum of 4 time periods per day. The controller shall be capable of controlling both the Wall Ventilator and the Wall Louvers. The system shall be interconnected such that the wall louvers open upon activation of the wall ventilator.

V. Wall Louver (WL-2) Outdoor Air for HVAC:

Wall louver for the economizer/fresh air intake shall be a minimum 12"x12", 4" deep louver constructed of aluminum and finished to match building. Louver shall be designed to have drainable blades that will prevent wind driven rain from entering the system and an internal insect screen.

End of Section

SECTION 10800 - TOILET AND BATH ACCESSORIES

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the furnishing and installation of toilet accessories.

~~3. MEASUREMENTS:~~

~~Quantities shall not be measured for the installation of toilet accessories for the buildings, but shall be included as a portion of the Furnish and Install Mezzanine and Office Space bid item as identified on the bid schedule.~~

~~4.~~3. SUBMITTALS:

Refer to Section 01300 - Submittals, for requirements.

~~5.~~4. PRODUCT DELIVERY, STORAGE, AND HANDLING:

I. Deliver items in manufacturer's original unopened protective packaging.

II. Store materials in original protective packaging to prevent soiling, physical damage, or wetting.

III. Handle so as to prevent damage to finished surfaces.

IV. Maintain protective covers on all units until installation is complete. Remove protective covers at final cleanup of installation.

~~6.~~5. PRODUCTS (TOILET ACCESSORIES):

I. Toilet Paper Holder:

Manufacturers:

A. Bobrick, “B-2740”, satin, www.bobrick.com

B. Tubular Specialities, “802S”, www.call-tsm.com

C. or approved equal

II. Toilet Grab Bars:

All grab bars shall be shaped on a mandrel insuring a uniform measurement and diameter at all bends and curves. All center posts, joints, and supports shall be contour sheared and then heliarc welded in a continuous seamless unit. End

flanges shall be passed over tubing and heliarc welded to form one continuous structural member. Each grab bar shall withstand a force in excess of 1,000 pounds sustained weight when installed strictly in accordance with manufacturer's instructions

Manufacturers:

A. Bobrick "B-6897" (Two-Wall Toilet Compt) or "B-5806", www.bobrick.com

B. Tubular Specialties "Q-2040/CS-1" (Horizontal Corner Bar) or "Basic Straight Bar", www.call-tsm.com

C. American Specialties, Inc., 3100 series (Type-57 or Type-01), www.americanspecialties.com

D. or approved equal

III. Baby Changing Station:

A. Koala Kare "KB200" Horizontal Wall Mounted Baby Changing Station. Color to be selected by Project Manager. Install in accordance with the manufacturer's recommendations

IV. Mountings:

Stud walls require Type 7002C concealed through wall anchorage mountings.

V. Accessories:

A. Accessory Type: Where indicated on the drawings, provide and install medicine cabinets, mirrors, etc., approved by the Engineer.

B. Acceptable Manufacturers: Bobrick, Tubular Specialties, American Specialties, Jensen, Donner, Cweco, or approved equal.

C. Towel Bar: Bobrick "B-7673" (24" length) ¾" square stain finish or approved equal.

D. Mirror: Bobrick, "B-290 2436" series with stainless steel ground and polished or approved equal. Mirror shall be warranted for 15 years against silver spoilage.

~~7.~~6. EXECUTION:

I. Preparation:

A. Check openings scheduled to receive recessed units for correct dimensions, plumbness of blocking or frames, preparation that would affect installation of accessories.

B. Check areas to receive surface mounted units for conditions that would

affect quality and execution of work.

C. Verify spacing that affects installation of accessories.

D. Do not begin installation of washroom accessories until openings and surfaces are acceptable.

E. Install wood blocking between studs in drywall partitions at all accessories.

II. Installation:

A. Toilet Risers:

Drill holes to correct size for the masonry anchors for the flange fastening of the toilet risers. Set concrete riser extension ring in construction adhesive.

B. Accessories:

Fasten all accessories rigidly and securely to walls using methods and materials recommended by the manufacturer. After completion of installation, clean and polish all exposed surfaces.

III. Adjust and Clean:

A. Adjust accessories for proper operation.

B. After completion of installation, clean and polish all exposed surfaces.

End of Section

SECTION 12390 - MANUFACTURED CABINETS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the furnishing and installation of manufactured cabinets.

~~3. MEASUREMENTS:~~

~~Quantities shall not be measured but shall be included as a part of the Furnish and Install Mezzanine and Office bid item as identified on the bid schedule.~~

~~Quantities shall not be measured separately for trim, toe kick, fasteners, or other materials and equipment needed for a complete installation but shall be included as part of the installation.~~

~~4.~~3. SUBMITTALS:

Refer to Section 01300 - Submittals, for requirements.

~~5.~~4. PRODUCT DELIVERY, STORAGE, AND HANDLING:

I. Deliver items in manufacturer's original unopened protective packaging.

II. Store materials in original protective packaging to prevent soiling and damage.

III. Handle in a manner to prevent damage.

~~6.~~5. GENERAL PROVISIONS:

I. General:

The drawings indicate the general arrangement of the proposed cabinet installation. Details of proposed departures due to actual room conditions or other causes shall be provided. No payment will be made to correct improperly fitted or installed cabinets.

II. Complete Installation:

Furnish and install all incidental rough and finish wood materials required for the proper fit of all component parts.

III. Ordinances and Codes:

Cabinets shall meet or exceed ANSI A161.1 recommended minimum construction and performance standards for kitchen and vanity cabinets. The cabinet

manufacturer shall be certified by the National Kitchen Cabinet Association (NKCA).

Cabinets shall meet ADA requirements for finished height and toe-kick dimensions.

IV. Coordination:

Ensure cabinets can be properly installed prior to purchase or fabrication.

It is not intended to indicate all offsets, filler sections, and accessories that may be required. Carefully examine the cabinet drawings and the finish conditions affecting all work, furnishing such filler sections, offsets and accessories as may be required.

~~7.~~6. PRODUCTS:

I. Product Line:

Manufactured cabinets shall be Passport Series model by Kraftmaid or approved equal.

II. Cabinets and Hardware:

A. Materials: All lumber shall be kiln dried to 8% moisture content. The front frames on all cabinets shall be solid oak or beech, 4/4 stock, dressed to a full ¾ in. Side panels shall be 3/8 in., 5 ply veneer. Wall cabinet tops and bottoms as well as base cabinet bottoms shall be ¼ in. 3 ply plywood veneer. Wall cabinet back panels shall be 1/8 in. plywood veneer. Base cabinet backs shall be 1/8 in. wood fiber material, felted and calendered into a hard, dense, smooth board. Back rails of both wall and base cabinets shall be ¾ in. solid wood. Shelves shall be ½ in. medium density particleboard, that is filled, base coat applied and finished. All wall cabinet shelves shall be fully adjustable. Base cabinet corner blocks and toe kick shall be made of ¾ in. solid wood.

B. Doors: The door construction varies according to the cabinet style. Materials consist of solid woods, oak, alder, and hardwood veneers on appropriate substrates.

C. Drawers: Fronts shall be of the same material as door stock. Sides and backs shall be 3/8 in. solid oak. Bottom shall be 1/8 in. plywood with appropriate reinforcement. Drawer suspension shall consist of dual bottom mount twin track guides with four low friction rollers.

D. Construction: All cabinets shall be assembled utilizing joint systems, adhesives, and fasteners engineered in combination to insure both sturdiness and aesthetics. All parts of the frame shall be joined by the full glue and screw doweled construction method. All joints shall be made up with glue and reinforced with glue blocks as required. All members shall be tongue and groove joined with moisture resistant glue with end vertical members dadoed to receive the side panels. Sides are

placed into the dados of front frames and secured by internal staples, driven through the front members of the side panel frames, into the front frames, thus eliminating all nail or screw holes in the exterior surfaces. All wall cabinet backs shall be locked into two substantial hanging strips running horizontally at the top and bottom of each cabinet. Tops and bottoms are let into cabinet sides, front frames, and back rails. Bottoms of base cabinets are let into cabinet sides and front frame. Base cabinets shall be reinforced with solid wood corner blocks to insure squareness and rigidity and to maintain the factory alignment of doors and drawers.

E. Finish: Cabinets shall be stained to a natural color.

The cabinet finish shall consist of hand-wiped stain, hand sanded sealer, and a high solids topcoat which is highly resistant to moisture, food stains, fruit acids, alcohol, grease, soap and detergents. Cabinet interiors shall be finished to match the exterior using a 3 step finishing system.

F. Hardware: All cabinets shall be equipped with heavy gauge steel, self-closing hinges which are color coordinated with distinctively designed pulls (ADA compliant) to complement the various styles of cabinets.

G. Cartoning: Each cabinet shall be individually cartoned. All cartons shall meet standard package description 19F of the uniform classification boards of motor freight and rail. Cabinet corners shall be protected by a highly resilient formed fiber pad which holds the cabinet securely within the carton.

~~8.~~7. EXECUTION:

I. Inspection:

Check wall and floor surfaces for correct dimensions, plumbness or level, and alignment.

II. Materials:

Materials shall be new and meet or exceed the grades specified. Receive and protect from loss or damage all materials to be installed.

III. Workmanship:

Work shall be performed by carpenters skilled in the installation of manufactured cabinets.

IV. Installation:

Secure cabinets in accordance with the manufacturer's printed instructions.

V. Cleaning:

Maintain the construction area free of waste material and debris during installation of cabinets.

Clean and polish exposed surfaces upon completion of installation.

End of Section

SECTION 13121 - PRE-ENGINEERED METAL BUILDINGS

1. SCOPE OF WORK:

   Furnish all labor, material and equipment to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, furnishing and erection of a pre-engineered metal building. The building shall be furnished with all materials and accessories required for a complete and weathertight building.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. COMPLIANCE WITH STANDARD AND INDUSTRY SPECIFICATIONS:

   Any material or operation specified by reference to the published specifications of a manufacturer, The American Society for Testing and Materials (ASTM), the American Iron and Steel Institute (AISI), The American Institute of Steel Construction (AISC), The American Hot Dip Galvanizers Association (AHDGA), The American Welding Society (AWS), the Metal Building Manufacturers Association (MBMA), or other published standard shall comply with the requirements of the current specification or standard listed. In case of conflict between the referenced specification and the project specifications, the project specifications shall govern unless written approval is obtained from the Project Manager.

5. ACCEPTABLE MANUFACTURERS:

   Alliance Steel, INC., American Buildings Company, Armco Building Systems, Braemar Building Systems, Butler, Chief Industries, Inc., Liberty Building Systems, Star Manufacturing Company and Varco-Pruden or approved equal.

6. SYSTEM DESCRIPTION:

   Buildings shall be a pre-engineered, clear-span, metal building system with a rigid steel frame. System design shall incorporate the specified doors, windows and accessories.

   Doors, windows, louvers and other openings shall be formed and framed by the building framing.

   The completed building shall be free of rattles, noise due to thermal movement, and wind whistles.

7. QUALITY ASSURANCE:

   I. Design: The building system shall be a system designed in accordance with the latest MBMA Low Rise Building Systems Manual. The framing and panel systems shall support the design loads in accordance with MBMA Recommended Design Practices. The structure systems design is to be certified by a qualified Professional Engineer registered to practice in the State of Colorado.

Finished building design shall meet or exceed all local and state building codes and requirements.

II. Design Loads: Structural engineering shall meet or exceed all current City and County design loads (as well as those identified on the construction drawings) applicable to the structure and location. Building deflections shall be limited to L/180 or local jurisdictional requirements which ever is more restrictive.

III. Fabrication of materials shall meet or exceed the fabrication tolerances specified in the MBMA Common Industry Practices.

IV. Welding of structural steel shall be in accordance with the AWS Structural Welding Code.

V. Building erector shall be authorized by the manufacturer to erect the building system.

8. MATERIALS:

I. Steel Framing:

All Steel framing shall be factory primed with the manufacturer's standard priming paint.

II. Roof and Wall Panel Systems:

A. Roof panels shall be 24 gauge. Wall panels shall be 26 gauge. All panels shall be galvanized (G-60, minimum).

B. Exterior Patterns:

Roof panels ~~may have~~shall be a 16" vertical rib (2" minimum rib height) standing seam ~~or overlapping rib~~ design. Valley may have minor striations (large profile valleys will not be accepted) to help limit "oil canning." The standing seam roof may be either snap-rib or machine rolled. Wall panels may have a vertical groove, flush, or architectural ribbed pattern.

C. Texture:

Exterior face may have an embossed or smooth texture.

D. Exterior Finish:

Manufacturer's exterior grade, factory-applied, oven-cured, silicone-polyester or polyvinylidene-fluoride, finish system with a minimum 35-year color performance warranty.

E. Interior Finish:

Manufacturer's interior grade, factory-applied, oven-cured, white polyester finish.

F. Flashings and Trim:

Metal flashings, trim, closures, and similar items shall be the manufacturer's standard items for matching the panel systems.

G. Fasteners:

Exposed fasteners shall be prefinished to match the building component surface with cup head washers.

III. Ridge Vent:

A. Construction:

Ridge Vents shall be 10’ in length with a low profile design and minimum 9” throats.

Exterior parts shall be constructed of 26 gauge galvanized (G90) material with factory applied painted surface. Interior parts shall be 24 gauge galvanized (G90). Vent shall be designed such that rain, snow, insects or birds do not enter the interior space.

B. Features:

Vents shall come with adjustable dampers with electric motor controls. Operation switch location to be approved by Project Manager.

IV. Accessories:

Building accessories, including door shoes, threshold and weather stripping for exterior doors shall be the building manufacturer's standard product.

Contractor shall provide a clamp-mounted snow guard system constructed of aluminum clamps and brackets, compatible with the specified roof system.

9. FABRICATION:

Panel units shall be fabricated in continuous vertical lengths to match the building dimensions. Horizontal seams in installed roof or wall panel systems will not be permitted.

10. ERECTION:

The building shall be erected in accordance with the approved drawings and the erection plans and manual. Components shall be installed in the correct position and alignment.

The finished building shall be trimmed, closed, and sealed weathertight.

Materials which are loose, improperly fitted, or damaged shall be repaired or replaced.

End of Section

SECTION 15010 - GENERAL PROVISIONS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. GENERAL:

   The drawings indicate the general arrangement of the proposed work. Details of departures due to actual field conditions or other causes shall be provided for by the Contractor as no extras will be paid for correcting faulty or poorly arranged and coordinated work.

3. COMPLETE INSTALLATION:

   Furnish and install all incidental parts and wiring required for the proper function of all component parts. The complete installation shall function smoothly and noiselessly to the full extent of the specifications and drawings. Complete the installation as rapidly as general construction permits. All safety devices shall be properly installed before starting equipment.

4. ORDINANCES AND CODES:

   All work shall be executed and inspected in accordance with all Underwriter's, Public Utililties, local and state codes and regulations applicable to the trade affected. Recommendations of ASTM, NFPA and ASHRAE shall be rigidly followed.

   Arrange and pay for all permits in connection with the work hereinafter specified and at completion of the work, furnish the Owner with the final certificate of inspection.

5. PERMITS AND INSPECTIONS:

   The contractor shall get a Colorado State Plumbing Permit prior to beginning the work. The work shall be inspected and approved. Make all changes, if any, directed to be made by the State Plumbing Inspector and accept and incur all expenses within the scope of the project to attain permanent approval.

6. COORDINATION:

   Before any equipment is purchased or fabricated and before running and/or fabricating any lines or piping, mechanical contractor or his subcontractors shall assure themselves that they can be run as contemplated.

   Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The mechanical contractor and his subcontractors shall carefully investigate all other mechanical and electrical drawings and the structural and finish conditions affecting all their work accordingly. Furnish such fittings, valves, offsets and accessories as may be required to meet such conditions, at no additional cost.

End of Section

SECTION 15050 - BASIC MATERIALS AND METHODS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. MATERIALS:

   Materials shall be new and of the best grades specified. Receive and be responsible for all owner-furnished equipment and provide rough-in and final connections for all mechanical equipment furnished under this Contract or by others.

3. WORKMANSHIP:

   Work throughout shall be performed by persons skilled in the installation of the various parts of the work herein specified.

4. CURBS, BASES, SUPPORTS:

   Major curbs, openings, and equipment supports will be provided under the General Section of this Contract only where shown on the drawings. All other supports, anchors, and bases shall be provided by the mechanical contractor for all mechanical equipment. Equipment shall be supported per manufacturer's written recommendations for noise-free operations.

5. ANCHORS, HANGERS AND SLEEVES:

   Provide and arrange for installation of required bolts, anchors, hangers, inserts, sleeves, etc., properly located for the work. Tape or wire hangers are not acceptable. Refer to Section 05500 - Metal Fabrications.

6. ELECTRICAL WIRING:

   All line voltage wiring including switches, disconnects, conduits and starters will be as scheduled herein.

   Automatic control wiring and interlock wiring for Mechanical Equipment shall be as scheduled herein, and shall be inserted into conduit.

7. FINAL APPROVAL:

   Before final acceptance, all mechanical equipment shall operate without objectionable noise or vibration. All equipment shall be adjusted to capacities shown on drawings. Make all corrections for above conditions to provide a completely acceptable system.

End of Section

SECTION 15266 - UNDERGROUND PIPE THERMAL PROTECTION

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to the installation of pipe insulation, heating cable and controls.

3. MEASUREMENTS:

   The heating cable and controls shall not be measured separately but shall be included as part of the building construction.

   Quantities for power, control wiring, splices, fastening tape and connectors shall not be measured separately but shall be included as part of the related construction.

4. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

5. JOB CONDITIONS:

   The insulation shall be chemically and thermally stable, undergoing no change in chemical composition or bulk density after commencement of operation.

   It shall not sinter or agglomerate at temperatures between 35°F and 460°F or require a curing procedure prior to commencement of operation.

6. MATERIALS:

   I. Approved Product:

      A. Heating Cable:

         The heating cable shall be constructed of #18 AWG copper bus wires with self-regulating conductive core, jacketed in a flame retardant TPE jacket, Copper Ground Braid, and a modified polyolefin jacket. It shall be equal to EasyHeat product “SR Trace, SR51J (120V)” or approved equal. The Heating Cable shall be constrolled by a line sensing thermostat. It shall be “C4XC” as manufactured by EasyHeat or approved equal.

         All fastening tape, connections, splices and seal kits shall be as recommended by the cable manufacturer.

7. HEATING CABLE INSTALLATION:

   I. Installation:

A. Refer to the manufacturer's installation instructions and design guide for proper installation and layout methods.

B. All installations and terminations must conform to the NEC and any other applicable national or local code requirements.

C. All heat tracing circuits shall be equipped with ground-fault equipment protections in accordance with applicable codes and standards.

D. Heating cable shall be installed such that all in-line devices and equipment may be easily removed and reinstalled without cuttin the heating cable.

E. Heating cable shall be installed on the bottom of the pipe and attached continuously with manufacturer supplied tape.

II. Testing:

A. Heating cable shall be tested with a megohmmeter (megger) between the heating cable bus wires and the heating cable metallic braid. The minimum acceptable level for testing is 500Vdc. This test should be performed a minimum of three times:

1. Prior to installation while the cable is still on reels.

2. After installation of heating cable and completion of circuit fabrication kits (including any splice kits) but prior to installation of thermal insulation.

3. After installationof thermal insulation, but prior to connecting cable to power.

End of Section

SECTION 15400 - PLUMBING SYSTEMS

1. SCOPE OF WORK:

Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

The work shall include, but is not necessarily limited to, furnishing and installing material and equipment, to satisfactorily complete the plumbing systems as shown on the drawings.

~~3. MEASUREMENTS:~~

~~Quantities for the installation of the potable water system shall be measured on a lump sum basis for the complete installation and included as part of the Furnish and Install Water Distribution System bid item as identified in the Bid Schedule.~~

~~Quantities for the sanitary sewer collection system starting at the outside edge of the foundation wall and including all internal plumbing shall be measured on a lump sum basis for the complete installation and included as part of the Furnish and Install Sanitary Sewer Collection System bid item as identified on the Bid Schedule.~~

~~Quantities for the gas piping system necessary to serve the building shall not be measured separately but shall be included as part of the Furnish and Install LPG Distribution System bid item as identified on the bid schedule.~~

~~4.~~3. SUBMITTALS:

Refer to Section 01300 - Submittals, for requirements.

~~5.~~4. QUALITY ASSURANCE:

Unless otherwise specified, plumbing systems shall be in accordance with the requirements of the Uniform Plumbing Code available from the International Association of Plumbing and Mechanical Officials, 5032 Alhambra Avenue, Los Angeles, CA 90032.

~~6.~~5. MATERIALS:

I. Copper Pipe:

A. Aboveground: Type "L" with 95-5 solder.

B. Buried: Type "K" with silver solder.

II. PEX Tubing:

PEX tube may be used in place of Copper Pipe for both interior and exterior installations. For interior installations red PEX tubing shall be used for the hot water and blue PEX tubing shall be used for the cold water.

PEX tubing for interior use shall meet ASTM F 876 and AWWA C904 for exterior

underground application. All piping shall have a minimum pressure rating of 160 psi at 74°F and 100 psi at 180°F. Tubing shall be tested in accordance with ASTM E84 for a flame spread/smoke developed index of 25/50 or less.

Fittings shall be certified by the manufacturer for use with their specific product.

All tubing and fittings shall be handled and stored in accordance with Manufacturer's recommendations.

All tubing used shall have the following information marked clearly on the pipe:

1. The manufacturer's name or trademark
2. The standard to which it conforms (ASTM F876 and/or AWWA C904)
3. Tube size and CTS
4. Material designation code (PEX0006)
5. Pressure/temperature rating(s)
6. SDR9
7. A laboratory seal or mark attesting to suitability for potable water
8. ASTM fittings designations approved for use by the tubing manufacturer

All underground installations shall have a tracer tape installed within the trench in accordance with these Standards and Specifications.

III. Black Iron and Galvanized Pipe:

Black iron (carbon steel), rated for 150 psi shall comply with ANSI B16.3 for dimensions, ASTM A 197 for material, ASTM A 153 for galvanizing and ANSI B2.1 for pipe threads.

Malleable iron fittings, 150 psi rated, shall comply with the industry standards for the pipe specified above.

Flange unions and companion flanges rated for 150 psi shall meet ANSI B16.1 for dimension and drilling, ASTM A 153 for galvanizing and ASTM A 126, Class A, for material. Flange gaskets shall meet ANSI A21.10 and AWWA requirements. The 1/8 inch thick gaskets shall be of SBR or neoprene rubber meeting ANSI requirements.

Flange bolts and nuts of high carbon, heat treated steel shall comply with ANSI B18.2.1 standard and be zinc chromate plated.

IV. PVC Pipe:

A. General:

Materials for PVC pipe shall comply with ASTM D 1784, Class 12454-B, (Type 1, Grade 1) by Certainteed, Diamond Plastics, or approved equal.

B. PVC Sewer and Vent Pipe:

PVC sewer and vent pipe and fittings shall conform to ASTM D 3034 and F 679, SDR-35. Joints shall comply with ASTM D 3212 for bell and spigot joints using flexible elastomeric seals.

Pressure joints shall have elastomeric seals meeting ASTM F 477.

C. Schedule PVC Pipe:

1. Schedule pipe shall meet ASTM D 1785.

2. Socket type fittings for solvent welded joints shall conform to ASTM D 2467 for Schedule 80 and ASTM D 2465 for threaded type.

3. Socket type fittings for solvent welded joints shall conform to ASTM D 2466 for Schedule 40 and ASTM D 2464 for the threaded type.

4. The solvent cement shall comply with ASTM D 2564.

5. Joints shall be made according to ASTM D 2855.

V. Supply Stop Valve:

A. Copper: NIBCO No. 725 or approved equal.

B. Threaded: NIBCO No. 75 or approved equal.

VI. Fixture Shutoff Valve: Chromium-plated by Brass Craft, American Standard or approved equal. Valves may be angled or straight.

VII. Sillcock:

A. Frost-proof: NIBCO No. 52 or approved equal.

B. Angle Sillcock:

1. Copper Pipe: NIBCO No. 763 or approved equal.

2. Threaded Pipe: NIBCO No. 63 or approved equal.

VIII. Insulating Bushings:

Install EPCO or approved equal dielectric type insulation bushings where piping connects to dissimilar metals.

IX. Joints:

Apply an approved teflon sealing tape on all threaded joints.

X. Escutcheons: Provide hinged or normal solid type for all penetrations.

XI. Accessories:

A. Wall Hydrant:

Anti-freeze, cast brass, ¾" hose end eall hydrant with renewable seat washer, integral vacuum breaker, loose T handle key. Provide Engineer with 1 key for each hydrant installed (minimum of 2).

B. Floor Drain:

Cast iron drain, adjustable (utilizing multiple thread interconnections) nickel bronze strainer and top, "P" trap. Provide ½" primer tapping. Drain outlet size to be the same as connecting pipe size.

C. Floor Drain Trap Seals:

Provide waterless trap seals for all floor drains. Floor drain trap seals shall be constructed of commercial gradde UV and ozone resistant ABS plastic housing and EPDM rubber diaphragm with a soft rubber sealing gasket.

D. P-Traps:

Exposed P-traps, drain lines, wall flanges and accessories for fixture connections shall be chromium-plated, heavy-duty type, of an approved manufacturer. Furnish P-traps with cast brass nuts and cleanout plugs.

~~7.~~6. INSTALLATION:

I. General:

Unless otherwise specified, install plumbing systems and test in accordance with the International Plumbing Code.

Soldered joints for copper tubing shall be made with suitable fittings. Clean surfaces to be soldered bright by approved mechanical means such as fine sandpaper, steel wool, or special steel brushes. Properly flux joints with a noncorrosive acidless flux. Perform installation of copper tubing only by experienced workmen.

Install piping without undue strains and stresses and make provisions for expansion, contraction, and structural settlement. Hangers, supports, and anchors shall be adequate in design and spaced at sufficiently close intervals to keep the pipe in alignment and to carry the load of the pipe and contents. Floor cleanout covers shall be level with the finished floor.

Provide ground joint unions at plumbing fixtures where union supply fittings are not part of the fixture trim at equipment connections.

Pitch all piping to drain at low points with hose end drain valves.

Threaded joints in chromium-plated pipe shall be made up neatly so that no threads are exposed. Make joints and connections in accordance the International Plumbing Code.

Take care to ensure that the pipe and fittings are kept clean during the work. Should any pipe become partially or wholly clogged before final acceptance, clean it out in a satisfactory manner or replace. Correct leakage or other defects in the work which may be disclosed at any time prior to acceptance.

Conceal supply, drain, and vent piping plumbing systems from view where feasible. Where exposed pipes pass through walls, floors, or finished ceilings, fit pipes with appropriate plates and escutcheons.

Insulate water service and distribution piping and traps installed in locations subject to freezing.

All work to be concealed or covered shall be tested and accepted before being concealed or covered.

All connections between copper tubing and steel pipe shall be made with dielectric insulating fittings. Dielectric unions shall be installed in the cold and hot-water pipelines near water heaters.

II. Pipe Insulation:

A. General:

All lines passing through the warehouse and shop area shall be insulated in accordance with this section. Lines within the office area do not require insulation.

B. Preassembled Lines: Apply insulation prior to assembling the line. Slip the full length of the tubing over the end of the pipe. Brush a light, even coat of adhesive, on butt ends. Allow the adhesive to set until dry to the touch but tacky under slight pressure, then butt the joints together firmly.

C. Fittings: The most commonly used fittings, tees, elbows and crosses, require only 45° and 90° cuts.

Insulation for sweat and threaded fittings shall be the same wall thickness as for all adjacent line insulation.

1. Sweated Fittings: On preassembled lines, push back the insulation a sufficient distance from fittings to prevent burning. Apply clamps to pipes, not insulation, to hold in place while soldering fittings. Remove clamps when fittings and pipes are cool.

Fabricate insulation for fittings, and join sections with adhesive. After the adhesive is dry, slit insulation and snap over the fittings.

Follow the same procedure for preassembled or existing lines. Slits and joints should be carefully bonded with adhesive after lines have been tested.

2. Threaded Fittings: Cut line insulation long enough to press against threaded fitting. Inside diameter of fitting insulation should be approximately the same as outside diameter of line insulation to cover overlap surface snugly. Allow a minimum of 1 in. overlap on line insulation. Follow the same fabricating and bonding procedures as for insulating sweated fittings and apply adhesive on overlap surfaces between fitting insulation and line insulation.

D. Appearance: The smooth outer surface shall have a neat finished appearance (and at the joints). No decorative or protective coatings shall be required for the indoor installations.

~~8.~~7. HYDROSTATIC TESTING:

I. Furnish equipment and qualified personnel to accomplish hydrostatic testing.

II. Test pressure piping in the presence of the Engineer. Hydrostatic testing shall consist of maintaining the piping at 100 psi a minimum of one hour after all leaks, including seepage, have been stopped. Thoroughly examine piping under test for leakage. Repair or replace defective elements and retest.

III. Sterilization:

A. General

Flush and sterilize the completed waterline with chlorine before acceptance for domestic service in the presence of the Engineer.

Chlorinate the finished pipeline prior to hydrostatic testing.

B. Health and Procedure Standards:

Flushing and sterilization of line shall be accomplished in accordance with the requirements of the Colorado State Board of Health, and AWWA C 601 for the chlorinating agent and the method of application.

C. Equipment, Materials and Procedure:

Furnish all equipment, material, qualified personnel and water for sterilization and flushing of waterline.

Liquid chlorine or Hypochlorite (H.T.H.) may be used, and shall conform to Federal Specifications O-C-114, Type II, Grade B.

If chlorine tablets are used for disinfection, one tablet shall be attached to the inside top of each section of pipe with Loctite Permatex No. 1 just prior to the pipe installation in the trench.

The number of 5-g tablets required for each pipe shall be $0.0012d^2L$ rounded to the next higher integer.

After the pipe is filled with water and chlorine, hold the water in contact with the pipe for 24 hours. After 24 hours the water in the pipeline shall be tested by the local county health authority or designated representative to insure a residual chlorine content of not less than 25 mg/1. Thoroughly flush pipeline to remove chlorinated water.

D. Care shall be taken in flushing the pipeline to prevent property damage and danger to the public.

Samples of water may be collected for bacteriological examination and residual chlorine content prior to service.

End of Section

SECTION 15440 - PLUMBING FIXTURES AND TRIM

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work within this Section consists of furnishing materials, equipment and labor necessary to satisfactorily complete the installation of plumbing fixtures.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. GENERAL PROVISIONS:

   All fixtures shall be securely bolted and screwed to walls and floor in accordance with manufacturer's rough-in and setting requirements. Make proper provisions for hanging fixtures during building construction. Steel backing plates shall be used to rigidly secure the fixtures. Set all metal fixtures' frames or bases in putty or waterproof mastic.

   After fixtures have been set, they shall be carefully protected until the building has been finally accepted. Any damage or defect developing before acceptance shall be replaced or situation resolved at the Contractor's expense. All metal trimmings on fixtures and exposed piping to fixtures shall be chrome plated, with chrome plated escutcheons.

5. PRODUCTS AND EXECUTION:

   I. Kitchen Sink:

      A. Sink: ADA Compliant counter mounted sink, Elkay, “Celebrity” single bowl sink or approved equal.

      B. Faucet: Centerset kitchen faucet, American Standard, “Colony Soft” or approved equal.

   II. Tub Sink:

      A. Material: Tub basin shall be constructed of stainless steel. Legs shall be heavy gauge steel with levelers.

      B. Capacity: 20 gallons (minimum)

      C. Mounting: Free standing, floor mounted

      D. Color: Stainless Steel

      E. Hardware: Centerset kitchen faucet, American Standard, "Colony Soft” or approved equal. Install a stand alone side handsprayer by American Standard or approved equal.

III. Water Fountain/Bottle Filler:

Stainless Steel, wall-mount water cooler with bottle filling station, barrier free access, Elkay model no. EMABF8WSSK or approved equal. The water cooler shall be capable of delivering 8 gph of 50°F water at 90°F ambient and 80°F inlet water. The units shall be capable of operating on 115V.

IV. Lavatory:

A. Lavatory: ADA Compliant wall mounted sink, Kohler "Greenwich", or approved equal.

B. Hardware: ADA Compliant centerset lavatory faucet, Kohler "Sculpted commercial bathroom sink faucet with Insight™ touchless technology", or approved equal.

V. Toilet:

The toilet shall be an ADA Compliant Kohler "Highline w/tank locks" pressure assisted, or approved equal vitreous china elongated siphon toilet or approved equal. Color shall be white. Provide an elongated, quiet close style, with integrated handle commercial toilet seat.

VI. Eye Wash Station:

Eye wash station shall be affixed to the tub faucet. Install Guardian Equipmetn Mount Eye wash, G1100 or approved equal.

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End of Section

SECTION 15453 - TANKLESS WATER HEATERS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED

   The work within this Section consists of furnishing materials, equipment and labor necessary to satisfactorily complete the installation of a tankless water heater.

3. SUBMITTALS:

   Refer to Section 01300 – Submittals, for requirements.

4. QUALITY ASSURANCE:

   The water heater shall meet efficiency performance criteria set by HUD, ASHRAE 90A-1980, or subsequent revisions thereto, and state performance codes when tested according to D.O.E. procedures.

5. DELIVERY, STORAGE AND HANDLING:

   Deliver, store, and handle the equipment to prevent damage and disfigurement.

   Protect all items from damage during transit and installation.

6. MATERIALS AND INSTALLATION:

   Electric Tankless Water Heater

   The electric tankless water heater shall be a Bosch, Powerstar AE3.4, EEmax SP3012, Stiebel Eletron Mini™ 3, or approved equivalent.

   I. Voltage: 120/240 Volt

   II. Amperage: 50 amperes maximum.

   III. Activation Water Flow: Maximum of 0.5 gallons per minute required to activate water flow maximum.

   IV. Temperature Rise: Must raise the ambient temperature of the water 41 degrees Fahrenheit minimum at 0.5 gallons per minute flow rate.

7. INSPECTION

   I. Upon Delivery:

      Check for damage that may have occurred in shipment. Reject equipment that will not satisfactorily function.

II. During Installation:

Check for the proper location of the unit. Check that the water heater unit is installed plumb and level.

End of Section

SECTION 15456 - LIQUID PETROLEUM GAS SYSTEMS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the complete furnishing and installation of liquid petroleum gas systems.

~~3. MEASUREMENTS:~~

~~Quantities shall be measured on a lump sum basis for furnishing and installation of the liquid propane distribution system (including tank) and included as part of the Furnish and Install LPG Distribution System bid item as identified on the bid schedule.~~

~~Quantities shall not be measured for the required earthwork, fittings, control valves or other associated work, but shall be included as a portion of the complete installation.~~

~~Quantities shall not be measured separately for the initial filling of the propane tank but shall be included as part of the Furnish and Install LPG Distribution System bid item as identified on the bid schedule.~~

~~4.~~3. SUBMITTALS:

Refer to Section 01300 - Submittals, for requirements.

~~5.~~4. PIPE INSPECTION AND INSTALLATION:

I. Sizing:

The Contractor will be responsible for sizing the associated gas lines as needed to serve each of the units being served. A layout with sizing shall be provided as part of the submittal process. Piping shall be sized for both LPG and Natural Gas. CPW may convert system to Natural Gas once it is available to the site. All appliances shall be capable of switching from LPG to Natural Gas. Adpater kits necessary for conversion from LPG to Natural Gas shall be provided by Contractor in sealed bags and securely fastened to each of the approprieate units.

II. Alignment:

Alignment of pipe shall be maintained to the staked lines and grades.

III. Placement:

Lowering and laying of pipe, fittings and accessories into the trenches carefully and with proper equipment shall be accomplished in a manner to prevent damage.

Any defective pipe materials found during the inspection, prior to placing within the trench, shall be replaced.

All foreign matter or dirt shall be removed from the interior of the pipe before lowering into position in the trench. Pipe shall be kept clean during and after installation.

The sealing surfaces of the pipe shall be cleaned immediately before assembly, and assembly shall be made as recommended by the manufacturer. Check the completed piping to assure joints are intact.

Prior to the placement of earthfill or other material around the pipe, the pipe shall be observed for leakage. Any leaks shall be repaired. The procedure shall be repeated until the pipe does not leak. (The pipe joints shall show no leakage using the standard soap suds testing method for gas service applications). Testing shall be done for 15 minutes at 10 psi or as otherwise required by the gas company.

When pipe laying is not in progress, the open ends of installed pipe shall be closed to prevent entrance of trench water into the line. No pipe shall be laid when the trench conditions or the weather are unsuitable for proper installation as determined by the Engineer.

IV. Handling:

The pipe shall be hauled and handled in a manner that will avoid damage to the pipe.

Remove and replace pipe damaged beyond repair in hauling or handling.

V. Installation:

Proper equipment shall be provided for lowering the pipe into the trench. Pipe shall be laid carefully upon the previously prepared foundation, true to lines and grade as indicated on the drawings.

VI. Initial Fill:

The Contractor shall coordinate with the propane supplier to fill the tank prior to initial acceptance of the project. Any propane used during construction shall be the contractor's responsibility until initial acceptance of the project.

~~6.~~5. MATERIALS AND INSTALLATION:

I. Liquid Petroleum Gas Tank:

Contractor shall provide a 1,000 gallon tank purchased tank (not leased). Tank shall be equipped with all necessary gauges and valves to meet local suppliers requirements. Contractor shall coordinate with suppliers to ensure all requirements have been met.

II. Steel Gas Pipe:

A. Pipe: Steel pipe approved for gas service shall comply with ANSI B125.2, ASTM A 120 (Schedule 80) and AWWA C 202 (mill pipe) standards.

B. Joints and Fittings: The threaded fittings shall comply with ANSI B16.3 and AWWA C 208.

Make all pipe joints carefully and neatly. All threaded joints shall comply with ANSI B2.1 NPT. Use joint compound or "teflon" thread tape on male threads only in making joints.

III. Copper Gas Tubing:

Soft temper, coilable, copper gas tubing shall be used for the interior applications only. Provide brass flared tube fittings and control corporation stops for the copper tubing connections and control.

~~7.~~6. SAFETY STANDARDS:

The design, construction, location, installation, and operation of the liquid fuel system and equipment shall conform to the minimum standards as prescribed by the applicable sections of the current edition of the National Fire Code published by The National Fire Protection Association (NFPA). Copies are available for review at the office of the state inspector of oils:

Colorado Department of Labor and Employment
Oil Inspection Section
1515 Arapahoe Street • T3-#600
Denver, CO 80202
(303) 620-4300

~~8.~~7. OPERATION AND MAINTENANCE:

The Contractor shall make provisions with the local gas provider to fill the tank prior to initial acceptance. Contractor will be responsible for all gas used during the construction process.

End of Section

SECTION 15500 - HEATING AND AIR CONDITIONING

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   Work within this Section consists of furnishing materials, equipment and labor necessary to satisfactorily complete the installation of heating and cooling systems, and associated equipment.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. QUALITY ASSURANCE:

   I. Acceptable Manufacturer:

      All heating, ventilation, and air conditioning equipment shall be Lennox or approved equal. Other acceptable manufacturers are Trane, Carrier, and Amana.

   II. Regulatory Agency Requirements:

      The units shall be American Gas Association (AGA) design certified, shall be rated and tested in accordance with U.S. Department of Energy test procedures and Federal Trade Commission labeling regulations.

   III. Reference Standards:

      Except as modified by governing codes and by the Contract, comply with the applicable provisions and recommendations of the following:

      A. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

      B. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

      C. National Fire Protection Association (NFPA).

5. DELIVERY, STORAGE AND HANDLING:

   Deliver, store, and handle the equipment to prevent damage and disfigurement.

   Protect all items from damage during transit and installation.

6. GUARANTEE:

Promptly repair or replace any defective material or faulty workmanship that becomes apparent prior to the final inspection.

7. MATERIALS AND INSTALLATION

I. Unit Heater (UH-1):

A. Heaters shall be Lennox Unit Heaters Model "LF24-75A" 75,000 BTUH input or approved equal.

B. Installation:

The unit shall be installed in accordance with manufacturer's recommendations for LPG delivery system.

Venting piping shall be stainless steel or galvanized steel installed through the walls and terminated with weather/insect proof vent caps on the exterior of the building. Venting pipe shall be supported with galvanized strapping. The vent shall be sloped at ¼" per foot maximum.

A listed thimble shall be installed through the wall and insulation.

Adjust gas pressure as required by the manufacturer accounting for supply pressure and altitude.

C. Thermostat (Unit Heater):

Thermostat shall be compatible with the Unit Heater and be a weekday/weekend programmable thermostat with a minimum of four time periods per day. The thermostat shall have a minimum heat set point of 40°F. Install isolation relay as recommended by unit heater manufacturer.

II. High Efficiency Gas Fired Furnaces(FU-1):

A. Up-Flow Gas Fired Furnaces:

1. Furnaces shall be Lennox Commercial Furnace Model "SLP98V" (98.7% AFUE Energy Efficiency) 66,000 BTUH input or approved equal. Manufacturer's conversion kit for Natural Gas shall be provided and securely fastened to unit in a sealed bag for future use. Unit shall be provided with equiped with necessary kit to operate at project altitude.

2. Cleanable Air Filter and Rack: Washable or vacuum cleanable frame type filter is to be furnished rated with at MERV 9 or higher . Install filter rack such that filter may be easily maintained.

3. Combustion Air Intake Box: Containing the purge blower, two pressure switches and air intake flapper valve. Purge blower is to be equipped with a permanently lubricated motor. Blower shall

operate only during pre-purge and postpurge cycles. Pressure switches shall terminate unit operation in case of air intake or flue exhaust blockage.

4. Automatic Gas Valve: 24 volt redundant two stage gas control valve shall combine gas pressure regulation and manual main shut-off valve into a compact combination control.

5. Wiring Junction Box: Power supply and thermostat wiring connections are to be made at the wiring junction box. Box shall contain transformer, high and low voltage terminal strips and blower cooling relay.

6. Fan and Limit Controls: Factory installed and accurately located on vestibule.

7. Approvals: The design shall be certified by A.G.A. Laboratories and rating certified by GAMA.

8. Installation Recommendations: Place (4) neoprene rubber isolation mounting pads and/or base insulation pad, 1 inch thick, 1½ lb. density fiberglass, under the unit. Install flexible duct connectors in the supply air plenum and return air plenum or duct connection.

   Insulate (1 inch thick 1½ to 3 lb. density, matt faced fiberglass) supply and return air plenums through take-off or duct elbow. Use flexible connector in gas supply piping where allowed by local codes. Insulate (refrigerant piping insulation or equivalent) all straps and hangers used in suspending ducts, electrical conduit, gas piping, combustion air intake piping and flue exhaust piping. In addition, use rigid PVC pipe or tubing for drain line from the heat coil condensate drain leg to the drain. Do not use copper tubing.

9. LPG Conversion Kit: Kit shall be provided for field changeover from natural gas if needed. Manufacturer's conversion kit for Natural Gas shall be provided and securely fastened to unit in a sealed bag for future use.

10. The furnace shall be a direct vent system. Intake and exhaust pipes shall be routed horizontally through the outside wall. Install piping and exterior pipe terminations in accordance with manufacturer's recommendations. All vent caps shall be equiped with insect mesh.

III. Evaporative Coils:

A. U.L. and A.R.I. listed, evaporator coil shall be constructed of aluminum fins machine fitted to seamless copper tubes and pressure leak tested to 450 psi. The coil shall be precharged and consist of capillary refrigerant control, corrosion resistant condensate pan with drain connection and mechanical or sweat refrigerant line connections. Pipe the drain pan connection full size to floor drain with SDR 11 PVC pipe.

Refrigerant lines shall be concealed within the wall and ceiling cavities. No exposure within the occupied areas will be allowed.

B. Coil Cabinet shall be Lennox CX34-38, Trane, Carrier or approved equal.

IV. Condensing Units:

A. Condensing Units shall be Lennox XC14-036-230, Trane, Carrier or approved equal. The unit shall have 33,800 BTU/hr. sensible capacity with 95°F dry bulb entering condensing temperature and 63°F wet bulb and 84°F dry bulb entering evaporator temperatures ARI Standard 210 rated cooling capacity.

B. U.L. and A.R.I. listed. Galvanized steel cabinet with baked-on enamel finish, access panels and grilles for coil and fan protection. Condensing coil shall be constructed of aluminum fins bonded to copper tubing and be pressure and leak tested to 450 psi. The unit shall be shipped with a holding charge of R-22. Refrigerant lines shall extend outside of cabinet and be equipped with fittings which permit mechanical or sweat connections. Service valves with fittings, gauge ports and drier-filter shall be furnished with refrigerant lines. Direct drive, propeller type condenser fan shall be arranged for vertical discharge. Compressor shall be hermetic with vibration isolation and have overload protection, crankcase heaters and high pressure safety switch. Unit shall be shipped completely assembled, piped and wired internally ready for field connection. Low ambient control down to 0°F. See furnace specification for temperature control.

C. Unit shall be equipped with freezestat which senses suction line temperature and cycles units when suction line temperature falls below it's setpoint.

D. Compressor shall be equipped equiped

V. Economizer (Mixing Damper Box):

A. Lennox, Model EMD14M-65 "Economizer Damper", or approved equal. The compact, multi-position damper box shall be equipped with a modulating damper motor non-sensitive to mounting position. The control system (M-2214) shall include a mixed air temperature controller, a transformer and all necessary relays in a relay control center and a set of damper and compressor monitors to allow for cooling by utilizing fresh air when temperatures are desirable.

B. The mixing damper box cabinet shall be constructed of heavy gauge steel with a finish of baked-on enamel. The air inlet and outlet openings in the cabinet shall be flanged. Large removable panels on both sides of the cabinet shall be provided. Damper blades shall be lined with polyurethane strips to make a tight air seal and make closing operation quiet. Damper blade shall ride on nylon bearings which require no lubrication. Damper boxes shall be shipped with the damper motor and

linkage factor installed and tested. Linkage is commercial quality and corrosion resistant.

A minimum of 10% fresh air shall be inducted into the system through the adjusted mixing damper box at all times.

VI. Commercial Thermostat:

Thermostat shall be a seven day programmable thermostat with a minimum of four time periods per day. The thermostat shall also be capable of controlling the economizer within the office area.

Lennox, Commercial Touchscreen Thermostat model no. "C0STAT02AE1L" or approved equal, shall be furnished and installed. Each thermostat shall have a C0MISC15AE1 clear plastic locking cover.

8. INSPECTION:

I. Upon Delivery:

Check for damage that may have occurred in shipment. Reject equipment that will not satisfactorily function.

II. During Installation:

Check for the proper location of the unit. Check that the furnace unit is installed plumb and level.

III. After Installation:

Check the operation of all components and each component's correct function during its period of operation within the operating sequence.

9. ADJUST AND CLEAN:

Adjust and lubricate moving parts for smooth, quiet operation.

As work progresses, remove the crating and packing materials from the premises.

End of Section

SECTION 15750 - GAS INFRARED HEATER

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   Work within this section consists of furnishing materials, equipment and labor necessary to satisfactorily complete the installation of the heating system and associated equipment.

3. QUALITY ASSURANCE:

   I. Acceptable Manufacturer:

      All heating and control equipment shall be Re-Verber-Ray, distributed by Infrared Radiant Inc.,1478 W. Tufts Ave., Englewood, CO 80110, phone (303) 761-1444, or approved equal.

   II. Regulatory Agency Requirements:

      The units shall be American Gas Association (AGA) design certified, shall be rated and tested in accordance with the U.S. Department of Energy test procedures and Federal Trade Commission labeling regulations.

   III. Reference Standards:

      Except as modified by governing codes and by contract documents, comply with the applicable provisions and recommendations of the following:

      A. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

      B. National Fire Protection Association (NFPA).

      C. Heaters design shall be certified by the American Gas Association (AGA) per American National Standard ANSI Z83.6-1982, comply with current Occupational Safety and Health Act (OSHA) requirements, be accepted by Factory Mutual (FM), and be listed by the Underwriters Laboratories (UL). The supplier shall prove AGA certificate numbers/UL guide and file numbers to verify approval(s) and heaters shall bear the AGA Seal of Certification/UL Listing Mark.

4. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

5. DELIVERY, STORAGE AND HANDLING:

   Deliver, store, and handle the equipment to prevent damage and disfigurement.

Protect all items for damage during transit and installation.

6. GUARANTEE:

Promptly repair or replace any defective material or faulty workmanship that becomes apparent prior to the final inspection.

7. MATERIALS AND INSTALLATION:

I. Gas infrared straight tube heaters (IR-1):

A. Heater parameters/specifications:

1. Gas fired vented infrared space heaters shall be furnished and installed in accordance with governing codes as listed. Heaters shall be Re-Verber-Ray, HL3 Series or approved equal. Infrared heaters shall be equiped with a high/low capability. Units shall be capable of providing a minimum of 75,000 BTU on the high side.

2. Heaters shall operate satisfactorily in any position from horizontal to forty-five degrees from horizontal.

3. Heaters shall be designed to satisfactorily operate at on Propane or Natural Gas. Initial installation shall be configured for Propane and contractor shall provide conversion kit for Natural Gas. Kit shall be securely fastened to unit in a sealed bag.

4. No condensation shall form from the products of combustion in the combustion chamber or heat exchanger while at operating temperature.

B. Heater Control System:

1. Heater shall be equipped with a direct silicon carbide Glo-Bar ignition control system. Power supplied to each heater shall be 120 VAC, 60 Hz.

2. The heaters control system shall shutoff the gas flow to the main burner in the event either a main gas supply line or power supply line interruption or failure occurs.

3. Control assembly shall be certified by AGA, shall provide main burner regulation, and shall be of the redundant dual selonoid type.

4. Heater controls shall include two differential pressure switches; one to monitor air intake flow so as to provide complete unit shutoff in the event of insufficient combustion air or flue blockage.

5. Prepurge of tubes for 45 seconds prior to firing sequence.

C. Heater Construction:

1. The material used in the heater's combustion chamber shall be 16 gauge titanium alloy aluminized steel, 4" O.D. for models below 100,000 BTUH, coated with Pyromark series 1200 high temperature corrosion resistant black paint with an emissivity rating of .95.

2. The radiant tube emitter shall be 16 gauge aluminized steel, 4" O.D. coated with Pyromark series 1200 high temperature corrosion resistant black paint with an emissivity rating of .95.

3. The reflectors shall be .025 bright aluminum designed to provide uniform irradiance levels and be adjustable.

4. The fan blower motor shall be protected by a thermal overload switch.

5. The design of the heater shall be such that the components utilized in the heater's control assembly shall be interchangeable from model to another and easily removed.

6. Heater shall be vented or unvented in accordance with manufacturer's recommendations and NFPA 74.1984 and provide for venting of products of combustion without the use of a draft hood.

7. Heater shall be equipped with sight glass for visual inspection of silicon carbide ignitor operation and burner flame.

8. Vent caps shall be UL approved and AGA Certified for use with heater. Breidert or Mastervent vent caps only of side wall venting.

9. The heaters shall be designed such that, at customer option, outside combustion air may be supplied in accordance with the National Fuel Gas Code ANS Z223.1 latest edition, without the use of additional supply fans. Provide as shown on heating plan.

10. An air intake collar and termination fitting AGA approved for use with the heater shall be provided where outside air intake for combustion is specified.

D. Accessories: (each unit)

1. Model TH-1F81, two stage programmable Thermostat, 45 degrees to 90 degrees range.

2. Model THC-S chain set, five foot with hooks.

3. Model GC50 gas cock, 50 psi max. ½" x ½" FPT with 1/8" NPT side pressure tap.

4. reflector hanger.

5. Model 4-DSK (side wall)/RTVP-4 (rooftop) vent kit.

6. Model WIV wall inlet cap with screen.

7. Model 325-3 high pressure regulator (if required by manufacturer).

8. INSPECTION:

I. Upon Delivery:

Check for damage that may have occurred in shipment. Reject equipment that will not satisfactorily function.

II. During Installation:

Check for the proper location of the unit. Check that the heater unit is installed plumb and level.

III. After Installation:

Check the operation of all components and each component's correct function during its period of operation within the operating sequence.

9. ADJUST AND CLEAN:

Adjust and lubricate moving parts for smooth, quiet operation.

As work progresses, remove the crating and packing materials from the premises.

10. WARRANTY:

The supplier shall provide a manufacturer's written warranty covering the heater's infrared element assembly for a period of three years and all components utilized in the heater's control assembly for a period of one year.

End of Section

SECTION 15872 - POWERED WALL EXHAUSTERS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK SCHEDULED:

   The work shall include, but is not necessarily limited to the installation of a direct drive wall exhauster for an end wall mounting where shown on the drawings.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. MATERIALS AND INSTALLATION:

   I. Exhauster:

      Furnish and install, where noted on the drawings, a direct drive wall ventilation fan.

      Construct the ventilator housing of heavy gauge spun aluminum. The finished housing shall be weatherproof.

      Fan blades shall be 36" diameter of aluminum construction and completely enclosed in an OSHA approved spiral enclosure.

      Provide a direct drive motor with a minimum of 14,000 cfm capacity at 0" static pressure.

5. COMPLETION:

   At the completion of the work, clean the affected areas of all debris, building and packing materials, having them in acceptable condition as determined by the Project Manager.

End of Section

SECTION 15890 - DUCTWORK

1. SCOPE OF WORK:

Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

The work within this Section consists of furnishing materials, equipment, and labor necessary to satisfactorily complete the installation of all ductwork for the complete air handling transport system.

~~3. MEASUREMENTS:~~

~~Quantities shall not be measured for the fabricated sheet metal ductwork, but shall be included as part of the Furnish and Install Mezzanine and Office bid item as identified on the bid schedule.~~

~~4.~~3. SUBMITTALS:

Refer to Section 01300 - Submittals, for requirements.

~~5.~~4. QUALITY ASSURANCE:

Reference Standards: Except as modified by governing codes and by the Contract, comply with the applicable provisions and recommendations of the following:

I. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

II. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

III. National Fire Protection Association (NFPA).

~~6.~~5. MATERIALS AND INSTALLATION:

I. Metal and Gauge:

Except where fiberglass duct materials is expressly indicated, galvanized iron shall be used throughout, fabricated, and installed so that no vibration or noise results. It shall be made from the best grade of mild steel sheets of the U.S. Standard Gauge, as recommended in the latest edition of ASHRAE Guide, with joint tabulated at the Contractor's option.

II. Rectangular and Round Rigid Ductwork:

A. All ductwork shall be constructed and erected in a workmanlike manner. Ducts shall be straight and smooth on the inside with neatly finished joints, air tight, and shall be free from vibration under all conditions in direction of air flow. Ducts shall be securely attached to building

construction in an approved manner. Change in dimensions and shape of ducts shall be gradual. All duct sizes fall within limiting dimensions indicated on drawings, unless otherwise approved.

B. Duct Turns: All 90° rectangular elbows up to 18" wide and all 45° elbows shall consist of an inside radius of not less than one-half the width of the duct, or shall be furnished with single blade duct vanes with 2¼" blade spacing. 90° elbows larger than 18" shall be equipped with air foil type duct vanes having an inside radius of 4½", and an outside radius of 2¼", and shall be Tuttle & Bailey Type D, Elgen Manufacturing Corp., Vane Runners, or approved equal.

Curved elbows in round ducts shall have a center line radius equal to 1½ times the duct width. Square elbows shall have turning vanes similar to Tuttle-Bailey Ducturn. Job fabricated turning vanes will not be accepted without prior approval.

C. Flexible Connections: Furnish and install sound isolating flexible connections on the inlet and outlet of each fan and unit to which duct connectors are made. Flexible connections shall be made from Ventglas, neoprene coated glass fabric. At least 1" slack shall be allowed in these connections to insure that no vibration is transmitted from fan to ductwork. Fabric shall either be folded in with the metal or attached with metal collar frames at each end to prevent air leakage.

D. Joints and openings in ducts and around equipment with excessive leakage shall be sealed air tight.

E. Seams: All exposed ducts with a maximum width and/or depth of 24" shall have flat seams.

Make all seams in fiberglass duct with heat-set tape.

F. Collars: Wherever exposed ducts pass through walls, floors, or ceilings, a 2" sheet metal collar fitting close around ducts shall be slipped along duct until flange is tight against finished surface covering edges of openings and presenting a neat appearance. Lock collar to duct.

G. Dampers: Opposed blade type volume dampers shall be installed where called for on drawings or otherwise necessary for proper balancing. Dampers to have felt or neoprene edges, and shall be gasketed around inside of frame for tight fit.

H. Duct Hardware for Surface Mounted Dampers:

1. Dampers with a shaft length of 12" or less shall be equipped with Ventlok No. 635 or approved equal 3/8" dial regulators and No. 607 end bearings.

2. Larger dampers shall be controlled with Ventlok or approved equal self-locking regulators No. 640 or No. 641 in 3/8" or ½" size, and shall be installed with No. 607 end bearings.

I. Duct hardware for Concealed Manual Dampers: Concealed ceiling dampers shall be operated by means of Ventlok No. 666 concealed damper regulators or No. 677 concealed damper regulators. Where ceiling regulators must be flush mounted, Ventlok No. 688 exposed damper regulators shall be used.

J. All concealed and lined ductwork shall be a fiberglass duct system, Type II taping system ½" thick with vapor seal. Installation as recommended by Manufacturer. Ductwork to be reinforced to ½" static pressure class as a minimum. All ducts in equipment rooms or otherwise exposed must be metal ductwork with liner.

K. At all places where inside of duct will be visible through return air grille louvers, etc., paint normally visible inside portion of duct with flat black paint.

L. Install hinged doors on ductwork and housing to provide access to all parts of every automatic damper, fire damper and all other items requiring maintenance or inspection. Access doors shall be 13" x 12" if permitted by duct size, and if not, shall be as large as possible. All access panels shall be at least two gauges heavier than the surface in which placed and shall have sponge rubber gaskets cemented in place.

M. Where insulation is expressly indicated, insulation shall be 1 inch thick ½ to 3 lb. density, matt faced fiberglass attached to the inside of rigid metal ducts.

N. When fiberglass rigid duct is used, no additional insulation will be required. Fiberglass duct shall not be permitted for any exhaust system.

III. Round Flexible Ductwork (Insulated, Low Pressure):

A. Approved manufacturers: Genflex other approved manufacturers are Clevaflex, Flex-Master, Hercules, Therma-Flex, Wiremold, or approved equal.

B. Insulated, low-pressure, flexible duct system shall be a factory-fabricated assembly consisting of a zinc-coated spring steel helix. Flex duct and insulation shall be sheathed in a vapor barrier jacket. Inner liner shall be of continuous, non-perforated aluminum copolymer forming a positive inner air seal, such that if the outer vapor barrier is punctured, no air will be lost. The composite assembly, including insulation and vapor barrier, shall meet the Class 1 requirement of NFPA Bulletin No. 9A, and be labeled by Underwriters' Laboratories, Inc., with a flame-spread rating of 25 or less, and a smoke developed rating of 50 or under.

C. Duct system shall include a Model CB coupling as an integral part of one end, factory installed for quick connection to an air outlet device. Opposite end shall have a "spin in" fitting, Model SM-1C, 1½ to 1 bell mouth fitting where non-removable ceilings occur, and SM-1D, 1½ to 1 bell mouth fitting with damper where "lift-out" ceilings occur.

D. Flexible ducts shall be installed in a fully extended condition, free of sags and kinks, using only the minimum length required to make the connection. Maximum length to be 10'-0".

E. Where horizontal support is required, flexible duct shall be suspended on 36 inch centers with a minimum ¾ inch wide flat banding material. All joints and connections shall be made with ½ inch wide, positive-locking, steel straps.

F. Insulated, low-pressure, flexible duct system Genflex Type SLF-181 or approved equal.

G. Where "lift-out" ceilings occur, flex duct shall be installed with volume damper in flex duct at connection to main duct, and a distributing grid at the diffuser (omit volume damper at the diffuser).

H. Where permanent ceilings occur, omit damper in flex duct and provide an opposed blade volume damper at the diffuser.

~~7.~~6. COMPLETION:

At the completion of this Division's work, clean the area of all debris, building and packing materials, leaving it in an acceptable condition as determined by the Engineer.

End of Section

SECTION 16010 - GENERAL PROVISIONS

1. SCOPE OF WORK:

Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. GENERAL:

I. The drawings show only the general location of conductors and the approximate location of fixtures, panels, outlets, switches, and other equipment. They are understood to be subject to such revision as may be found necessary or desirable at the time the work is installed. Report significant changes in feature location or conductor locations to the Engineer for approval prior to alteration. The contractor shall be responsible for all other drawings necessary for permitting

II. Obtain from the Engineer in the field the location of such outlets or equipment not definitely located on the drawings.

III. Examine and compare the electrical drawings and specifications with the drawings and specifications of other trades. Report any discrepancies to the Engineer and obtain from him written instructions for changes necessary in the electrical work.

IV. The drawings generally do not indicate the number of wires for the branch circuit wiring of fixtures and outlets or the actual circuiting. Provide the correct wire size and quantity as required by the requirements of the NEC.

3. MEASUREMENTS:

I. Service:

A. The Owner will pay ~~the Contractor an allowance~~ for permitting and securing power from the power company including the installation of required transformers and power company cable. ~~The allowance does not include administration/coordination costs associated with the Contractor's time and effort. Those costs should be included elsewhere as applicable.~~

~~A.~~B. The contractor will be responsible for all other work related to the installation of the electrical system and shall be paid in accordance with the bid schedule.

~~B. Primary Service Cable:~~

~~Quantities shall not be measured separately for the primary buried service cable installation, but shall be included into the allowance for the power company.~~

~~C. Electric Meter:~~

~~The Contractor shall furnish meter housing and 2" drop conduit with slip~~

joint and shall be included as part of the Furnish and Install Electrical Distribution System bid item as identified on the bid schedule.

D. Service Entrance:

Quantities shall not be measured separately for service entrance equipment but shall be included as part of the electrical installation.

II. Distribution:

A. Quantities shall be measured on a lump sum basis for the electrical distribution system and shall be included as part of the Furnish and Install Electrical Distribution System bid item as identified on the bid schedule.

B. Quantities shall not be measured separately for any wiring, wiring devices or supports but shall be included as part of the electrical installation.

C. Quantities shall not be measured for feeder circuits, breaker panels or subdistribution panels but shall be included as part of the electrical installation.

III. Equipment and Control:

Quantities shall not be measured for furnishing or connection of starters or motor control wiring but shall be included into the installation of motors complete and in place.

IV. Lighting and Controls:

Quantities shall not be measured for connection of lighting or controls but shall be included as part of the electrical installation.

4. SUBMITTALS:

Refer to Section 01300 - Submittals, for requirements.

5. CODES, REGULATIONS, STANDARDS AND PERMITS:

I. The electrical installation shall be in compliance with the latest requirements of the NEC, O.S.H.A. and the rules and regulations and requirements of the power company supplying power to the buildings. Comply with ASHRAE 90-75A energy conservation code.

II. The electrical installation and the Contractor shall comply fully with all city, county and state laws, ordinances and regulations applicable to electrical installations.

III. Notify the Engineer of conflicts between these specifications, drawings, codes and ordinances.

IV. All local fees and permits and services of inspection authorities shall be obtained

and paid for by the Contractor. The Contractor shall cooperate fully with local utility companies with respect to their services. The Contractor shall include in his bid, any costs to be incurred relative to power service (primary and/or secondary).

6. COORDINATION OF WORK:

   I. Coordinate with Division personnel the dates and times of installation.

   II. Certain materials will be provided by other trades. Examine the Contract to ascertain these requirements.

   III. Carefully check space requirements with other trades to insure that all material can be installed in the spaces allotted thereto.

   IV. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items to work that require access so that the ceiling trade will know where to install access doors and panels. Before installation, make proper provisions to avoid interferences in a manner approved by the Engineer.

   V. Due to the type of the installation, a fixed sequence of operation is required to properly install the complete systems. Coordinate projects and schedule work with other trades in accordance with the construction sequence.

7. CERTIFICATION:

   Upon completion of the electrical service installation the Colorado State Electrical Board will be contacted by the Contractor and arrange to have the new construction inspected and certified. Make all changes, if any, directed to be made by the State Electrical Board and accept and incur all expenses within the scope of the project to attain permanent service certification for the electrical service installations.

8. INSPECTION TESTS AND GUARANTEES:

   After the electrical installation is completed and at such times as the Engineer may direct, the Contractor shall conduct an operating test for approval. The installation shall be demonstrated to be in accordance with the requirements of this specification. Any defects revealed shall be corrected promptly at the Contractor's expense and the tests reconducted.

9. PRODUCTS:

   I. If products and materials are specified or indicated on the drawings for a specific item or system, use those products or materials. If products and materials are not listed in either of the above, use first class products and materials, subject to approval of shop drawings.

   II. All equipment capacities, etc., are listed for job site operating conditions. All equipment sensitive to altitude is to be derated and method of derating shown on shop drawing. Where operating conditions shown differ from the laboratory

test conditions, the equipment to be derated and the method of derating is to be shown on shop drawings.

III. All products and materials to be new, clean, free of defects and free of damage and corrosion, excluding temporary power and lighting.

IV. Delivery of Products and Materials:

Ship and store all products and materials in a manner which will protect them from damages, weather and entry of debris. If items are damaged, do not install, but take immediate steps to obtain replacement or repair. Deliver materials (except bulk materials) in manufacturer's unopened container fully identified with manufacturer's name, trade name, type, class, grade, size and color.

V. Storage of Products and Materials:

Store materials suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed. Store all items subject to moisture damage in dry, heated spaces.

VI. Identification:

Furnish a nameplate for each panel, feeder switch, etc. Unless otherwise noted, use lamacoid or aluminum with a black enamel background with etched or engraved upper case letters, enclosed by natural aluminum border, or black and white laminated bakelite plate with beveled edges. Inscribe name and number of equipment as shown on the drawings.

10. EXECUTION:

I. Follow manufacturer's instructions for installing, connecting, and adjusting all equipment. Provide one copy of such instructions to the Engineer before installing any equipment. Provide a copy of such instructions at the equipment during any work on the equipment. Provide all special valves, piping, wiring and accessories.

II. Use mechanics skilled in their trade for all work.

III. Keep all items protected before and after installation. Cleanup all debris.

IV. Perform all tests required by local authorities in addition to tests specified herein, such as life safety systems.

V. Applicable equipment and materials are to be listed by Underwriters' Laboratories and manufactured in accordance with ASME, NEMA, ANSI or IEEE standards and as approved by local authorities having jurisdiction.

VI. Before commencing work, examine all adjoining work on which this work is in any way dependent for perfect workmanship and report any condition which prevents performance of first class work. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be

changed or altered. Adjust location of conduits, panels, equipment, pull boxes, fixtures, etc., to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each pipe and duct prior to fabrication.

VII. Right of Way: Lines which pitch to have the right-of-way over those which do not pitch. For example: steam, condensate, and plumbing drains normally have right-of-way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.

VIII. Make offsets, transitions and changes in direction in conduits as required to maintain proper head room in pitch of sloping lines whether or not indicated on the drawings.

IX. Miscellaneous Repair:

A. The work shall be carefully laid out in advance to avoid damage to surrounding elements. Where cutting, channeling, chasing or drilling is necessary for proper installation, the work shall be carefully done. Any damage shall be repaired or replaced by skilled mechanics of the trades involved at no additional cost to the Owner.

B. Slots, chases, openings and recesses through floors, walls, ceilings and roofs will be provided by the various trades in their respective materials. The trade requiring them to properly locate such openings shall be responsible for any cutting and patching caused by the neglect to do so.

C. The Contractor shall not do cutting, channeling, chasing, or drilling of unfinished masonry, structural steel, wood members, tile, etc., unless he first obtains permission from the Engineer. If permission is granted, the Contractor shall perform this work in a manner approved by the Engineer.

D. Where conduits, outlet, junction, or pull boxes are mounted on a painted surface, or a surface to be painted, they shall be painted to match the surface unless otherwise specified. Whenever support channels are cut, the bare metal shall be cold galvanized.

X. Deliver to the Owner's representative all special tools needed for proper operation, adjustment and maintenance of equipment.

End of Section

SECTION 16050 - BASIC MATERIALS AND METHODS

1. SCOPE OF WORK:

Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

The work shall include, but is not necessarily limited to, the furnishing and installation of all components required for a complete installation of the electrical system.

~~3. MEASUREMENTS:~~

~~Quantities shall not be measured separately for electrical supplies and materials necessary for the complete installation of the electrical system but shall be included as part of the Furnish and Install Electrical Distribution System bid item as identified on the bid schedule.~~

~~4.~~3. SUBMITTALS:

Refer to Section 01300 - Submittals, for requirements.

~~5.~~4. GENERAL:

I. Materials shall be new, first quality and approved by Underwriters' Laboratories, Inc. or National Electrical Manufacturers Association.

II. Material damaged during course of installation shall be replaced and paid for by the Contractor. Alternates must be approved by the Engineer.

III. All materials and products will not be permitted to contain asbestos.

~~6.~~5. MATERIALS:

I. Raceways:

A. General:

1. Provide raceways for wiring systems.

2. Where nonmetallic raceways are utilized, provide the proper sized grounding conductor within the raceway.

3. A minimum size ½" raceway is to be used.

B. Concrete Encased Raceways:

Provide electrical metallic underfloor distribution system manufactured of steel, galvanized on the outside and coated on the inside with a smooth hard finish of lacquer, varnish or enamel. Steel "Walkerduct" or

approved equal screw type service fittings shall be used. Where installed in slab or fill, provide concrete tight fittings.

C. Non-Encased Raceways:

Unless specifically noted on the drawings or for concrete encasement, provide one of the following raceway systems:

1. Thinwall Conduit:

Electrical Metal Tubing (EMT) with couplings and connectors for terminating conduit at outlet boxes, pull boxes, cabinets, gutters, etc.

2. Rigid Conduit:

a. Rigid, heavywall, Schedule 40, PVC conduit, suitable for direct burial and Underwriters' Laboratories listed by Borg Warner, Carlon, Ethyl, Karloy, Triangle or approved equal. PVC may be utilized to exterior luminaries where ground wire is employed.

b. Rigid, heavy wall galvanized steel conduit with double lockouts and bushings on conduits terminating at outlet boxes, cabinets, gutters, etc.

3. Flexible Electrical Conduit:

Flexible interlocked double-wrapped steel, galvanized inside and outside forming smooth internal wiring channel, by National Electrical Products, Triangle, Clifton Conduit or approved equal. Each section of raceway must contain a bonding wire bonded at each end and sized as required, except for lighting fixtures. Provide connectors with insulating bushings.

4. Liquid-Tight Flexible Electrical Conduit:

a. Maximum length 6 feet, single strip, continuous, flexible interlocked double-wrapped steel galvanized inside and outside forming a smooth internal wiring channel, by National Electric Products, Triangle, Clifton Conduit or approved equal. Each section of raceway must contain a bonding wire bonded at each end and sized as required, except for lighting fixtures. Conduit is to be covered with a tough, inert watertight plastic outer jacket, "Seal-Tite" Type U.S. (American Brass Company), "Flex-Seal Type LX" (Columbia Cable and Electric Corporation), "Electric-Flex" (International Metal Hose) or approved equal.

b. Fittings: Cast malleable iron body and gland nut, cadmium plated with one-piece brass grounding bushings which threads to interior of conduit. Spiral molded vinyl sealing ring between gland nut and bushing and nylon insulated throat, by Gedney, Appleton, Thomas & Betts or approved equal.

D. Wiring Channel:

See Section 05500 - Metal Fabrications for wiring channel.

E. Surface-mounted Raceways:

1. Surface Metal:

a. Surface metal raceways shall be used to provide power services as shown on drawings.

b. The electrical contractor shall provide and install all surface metal raceways and appropriate fittings to provide a safe and complete installation "wiremold", two-piece, surface metal raceway.

c. The surface metal raceway and fittings shall be the G-3000 series as manufactured by The Wiremold Company, West Hartford, CT or approved equal.

d. The two piece surface metal raceway shall consist of a base section having ½" and ¾" trade size knockouts for electrical fittings.

e. The base and cover sections shall be manufactured of cold rolled steel, and painted with ANSI 61 gray finish which is capable of being overpainted in the field.

f. A full complement of fittings for the surface metal raceway shall be used including but not limited to elbows, (90°, internal and external), tees, couplings for joining raceway sections, wire clips for holding wires or cables in place, blank end fittings for closing open ends of the raceway, boxes to allow inclusion of devices like System 3000 Duplex Receptacles, transition connectors to other surface metal raceways and tradesize conduit or armored cable.

g. The surface metal raceway and fittings shall meet all requirements of the National Electrical Code Article 352A and shall be listed by Underwriters' Laboratories, Inc. in full compliance with their standard for surface metal raceways and fittings (UL-5).

II. Boxes:

A. Outlet, Junction and Pull Boxes

Provide zinc-coated or cadmium-plated sheet steel outlet boxes not less than 4 inches octagonal or square, unless otherwise noted. Equip fixture outlet boxes with 3/8 inch no-bolt fixture studs where required. Where fixtures are mounted on or in an accessible type ceiling, provide a

junction box and extend flexible conduit to each fixture. Fit outlet boxes in finished ceilings or walls with appropriate covers, set flush with the finished surface. Where more than one switch or device is located at one point, use gang boxes and covers unless otherwise indicated. Sectional switch boxes or utility boxes will not be permitted. Where drywall material is utilized provide plaster ring. Provide outlet boxes of the type and size suitable for the specific application.

B. Provide pullboxes, Type "SC" surface mounted with screw covers exposed to outside. Each pullbox shall have knockouts. Each box shall be galvanized and U.S. labeled.

C. Plug any open knockouts not utilized.

D. Outdoor and Wet Location Boxes:

Weatherproof boxes to have built-in, reinforced, threaded international hubs and grounded terminals. Plugs to be nylon taped prior to installation. Connectors to be water tight and gasketed. Box to be affixed to surface with exterior tie.

III. Wire and Cable:

A. General:

Actual (secondary) service cable size shall be determined by the Contractor based upon the amperage required for the designated total installation.

B. Conductor:

Electrical grade, annealed copper, tinned or rubber insulated, and fabricated in accordance with ASTM standards. Minimum size number 12 for branch circuits; number 14 for control wiring.

C. Stranding and Number of Conductors:

1. Number 12 and number 10 solid.

2. Cables larger than number 10, stranded in accordance with Class B, ASTM flexibility standards.

3. Control wires stranded in accordance with Class B, ASTM flexibility standards.

4. Cables, multi-conductor unless otherwise noted for low tension systems.

D. MC Cable:

MC Type conductor may be used for internal use within the office area in accordance with NEC requirements.

E. Insulation:

1. Provide wire with a minimum insulating rating of 600 volts, except for wire used in low voltage (below 50 volts) control of signal systems use 300 volt minimum or 600 volt where permitted to be incorporated with other wiring systems.

2. Jacketed:

   a. Type THW: Thermoplastic insulation suitable for use in wet locations up to 75°C. Use for lighting, outlet, and motor circuits and for panel and equipment feeders.

   b. Type USE: Two and three conductor Type RHW insulated with neoprene jacket suitable for operation in wet or dry locations at a maximum temperature of 75°C. Underground service entrance cable for direct earth burial, duct, or aerial applications.

   c. Type TC: Control Wire, multiconductor THHN-THWN conductors rated for 90°C in dry locations and 75°C in wet locations. Cables may be installed in open air, ducts, conduits, in tray and trough, and are suitable for direct burial.

3. Single Conductor:

   a. Type THHN: Heat-resistant thermoplastic insulation, nylon jacket rated for 90°C operation. Use for lighting branch circuit wiring installed and passing through the ballast channels of fluorescent fixtures, wiring in metal or wood roof decks in or near roof insulation, in attic or joist spaces, or in raceways exposed to the sun.

   b. Type TFFN or TFN: Fixture wire with PVC insulation and nylon jacket, suitable for use on lighting fixtures and other applications where temperatures do not exceed 90°C.

4. Aerial Cable: Three conductor crosslinked polyethylene insulated cable with 30% EHS copper-clad steel messenger.

5. Color-code wiring for control systems installed in conjunction with mechanical and/or miscellaneous equipment in accordance with the wiring diagrams furnished with the equipment. Factor color code wire number 2 and smaller. Wire number 1 and larger may be color coded by color taping of the entire length of the exposed ends.

F. Connectors:

1. Make connections, splices, taps and joints with solderless devices mechanically and electrically secure. Protect exposed wires and

connecting devices with electrical tape or insulation.

2. Branch circuit wires (No. 10 and smaller): Use any of the following types of terminals and connecting devices:

   a. Hand Applied: Coiled tapered spring wound devices with a conducting corrosion-resistant coating over the spring steel and a plastic cover and skirt providing full insulation for splice and wired ends. Screw connector on by hand. Manufacturer: "Wing Nut" (Ideal Industries), "Piggy" (Thomas & Betts), "Scotchlok" (3M Company) or approved equal.

   b. Tool Applied: Steel cap, with conduction and corrosion resistant metallic plating, open at both ends, fitted around the twisted ends of the wire and compressed or crimped by means of a special die designed for the purpose. Specifically fitted plastic or rubber insulating cover wrap over each connector. Manufacturer: "Stakon" (Thomas & Betts), "Number 410 Crimp Connector" (Ideal Industries), "Wrap-Cap" (Buchanan) or approved equal.

G. Electrical Tape:

1. Specifically designed for use as insulating tape.

2. Manufacturer: Johns-Manville, Minnesota Mining or approved equal.

H. Lubricant: Use lubricant only where the possibility of damage to conductors exists. Use only a lubricant designed by the cable manufacturer and one which is inert to cable raceways.

IV. Switch and Wiring Devices:

A. Wall Switches:

1. Provide specification grade, flush mounting, quiet-operating AC type, with toggle operator and heat-resistant plastic housing. Silver alloy contact rated 20A at 277V and capable of full capacity on tungsten or fluorescent lamp load. Design for side or back wiring with up to Number 10 wire verified by U.L. to meet or exceed Federal specifications WS-896E.

2. Use single-pole, double-pole, 3-way, 4-way, pilot or keyed type, as indicated on drawings or required.

3. Switches controlling lighting connected to the emergency power system shall be the illuminated toggle type--illuminated when the switch is in the off position.

4. Switches controlling lighting by way of low voltage lighting control relays shall be 3-position, momentary-contact, center-off type to match the other switches.

5. Manufacturers: "1990 Series" (Arrow-Hart), "1220 Series" (Hubbell), "5600 Series" (Leviton) or approved equal. Color as selected by the Engineer.

B. Ground Fault Circuit Interrupt (G.F.C.I.):

Provide and install Leviton, "6800 Series 3" wire with ground type ground fault outlet or approved equal. The device shall be rated for 20 amp and 120 volts with a sensitivity of 5 ma. The exposed portions of the device shall be "Ivory" in color.

C. Duplex Convenience Outlets:

1. Unless otherwise noted, mount receptacle vertically with U-shaped ground position at bottom.

2. Provide 3-pole NEMA and American National Standards Institute standard type, with bronze contacts that accept plug with 2 parallel blades and 1 grounding blade, heat-resistant plastic enclosure with nylon face, two grounding screws, break-off terminals for 2-circuit wiring, rated for 20 amps at 125 volt AC. Comply with National Electrical Manufacturers' Association Standard W D-1, 3.02 through 3.10 and Underwriters' Laboratories Standard 498.

3. Manufacturers: "Catalog Number 5362" (Hubbell), Arrow Hart, Leviton or approved equal. Color as selected by the Engineer.

D. Cover Plates:

Wall plates and cover plates shall be ivory plastic.

Screws to be of the same color and suitable for this application.

When two or more switches or devices are shown in one location, mount under a common plate.

E. Outdoor Locations:

1. Protect receptacles located outdoors or where indicated to be weatherproof by a GFI receptacle or circuit breaker.

2. Protect exterior receptacles by a cast aluminum metal plate with a stainless steel spring-loaded, gasketed lift cover to remain locked in either open or closed.

F. Switch and Pilot Light: "Number 1261" (Hubbell) switch with "Number 1375" (Hubbell) or approved equal flush neon pilot light with red jewel.

G. Smoke & Carbon Monoxide Alarm:

Provide and install smoke & carbon monoxide detection/alarm unit by Universal Security Systems, Model No. CD-9795 or approved equal.

H. Buried Detection Tape:

The electrical detection tape shall be a underground warning tape by Empire Level Manufacturer, Inc., available from Hamilton Associates, Inc., 800 W. Louisiana Ave, Denver, CO 80223, (303) 722-6882, or approved equal. The tape shall consist of a flexible plastic sheath, permanently color coded (impregnated) APWA "Safety Red" containing a solid aluminum foil core. The tape legend shall read "Caution Buried Electric Line Below" upon the 6 inch wide material.

V. Exit Signs:

A. Exit/Emergency Combo:

Exit/Emergency Combo signs shall be model “LHQM LED G HO” as manufactured by Lithonia Lighting or approved equal and shall be wall or ceiling mounted per the drawings. The unit shall have a white engineering grade thermoplastic housing. Lettering shall be a minimum of 6” in height with a ¾” stroke width. Lettering shall be internally illuminated with LED lights and be green in color.

Emergency lighting shall consist of two LED lamp heads with no less than 12 LEDs per head which operate in emergency (DC input) mode. Battery backup shall be either nickel-cadmium or lithium-ion and shall habe a current-limiting charger. Unit shall also have the ability to self-test for 30 seconds every 30 days, and for 30 minute every 180 days, and for 90 minutes annualy. Battery shall have a minimum capacity of 90 minutes of operation time for both the lamps and the sign.

~~7.~~6. EXECUTION:

I. Raceway Systems

A. Install capped bushings on conduits as soon as installed and remove only when wires are pulled. Securely tie embedded raceway in place prior to embedment. Conduits installed below or in floor slabs must extend a minimum of 6 inches above the finished slab to the first connector. Lay out the work in advance to avoid excessive concentrations of multiple raceway runs. Locate raceways so that the strength of structural members is unaffected and they do not conflict with the services of other trades. Install 1 inch or larger raceways in or through structural members (beams, slabs, etc.) only when and in the manner accepted by the Engineer. Draw up couplings and fittings full and tight. Protect threads from corrosion with one (1) coat red lead or zinc chromate after installation.

B. Above Grade - Defined as the area above finished grade for a building exterior and above top surface or any slabs (or other concrete work) on grade for a building interior. Above-grade raceways to comply with the

following:

1. Install raceways concealed except at surface cabinets and for motor and equipment connection in electrical and mechanical rooms. Install a minimum of 6 inches from flues, steam pipes, or other heated lines. Provide flashing and counter-flashing for waterproofing of raceways, outlets, fittings, etc., which penetrate the roof. Route exposed raceways parallel or perpendicular to building lines with right-angle turns and symmetrical bends. Run concealed raceways in a direct line and, where possible, with long sweep bends and offsets.

2. Provide raceway expansion joints with necessary bonding conductor at building expansion joints and where required to compensate for raceway or building thermal expansion and contraction. Terminate raceways 1¼ inches and larger with insulated bushings or rain-tight connections with insulated throats.

3. In all remaining areas where permitted by Code, Electric Metallic Tubing (EMT) may be used.

4. Provide flexible metal conduit in sufficient lengths not exceeding 6 feet for the makeup of motor, transformer or equipment, and/or raceway connections where isolation of sound and vibration transmission is required. For connections in locations exposed to weather and in interior locations to moisture, use watertight flexible conduit.

5. Provide separate code-size ground conductor in all plastic conduits.

6. Where conduits pass between levels provide seal fittings to maintain fire rating of level passing through.

II. Outlet, Junction and Pullboxes:

A. Provide outlets, junction and pullboxes as indicated on the drawings and as required for the complete installation of the various electrical systems and to facilitate proper pulling of wires and cables. J-boxes and pullboxes shall be sized per N.E.C. minimum.

B. The exact location of outlets and equipment is governed by structural conditions and obstructions, or other equipment items. When necessary, relocate outlets so that when fixtures or equipment are installed, they will be symmetrically located according to the room layout and will not interfere with other work or equipment. Verify final location of outlets, panels, equipment, etc., with the Engineer and indicate on as-built drawings.

C. Back to back outlets in the same wall, or through-wall type boxes not permitted. Provide 12 inch (minimum) spacing for outlets shown on opposite sides of a common wall to minimize sound transmission.

III. Wiring Devices:

A. Plates:

1. Plates to be attached correctly and firmly without cracking.

2. Blind plates to be located at all boxes that are to be abandoned.

B. Mounting Heights:

Heights listed are from finished floor to center of device. Verify exact locations with the Engineer before installation.

1. Convenience and Signal Outlets: 12” unless otherwise noted.

2. Lighting Switches: 4 feet

3. Disconnect Switches and Motor Controllers: 5 feet

4. Exit Lights: Wall-mounted 12” below ceiling to center of sign.

5. Wall-mounted Fixtures: 7 feet 6 inches or over mirrors (as applicable) or 1 foot below ceilings lower than 8 feet. Stairwell fixtures to be mounted 8 feet 6 inches above finished floor or 1 foot below ceiling.

6. Mount switches vertically with the "on" position on top, unless noted or specified otherwise.

7. Where switches are indicated to be installed near doors, corner walls, etc., mount same not less than 2 inches and not more than 12” from trim. Verify exact location with the Engineer.

8. Carefully coordinate the location of switches to insure locations at the strike side of doors.

9. Furnish and install an engraved legend for each switch that controls motors, equipment systems, etc., not located within sight of the controlling switch.

IV. Wire and Cable:

A. Provide a complete system of conductors in raceway system. Mount wiring through a specified raceway, regardless of voltage application.

B. Drawings do not indicate size of branch circuit wiring. For branch circuits whose length from panel to furthest outlet exceeds 150 feet for 120 volt circuits use number 10 or larger.

C. Do not install wire in incomplete conduit runs or until after the concrete work and plastering is completed and moisture is swabbed from conduits. Eliminate splices wherever possible. Where necessary, splice in readily

accessible pull, junction or outlet box.

D. Provide cable supports for all vertical risers where required by code.

E. Flashover or insulation value of joints to be equal to that of the conductor. Provide Underwriters' Laboratories listed connectors rated at 600 volts for general use and 1,000 volts for use between ballasts and lamps or gaseous discharge fixtures.

F. Use terminating fittings, connectors, etc., of a type suitable for the specific cable furnished. Make bends in cable at termination prior to installing compression device. Make fittings tight. Recheck splices and termination and make mechanically and electrically tight during a 15 day period immediately prior to final acceptance of the work.

G. Apply an anti-oxide inhibitor equivalent to "Penetrox" (Burnday), "Noalox" (Ideal) or approved equal to aluminum terminations.

H. Install wire in raceways and make up terminations in accordance with manufacturer's recommendations using special washers, nuts, etc., as required. Use an accepted wire-pulling lubricant equivalent to "Yellow" (Ideal) or approved equal for all wire number 4 and larger. Strip insulation so as to avoid nicking of wire.

I. Extend wire sizing for the entire length of a circuit unless otherwise noted.

V. Grounding

A. Provide a separate grounding conductor, securely grounded on each end of the sections of plastic, fiber, or flexible raceways.

B. Provide grounding type bushings for conduits that originate at the service panels and individually bond this raceway to the ground bus in the service panels.

End of Section

SECTION 16400 - SERVICE AND DISTRIBUTION

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, electrical service and distribution systems.

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. QUALITY ASSURANCE:

   Except as modified by governing codes and by the Contract, comply with the applicable provisions and recommendations of the following:

   I. Panelboards: Comply with Underwriters' Laboratories Standards UL 50 and UL 67, Federal Standard W-P-115A, Amendment Number 2, and National Electrical Manufacturers' Association Standard PB-1.

   II. Circuit Breakers: Comply with Underwriters' Laboratories Standard UL 489, Federal Standard W-C-375a, Amendment Number 4, and National Electrical Manufacturers' Association Standard AB-1.

   III. Ground Fault Circuit Interrupt (G.F.C.I.): Underwriters' Laboratories Standards

   IV. Except as modified by governing codes and by this specification, comply with the applicable provisions and recommendations of the following: Institute of Electrical and Electronics Engineering, National Electrical Manufacturers Association, Underwriters' Laboratories, Utility Company Standards, ASA, AIEE.

5. PRIMARY SERVICE:

   I. The Contractor shall coordinate with the power company to provide and install 225 amp underground service.

   II. Make service connections at service entrance as necessary.

6. PRODUCTS:

   I. Service Panel:

      A. Provide panelboard consisting of an assembly of branch circuit switching and protective devices mounted inside a dead front enclosure. Provide the number and size of these branch circuit devices as required to serve the building. The panel shall have the following specifications.

1. Amperage - 400 amps.

2. Voltage - 120/240 volts.

3. Phase - single.

4. Blank spaces - 40.

B. Panelboard:

1. Rigid removable assembly of aluminum or copper bus bars and interchangeable bolted branch circuit devices.

2. Bus bars drilled to permit branch circuit devices of all sizes and number of poles to be interchangeable and installed in any spare space of sufficient size, without disturbing adjacent units; without removing main bus or branch circuit connectors; and without machining, drilling or tapping.

3. Arrange bus in sequence or distributed phasing so that multipole circuit breaker can replace any group of single circuit breakers of the same size.

4. Provide ground bus in each lighting and appliance branch circuit panelboard.

C. Enclosure:

1. Code gauge steel box galvanized

2. Provide a bolt-on connector inside box for service entrance conduit.

3. Flush mounted in finished areas and where indicated. Surface mount elsewhere.

D. Front:

1. Heavy code gauge steel as required to maintain panel face flat.

2. Locate main lugs properly at top or bottom, depending on where main feeder enters.

E. Circuit Breaker Branch Circuit Devices:

1. Completely sealed enclosure; toggle type operating handle; trip ampere rating and ON/OFF indication clearly visible.

2. Thermal-magnetic trip-free, trip-indicating, quick-make, quick-break, with inverse time delay characteristics. Single-handle and common tripping multipole breakers. Silver alloy contacts with auxiliary arc-quenching devices.

3. Commercial grade plug-in or bolt-on type.

F. Provide main breakers in panels in sections of multi-section panels and when 2 or more panels are served by a common conductor or overcurrent device.

G. Ground Fault Interrupt (G.F.C.I.):

Furnish and install UL listed devices as required by code or as shown on the drawings.

7. EXECUTION:

I. Grounding:

A. Connect grounding wire to building foundation reinforcement in accordance with NEC requirements.

B. Ground service equipment, conduit systems, supports, cabinets, transformers, poles, fixtures, etc., and the grounding circuit conductors.

C. Provide bonding jumpers and wire, grounding bushings, clamps, etc., as required for complete grounding. Route ground conductors to provide the shortest and most direct path to the ground electrode system. Provide ground connections with clean contact surfaces, tinned and sweated while bolting. Install ground conductors in conduit. Make readily accessible connections to the underground in the vicinity of the switchgear. Make connections to the water pipe with "Series 3900" Thomas & Betts or approved equal ground clamp, grounding the conduit enclosing as well as the conductor. Bond cold water pipe system to separate grounding electrode.

D. Provide a separate grounding conductor, securely grounded on each end of sections of plastic, fiber, or flexible raceways. Route inside raceway.

E. Provide grounding type bushings for feeder conduits which originate from the service switchboards and individually bond this raceway to the ground bus in the main switchboards.

F. Connect the neutral bus in the main service switchboards to the ground bus by means of removable link.

G. Provide grounding of conduits entering motor control starters and panelboards as specified elsewhere.

II. Panelboards:

A. Installation:

1. Mount panel 4 feet to panel center but with maximum height of 6 feet 6 inches to handle of topmost switching device.

2. Neatly arrange branch circuit wires and tie together in each gutter with Thomas & Betts nylon "Ty-Raps," or approved equal at minimum intervals.

3. Plug all knockouts removed and not utilized.

B. Indexing and Identification

1. After installations are complete, provide and mount under sturdy transparent shield in the directory frame of each panel door, a neat, accurate and carefully typed directory properly identifying the lighting, receptacles, outlets, and equipment each branch circuit breaker controls.

2. Include on directory the panel identification, the cable and conduit size of panel feeder.

End of Section

SECTION 16410 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   I. This Section includes individually mounted enclosed switches and circuit breakers used for the following:

      A. Motor and equipment disconnecting means.

   II. Related Sections may include but are not limited to the following:

      A. Division 16 Section "Electrical Identification."

      B. Division 16 Section "Grounding and Bonding."

      C. Division 16 Section "Boxes, Enclosures, and Cabinets."

      D. Division 16 Section "Fuses."

3. MEASUREMENTS:

   Quantities shall not be measured separately for the electrical switches and circuit breakers, but shall be included as a portion of the associated installations.

4. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

5. QUALITY ASSURANCE:

   I. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by UL or by a testing agency acceptable to Authorities having Jurisdiction, and marked for intended use.

   II. Comply with NEMA AB 1 and NEMA KS 1.

   III. Comply with NFPA 70.

6. COORDINATION:

   I. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

7. EXTRA MATERIALS:

I. Enclosure Keys: Furnish two each to owner. All keys shall be keyed alike or keyed as directed by the Engineer.

8. PRODUCTS:

I. Manufacturers:

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

1. Eaton Corp.; Cutler-Hammer Products.

2. General Electric Co.; Electrical Distribution & Control Division.

3. Siemens Energy & Automation, Inc.

4. Square D Co.

II. Enclosed switches:

A. Enclosed, Nonfusible Switch: NEMA KS 1, Type GD or HD to suit voltage, quick make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

B. Enclosed, Fusible Switch, 800-A and Smaller: NEMA KS 1, Type GD or HD to suit voltage quick-make, quick-break, and load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate specified fuses.

C. Enclosed switches shall be provided with an equipment ground kit, and if required an insulated, groundable, bondable neutral kit.

III. Enclosed circuit breakers:

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250A and larger.

2. GFCI Circuit Breakers: Single-and two-pole configurations with 30-mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.

2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground fault indicator.

IV. Enclosures:

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

V. Factory finishes:

A. Finish for Outdoor Units: Factory-applied finish in manufacturer's standard color or as specified, including undersurfaces treated with corrosion-resistant undercoating.

B. Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

9. EXECUTION:

I. Examination:

A. Examine areas and surfaces to receive enclosed switches and circuit breakers for compliance with requirements, installation tolerances, code compliance clearances, and other conditions affecting performance.

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

II. Installation:

A. Install enclosures so they are rigidly supported and squarely aligned.

III. Identification:

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated plastic nameplate mounted with corrosion-resistant screws.

IV. Connections:

A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.

B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.

C. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

D. Do not use switch or circuit breaker enclosure as pull box. All conductors entering enclosure must terminate on lugs within enclosure.

V. Field quality control:

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.

2. Test continuity of each line-and load-side circuit.

B. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

VI. Cleaning:

A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots, dirt, and debris. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Touch up scratches and marred finish to match original finish.

End of Section

SECTION 16442 – PANELBOARDS

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   I. The work shall include, but is not necessarily limited to, providing materials, methods and systems necessary for the complete installation of wiring including receptacles, cord and plug sets, switches, dimmers, finish plates and multi-outlet assemblies.

   II. This Section includes panel boards, over current protective devices, and associated auxiliary equipment rated 600 V and less for the following types:

      A. Lighting and appliance branch-circuit panel boards.

      B. Related Sections may include but are limited to the following:

         1. Division 16 Section "Electrical Identification."

         2. Division 16 Section "Grounding and Bonding."

         3. Division 16 Section "Boxes, Enclosures, and Cabinets."

         4. Division 16 Section "Fuses."

3. SUBMITTALS:

   Refer to Section 01300 - Submittals, for requirements.

4. DELIVERY, STORAGE AND HANDLING:

   Deliver the material in the original unopened containers and store under cover.

5. QUALITY ASSURANCE:

   I. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by UL or by a testing agency acceptable to Authorities Having Jurisdiction, and marked for intended use.

   II. Comply with NEMA PB 1.

   III. Comply with NFPA 70.

6. COORDINATION:

   Coordinate layout and installation of panel boards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance

requirements.

7. EXTRA MATERIALS:

Keys: Furnish two each to owner. All keys shall be keyed alike or keyed as directed by the Engineer.

8. PRODUCTS:

I. Manufacturers:

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

1. Panel boards and associated devices:

a. Eaton Corp.; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Control Div.
c. Siemens Energy &Automation, Inc.
d. Square D Co.

II. Fabrication and features:

A. Enclosures: As indicated on Panel board schedule, flush or surface mounted cabinets. NEMA PB 1, Type to meet environmental conditions at installed location.

B. Hinged Front Cover: Entire front trim hinged to box.

C. Directory Card: With transparent protective cover, mounted inside metal frame, inside panel board door. Cards shall be numbered odd on the left side and even on the right side.

D. Bus: Hard-drawn copper, of 98 percent conductivity.

E. Main and Neutral Lugs: Mechanical type suitable for use with conductor material.

F. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

G. Feed-through Lugs: If required provide mechanical type suitable for use with conductor material where required. Locate at opposite end of bus from incoming lugs or main device.

H. Service Equipment Label: Provide UL label for use as service equipment for panel boards with main service disconnect switches where required.

III. Panelboard short-circuit rating:

A. Fully rated to interrupt symmetrical short-circuit available at terminals.

B. Where series rated panel boards are required, provide UL required panel board label indicating series-connected rating with integral or remote upstream devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.

IV. Lighting and appliance branch-circuit panel boards:

A. Main Overcurrent Protective Device: As indicated on panel board schedule and/or electrical one-line diagram.

B. Branch Overcurrent Protective Devices: Bolt-on or commercial grade plug-in type circuit breakers, replaceable without disturbing adjacent units.

C. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

V. Overcurrent protective devices:

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250A and larger.

B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.

2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground fault indicator.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

VI. Factory finishes:

A. Enclosure Finish for Outdoor Units: Factory-applied finish in manufacturer's standard color or as specified, including undersurfaces treated with corrosion resistant undercoating.

B. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal

surface.

9. EXECUTION:

I. Installation:

A. Install panel boards and accessories according to NEMA PB 1.1.

B. Mounting Heights: Top of trim 74 inches above finished floor, unless otherwise indicated.

C. Mounting: Plumb and rigid without distortion of box. Mount recessed panel boards with fronts uniformly flush with wall finish.

D. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panel board loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

E. Install filler plates in unused spaces.

F. Wiring in Panel board Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing. Do not splice conductors in panel board gutter.

II. Identification:

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."

B. Panel board Nameplates: Label each panel board with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

III. Connections:

A. Install equipment grounding connections for panel boards with ground continuity to main electrical ground bus.

B. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

IV. Field quality control:

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panel board bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

B. Testing: After installing panel boards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:

1. Measure as directed during period of normal system loading.

2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.

3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.

4. Tolerance: Difference exceeding 10 percent between phase loads, within a panel board, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

10. CLEANING:

On completion of installation, inspect interior and exterior of panel boards. Remove paint splatters and other spots, dirt and debris. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Touch up scratches and marred finishes to match original finish.

End of Section

SECTION 16500 - LIGHTING FIXTURES

1. SCOPE OF WORK:

   Furnish all labor, materials and equipment required to complete the work of the noted Sections of this Division described herein and on the drawings.

2. WORK INCLUDED:

   The work shall include, but is not necessarily limited to, the installation of lighting fixtures.

~~3. MEASUREMENT:~~

~~Quantities for the lighting fixtures shall not be measured separately but shall be included as part of the Furnish and Install Electrical Distribution System bid item as identified on the bid schedule.~~

~~Quantities shall not be measured separately for junction boxes, supports, fasteners or other miscellaneous equipment needed for the complete installation of the lighting fixtures but shall be included in the related work.~~

~~4.~~3. GENERAL:

I. Provide lighting fixtures in accordance with the Contract.

II. Fixtures to be complete with light bulbs as specified.

~~5.~~4. QUALITY ASSURANCE:

Guarantee ballast for one full year and one year prorated as per standard manufacturer's warranty against defects for a period of 2 years. Guarantee to include replacing defective ballast with new ballast.

~~6.~~5. SUBMITTALS:

Refer to Section 01300 - Submittals, for requirements.

~~7.~~6. MATERIALS:

I. Plastic Lenses and Diffusers: Virgin methyl methacylate unless otherwise permitted. Destaticize after cleaning. Install and leave with no finger or dirt marks on the lense or diffuser. Use white gloves if necessary.

II. Parabolic Fixture Care: Parabolic fixtures to be installed with mylar cover over louvers. Upon completion of work, remove mylar cover with white gloves and blow clean reflectors.

III. Finish: Porcelain or baked enamel finish matte white on interiors with minimum tested reflectance of 90 percent matte white finish or as specified in visible exterior. Thoroughly clean base metal and bonderize after fabrication.

IV. Lamps:

A. Provide a complete set of new lamps in each fixture.

1. LED Lamps: warm white, 1½" diameter.

B. Manufacturers: General Electric, Westinghouse, Sylvania or approved equal.

V. LED Fixtures:

A. Main Lighting (FF-1):

Architectural LED lighting with metal basket style cover. Lamar Lighting VGAL-48-M-30-PF or approved equal.

B. Mechanical and IT Room Lighting (FF-4):

LED 120-277V Universal voltage with Battery Backup and square diffuser by Lamar Lighting or approved equal.

C. Interior High-Bay Lighting (HB-1):

LED reflected ceiling fixtures, Metalux, MET-LHB, LED H-Bay, or approved equal

D. Exterior Patio Recessed Lighting (RL-1):

Round Recessed (Can Style) LED 120-277V universal voltage. Lamar Lighting, CSL-13-2200-SW-30 or approved equal.

E. Exterior Wall Packs (WP-1):

120V, LED (20-40 watts), full cutoff wall pack. Flat tempered glass lens with photocontrol. Color – Bronze or approved equal.

VI. Manufacture fixtures to the specifications described herein. Manufacturer's catalog numbers are given to further describe the general appearance of the fixture.

~~8.~~7. EXECUTION:

I. Fabrication:

Provide fixtures, completely factory assembled and wired and equipped with necessary sockets, ballasts, wiring, shielding, reflectors, channels, lenses, etc., and deliver to job ready for installation.

II. Installation:

Install fixtures in mechanical areas after ductwork and piping installation.

Locate fixtures above floor, as shown, or at suitable locations within space on walls or ceilings.

End of Section