MISSOURI

HIGHWAYS and TRANSPORTATION

COMMISSION

JEFFERSON CITY, MISSOURI

SPECIFICATIONS

FOR

CONSTRUCTING OR IMPROVING

District – 6
Maintenance & Storage Buildings
St. Clair, Missouri

9-090901

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DIVISION 16 - ELECTRICAL

Drawings; 27-pages
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BIDDER CHECKLIST

FINAL CHECKLIST BEFORE SUBMITTING PROPOSAL

_____1. The orange bound Request for Proposal includes a complete set of bidding forms, specifications, and appendices which are made part of the proposal by reference. It is for the bidders information and convenience only and is not to be returned with the proposal.

_____2. The blue bound Proposal contains a complete set of bidding forms only. It is to be completed, executed and submitted in a sealed envelope marked **"New Maintenance and Storage Buildings, 2273 North Service Road West, District #6, Franklin County, St. Clair, MO"**

_____ a. Complete the Bid Form by filling in the total dollar amount of the bid; listing any addenda which may have been issued; filling in the dollar amount of the bidder's check or Bid Bond, sign the proper signature line, and supply the required information in connection with the signature for the individual bidder, joint adventurer, or corporation.

_____ b. Submit Bid Bond executed by the bidder and surety. The bidder may use the Bid Bond furnished by the Commission or AIA Document A310 or approved equivalent or attach cashier's check to Bid Bond form. Personal checks are not accepted.

_____ c. Complete Subcontractor section by listing major subcontractor(s) and general supervisor(s), sign as required.

_____ d. Complete Certification Regarding Missouri Domestic Products Procurement Act section, if applicable.

_____3. If addenda are issued attach to the back of the blue bound Proposal. Copy addenda and add to the appropriate section of the orange bound Request for Proposal and retain for your records.

NEWSPAPER ADVERTISEMENT

"Notice to Contractors

Bids for constructing a maintenance and storage Buildings, 2273 North Service Road West, District #6, Franklin County, St. Clair, MO will be received by the Missouri Department of Transportation at its One Stop, 1320 Creek Trail Drive, PO Box 270, Jefferson City, MO 65102-0270 until 3:00 P.M., Sept. 1, 2009. Contact Lynn Ferguson at 573-751-4879 or Lynn.Ferguson@modot.mo.gov to obtain plans, forms, and information, or download them at no charge from http://modot.org/business/contractor_resources/FacilitiesConstructionandMaintenance.htm. A sum of $40 will be charged for each set of bid documents which shall be non-refundable. A sum of $40 will be charged for each set of bid documents. Prevailing wages as established by the Missouri Department of Labor and Industrial Relations, for Franklin County, as shown in the Proposal, will apply.
The amount paid for the plans is not refundable. A pre-bid conference is scheduled for August 26, 2009, at 10:00 AM at the Project Office, 2215 N. Commercial, St. Clair, MO."

SECTION 00020

INVITATION TO BID

Notice is given hereby that the Missouri Department of Transportation will accept bids for construction of the proposal marked **"New Maintenance and Storage Buildings, 2273 North Service Road West, District #6, Franklin County, St. Clair, MO"**, according to Drawings and Specifications, and described in general as:

> **Constructing a pre-engineered metal building and three pole barn storage buildings with a reroof of an existing building on the same site. The metal building has nominal dimensions of 50' wide x 180' long with an eave height of 18' A.F.F., standing seam roof, office space, toilets, truck wash area, electrical, HVAC, plumbing, solar panels, asphalt paving and incidental site work. Two of the pole barns are to have dimensions of 50' wide x 150' long and includes wood framing, electrical and incidental site work. One pole barn has nominal dimensions of 30' wide x 50' long and includes wood framing and electrical. One other building is to be reroofed with metal panel.**

Sealed bids will be received by the Missouri Department of Transportation at its **Central Office, Creek Trail Drive, PO Box 270, Jefferson City, MO 65102-0270 until 3:00 P.M., September 1, 2009.**

Bids will be opened and read aloud at that time and that place. Bids received after that time will not be accepted.

Bidders may secure copies of the Proposal, contract forms, specifications, plans and information from the **MoDOT** One Stop, 1320 Creek Trail Drive, PO Box 270, Jefferson City, MO 65102-0270 beginning **August 17, 2009.** A sum of $40 will be charged for each set of bid documents which shall be non-refundable.

Prevailing wages as established by the Missouri Department of Labor and Industrial Relations, for **Franklin County**, as shown in the Proposal, will apply.

Bid securities in the amount of 5% of the bid will be required to accompany bids.

Proposals must be made on forms provided by the Commission. The Commission reserves the right to reject any or all bids and to waive irregularity in the bids and the bidding. **No bid may be amended or withdrawn after the bid is opened.**

A pre-bid conference is scheduled for August 26, 2009, at 10:00 AM at the Project Office, 2215 N. Commercial, St. Clair, MO.

MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION

_____

Building Design Supervisor

SECTION 00100

INSTRUCTIONS TO BIDDER

1. SCOPE OF WORK

Constructing a pre-engineered metal building and three pole barn storage buildings with a reroof of an existing building on the same site. The metal building has nominal dimensions of 50’ wide x 180' long with an eave height of 18' A.F.F., standing seam roof, office space, toilets, truck wash area, electrical, HVAC, plumbing, solar panels, asphalt paving and incidental site work. Two of the pole barns are to have dimensions of 50’ wide x 150’ long and includes wood framing, electrical and incidental site work. One pole barn has nominal dimensions of 30’ wide x 50’ long and includes wood framing and electrical. One other building is to be reroofed with metal panel.

2. BID FORM

In order to receive consideration, bids must be made in strict accordance with the following.

A. Make bids, upon the forms provided herein, properly signed and with all items filled out. Do not change the wording of the bid form and do not add words to the bid form. Unauthorized conditions, limitations or provisions attached to the bid will be cause for rejection of the bid.

B. No telegraphic bid or telegraphic modification of a bid will be considered. No bids received after the time fixed for receiving them will be considered. Late bids will be returned to the bidder unopened.

C. Address bids to the Missouri Department of Transportation, and deliver to the address given in the Invitation to Bid, on or before the day and hour set for opening the bids. Enclose each bid in a sealed envelope bearing the title of the Work, the name of the bidder, and the date and hour of the bid opening. Submit only the original signed copy of the bid. It is the sole responsibility of the bidder to see that the bid is received on time.

3. BONDS

A. Bid securities, a cashiers check, a Bank Money Order, or a Certified Check made payable to "Director of Revenue, Credit Road Fund", in the amount stated in the invitation to bid must accompany each bid. The successful bidder's security will be retained until he has signed the Contract and has furnished the required Certificates of Insurance.

B. The Owner reserves the right to retain the security of all bidders until the successful bidder enters into the Contract. Other bid securities will be returned as soon as practical. If any bidder refuses to enter into a Contract, the Owner may retain his bid security as liquidated damages but not as a penalty.

C. Prior to signing the Contract, the successful bidder will secure a Performance Bond in the amount of 100% of the Contract Sum. Surety, acceptable to the Owner, shall issue the bond. Costs of such bonds will be the responsibility of the bidder.

4. EXAMINATION OF DOCUMENTS AND SITE OF WORK

Before submitting a bid, each bidder shall examine the Drawings carefully, read the Specifications and all other proposed Contract Documents, and visit the site of the work. Each bidder shall fully inform himself, prior to bidding, as to existing conditions and limitations under which the Work is to be performed and shall include in his bid a sum to cover the cost of items necessary to perform the Work, as set forth in the proposed Contract Documents. No allowance will be made to a bidder because of lack of such examination or knowledge. The submission of a bid will be considered conclusive evidence that the bidder has made such examination.

5. INTERPRETATION

No oral interpretations will be made to any bidder as to the meaning of the plans and specifications or the acceptability of alternate products, materials, form or type of construction. Every request for interpretation shall be made in writing and submitted with all supporting documents not less than ten (10) calendar days before opening of bids. The request

shall be sent directly to the project Designer. Every interpretation made to a bidder will be in the form of an addendum and will be sent as promptly as is practicable to all persons to whom plans and specifications have been issued. All such addenda shall become part of the contract documents.

6. PROOF OF COMPETENCY OF BIDDER

A bidder may be required to furnish evidence, satisfactory to the Commission, that he and his proposed subcontractor(s) have sufficient means and experience in the types of work called for to assure completion of the Contract in a satisfactory manner.

7. WITHDRAWAL OF BIDS

A. A bidder may withdraw his bid, either personally or by written request, at any time prior to the scheduled time for opening bids.
B. No bid may be amended or withdrawn after the bid is opened.

8. AWARD OR REJECTION OF BIDS

A. The Contract, if awarded, will be awarded to the responsible bidder who has proposed the lowest Contract Sum, subject to the Commission's right to reject any or all bids and to waive informality and irregularity in the bids and in the bidding.
B. Award of alternates, if any, will be made in numerical order to result in the maximum amount of work being accepted within available construction funds.
C. MoDOT is exempt from paying Missouri Sales Tax, Missouri Use Tax and Federal Excise Tax. An Exemption From Missouri Sales and Use Tax on Purchases letter and a Project Exemption Certificate (Form 5060 Rev. 10-2006) for tax-exempt purchases at retail of tangible personal property and materials for the purpose of constructing, repairing or remodeling facilities for the Missouri Highways and Transportation Commission, only if such purchases will "are related to the Commission's exempt functions and activities be furnished to the successful Bidder upon request.

9. EXECUTION OF CONTRACT

A. The Contract, which the successful bidder will be required to execute, will be included in the Contract Documents.
B. The bidder to whom the Contract is awarded shall, within fourteen calendar days after notice of award and receipt of Contract Documents from the Commission, sign and deliver required copies to the Commission.
C. Upon delivery of the signed Contract, the bidder to whom the Contract is awarded shall deliver to the Commission those Certificates of Insurance required by the Contract Documents and Performance Bond, as required by the Commission.
D. Execution of the Contract by the Commission must be done before the successful bidder may proceed with the work.

10. CONSTRUCTION TIME AND LIQUIDATED DAMAGES

A. Time of Completion - If this proposal is accepted, it is hereby agreed that work will begin not later than the date specified in the "Notice to Proceed" and will diligently be prosecuted in order to complete the work and billing within **120 working days** from the date specified. Completion of work will be based on FINAL ACCEPTANCE of the building; "SUBSTANTIAL COMPLETION" will not be accepted as basis for completion.

B. Liquidated Damages - It is agreed that time is of the essence. Because failure to complete the contract within the time fixed herein will cause serious inconvenience, loss, and damage to the state, liquidated damages will be assessed in the amount of **$1000.00** per working day, for each working day after the agreed completion date that the Work is not fully completed.

11. NONDISCRIMINATION

A. The Bidder/Offeror understands that this project involves state funds and the Bidder/Offeror awarded the contract will be required to comply with the Executive Order 05-30 of the Governor of the State of Missouri dated September 8, 2005. This order stipulates that there shall be no discriminatory employment practices by the Contractor or his subcontractors, if any, based on race, sex, religion, national origin, age, color, disability, or veteran status. The undersigned Contractor or his subcontractors, if any, shall give written notice of their commitments under this clause to any labor union with which they have bargaining or other agreements.

B. The Contractor shall comply with the Regulations relative to nondiscrimination in federally-assisted programs of the Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.

C. All solicitations either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials or leases of the Contractor's obligations under this contract and the Regulations, will be relative to nondiscrimination on the grounds of race, color, or national origin.

D. Sanctions for Noncompliance: In the event of the Contractor's noncompliance with the nondiscrimination provisions of this contract, MoDOT shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to: (i) withholding of payments to the Contractor under the contract until the Contractor complies, and/or, (ii) cancellation, termination or suspension of the contract, in whole or in part.

12. EXECUTIVE ORDER

A. The Contractor shall comply with all the provisions of Executive Order 07-13, issued by the Honorable Matt Blunt, Governor of Missouri, on the sixth (6^{th}) day of March, 2007. This Executive Order, which promulgates the State of Missouri's position to not tolerate persons who contract with the state engaging in or supporting illegal activities of employing individuals who are not eligible to work in the United States, is incorporated herein by reference and made a part of this Agreement.

B. "By signing this Agreement, the Contractor hereby certifies that any employee of the Contractor assigned to perform services under the contract is eligible and authorized to work in the United States in compliance with federal law."

C. In the event the Contractor fails to comply with the provisions of the Executive Order 07-13, or in the event the Commission has reasonable cause to believe that the contractor has knowingly employed individuals who are not eligible to work in the United States in violation of federal law, the Commission reserves the right to impose such contract sanctions as it may determine to be appropriate, including but not limited to contract cancellation, termination or suspension in whole or in part or both.

D. The Contractor shall include the provisions of this paragraph in every subcontract. The Contractor shall take such action with respect to any subcontract as the Commission may direct as a means of enforcing such provisions, including sanctions for noncompliance.

13. EMPLOYMENT OF UNAUTHORIZED ALIENS

A. Pursuant to 285.530 RSMo, the bidder/offeror must affirm its enrollment and participation in a federal work authorization program with respect to the employees proposed to work in connection with the services requested herein by

- submitting a completed, notarized copy of the AFFIDAVIT OF WORK AUTHORIZATION and
- providing documentation affirming the bidder's/offeror's enrollment and participation in a federal work authorization program (see below) with respect to the employees proposed to work in connection with the services requested herein.

B. E-Verify is an example of a federal work authorization program. Acceptable enrollment and participation documentation consists of completed copy of the E-Verify Memorandum of Understanding (MOU). For vendors that are not already enrolled and participating in a federal work authorization program, E-Verify is available at http://www.dhs.gov/xprevprot/programs/gc_1185221678150.shtm.

C. The contractor understands and agrees that by signing the (IFB/RFP/RFQ/SFS document or contract), they certify the following:

a. The contractor shall only utilize personnel authorized to work in the United States in accordance with applicable federal and state laws. This includes but is not limited to the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) and INA Section 274A.

b. If the contractor is found to be in violation of this requirement or the applicable state, federal and local laws and regulations, and if the State of Missouri has reasonable cause to believe that the contractor has knowingly employed individuals who are not eligible to work in the United States, the state shall have the right to cancel the contract immediately without penalty or recourse and suspend or debar the contractor from doing business with the state.

c. The contractor agrees to fully cooperate with any audit or investigation from federal, state or local law enforcement agencies.

d. In addition, the contractor shall maintain enrollment and participation in a federal work authorization program with respect to the employees working in connection with the contracted services included herein.

14. PREFERENCES

A. In the evaluation of bids/quotes/proposals, preferences shall be applied in accordance with Chapter 34 RSMo. Contractors should apply the same preferences in selecting subcontractors.

B. By virtue of statutory authority, RSMo. 34.076 and 34.350 to 34.359, a preference will be given to materials, products, supplies, provisions and all other articles produced, manufactured, made or grown within the State of Missouri. Such preference shall be given when quality is equal or better and delivered price is the same or less.

1) If attached, the document entitled "PREFERENCE IN PURCHASING PRODUCTS" should be completed and returned with the solicitation documents.

2) If attached, the document entitled "MISSOURI DOMESTIC PRODUCTS PROCUREMENT ACT" should be completed and returned with the solicitation documents. Applies if bid is Twenty-Five Thousand Dollars ($25,000.00) or more.

C. By virtue of statutory authority, RSMo 34.074, a preference will be given all contracts for the performance of any job or service to service-disabled veteran business either doing business as Missouri firms, corporations, or individuals; or which maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less or whenever competing bids, in their entirety, are comparable.

1) If attached, the document entitled "MISSOURI SERVICE-DISABLED VETERAN PREFERENCE" should be completed and returned with the solicitation documents.

D. In the event of a tie of low bids, the MHTC reserves the right to establish the method to be used in determining the award.

PREFERENCES IN PURCHASING PRODUCTS

DATE: _____

The bidders attention is directed to Section 34.076 RSMo 2000 which gives preference to Missouri corporations, firms, and individuals when letting contracts or purchasing products.

Bids/Quotations received will be evaluated on the basis of this legislation.

All vendors submitting a bid/quotation must furnish ALL information requested below.

FOR CORPORATIONS:

State in which incorporated: _____

FOR OTHERS:

State of domicile: _____

FOR ALL VENDORS:

List address of Missouri offices or places of business:

_____

_____

_____

_____

_____

_____

_____

THIS SECTION MUST BE COMPLETED AND SIGNED:

FIRM NAME: _____

ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____

BY (signature required): _____

Federal Tax I.D. #: _____ if no Federal Tax I.D. # - list Social Security #: _____

NOTE: For bid/quotation to be considered, the "Preference in Purchasing Products" form must be on file in the General Services (Procurement) Division and must be dated in the current calendar year.

MISSOURI DOMESTIC PRODUCTS PROCUREMENT ACT

The bidder's attention is directed to the Missouri Domestic Products Procurement Act, Sections 34.350 to 34/359, RsMO, which requires all manufactured goods or commodities used or supplied in the performance of this contract or any subcontract to be manufactured or produced in the United States.

Section 34.355, RsMO, requires the vendor or contractor to certify his compliance with Section 34.353 and, if applicable, Section 34.359, RsMO, at the time of bidding and prior to payment. Failure to comply with Section 34.353, RsMO, during the performance of the contract and to provide certification of compliance prior to payment will result in nonpayment for those goods or commodities.

Section 34.353.2, RsMO, specifies that it does not apply where the total contract is less than Twenty-Five Thousand Dollars ($25,000.00). If your total bid is Twenty-Five Thousand Dollars ($25,000.00) or more, you must complete this form as directed below.

Failure to complete and return this document with this bid will cause the State to presume the manufactured goods or products listed in the bid are not manufactured or produced in the United States, and the bid will be evaluated on that basis. Please read the certification appearing below on this form.

[ ] If all the goods or products specified in the attached bid which the bidder proposes to supply to the State shall be manufactured or produced in the "United States" as defined in Section 34.350, RsMO, check the box at left.

[ ] If only one item of any particular goods or products specified in the attached bid is manufactured or produced in the "United States" as defined in Section 34.350, RsMO, check the box at left and list the items (or item number) here:
_____
_____

[ ] If any or all of the goods or products specified in the attached bid which the bidder proposes to supply to the State are not manufactured or produced in the "United States" as defined in Section 34.350, RsMO, then: (a) check the box at left; (b) list below, by item (or item number), the country other than the United States where each good or product is manufactured or produced; and (c) check the boxes to the left of the paragraphs below if applicable and list the corresponding items (or item numbers) in the spaces provided.

Item (or item number)	Location Where Item Manufactured or Produced

(attach an additional sheet if necessary)

[ ] The following specified goods or products cannot be manufactured or produced in the United States in sufficient quantities or in time to me the contract specifications. Items (or item numbers): _____
_____

[ ] The following specified goods or products must be treated as manufactured or produced in the United States, in accordance with an existing treaty, law, agreement, or regulation of the United States, including a treaty between the United States and any foreign country regarding export-import restrictions or international trade. Items (or item numbers): _____
_____

CERTIFICATION

By submitting this document, completed as directed above, with a bid, the bidder certifies under penalty of making false declaration (Section 575.060, RsMO) that the information contained in this document if true, correct and complete, and may be relied upon by the State in determining the bidders qualifications under and in compliance with the Missouri Domestic Products Procurement Act.
The bidder's failure to complete and return this document with the bid as directed above will cause the State to presume the manufactured goods or products listed in the bid are not manufactured or produced in the United States, and the bid will be evaluated on that basis pursuant to Section 34.353.3(2), RsMO.

MISSOURI SERVICE-DISABLED VETERAN BUSINESS PREFERENCE

By virtue of statutory authority, RSMo 34.074, a preference will be given all contracts for the performance of any job or service to service-disabled veteran business either doing business as Missouri firms, corporations, or individuals; or which maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less or whenever competing bids, in their entirety, are comparable.

Definitions:

Service-Disabled Veteran is defined as any individual who is disabled as certified by the appropriate federal agency responsible for the administration of veterans' affairs.

Service-Disabled Veteran Business is defined as a business concern:

a. Not less than fifty-one (51) percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than fifty-one (51) percent of the stock of which is owned by one or more service-disabled veterans; and
b. The management and daily business operations of which are controlled by one or more service-disabled veterans.

If an offeror meets the definitions of a service-disabled veteran and a service-disabled veteran business as defined in 34.074 RSMo and is either doing business as a Missouri firm, corporation, or individual; or maintains a Missouri office or place of business, the offeror must provide the following with the proposal in order to receive the Missouri service-disabled veteran business preference over a non-Missouri service-disabled veteran business when the quality of performance promised is equal or better and the price quoted is the same or less or whenever competing proposals, in their entirety, are comparable:

a. A copy of a letter from the Department of Veterans Affairs (VA), or a copy of the offeror's discharge paper (DD Form 214, Certificate of Release or Discharge from Active Duty) from the branch of service the offeror was in, stating that the offeror has a service-connected disability rating ranging from 0 to 100% disability; and
b. A completed copy of this exhibit

(NOTE: For ease of evaluation, please attach copy of the above-referenced letter from the VA or a copy of the offeror's discharge paper to this Exhibit.)

By signing below, I certify that I meet the definitions of a service-disabled veteran and a service-disabled veteran business as defined in 34.074 RSMo and that I am either doing business as a Missouri firm, corporation, or individual; or maintain Missouri offices or places of business at the location(s) listed below.

Veteran Information	Business Information
Service-Disabled Veteran's Name, (Please Print)	Service-Disabled Veteran Business Name
Service-Disabled Veteran's Signature	Missouri Address of Service-Disabled Veteran Business

SECTION 00301

BID FORM

To: The Missouri Highway and Transportation Commission
105 West Capitol Avenue
Jefferson City, Missouri 65101

1. The undersigned, having examined the proposed Contract Documents titled: marked **"New Maintenance and Storage Buildings, 2273 North Service Road West, District #6, Franklin County, St. Clair, MO"** and having visited the site and examined the conditions affecting the Work, hereby proposes and agrees to furnish all labor, materials, equipment and everything which may be necessary or incidental thereto, as proposed by said Contract Documents, all to the satisfaction of the Chief Engineer of the Missouri Department of Transportation and the Missouri Highway and Transportation Commission, for the stipulated sum of:

   _____ DOLLARS ($_____).

2. The undersigned, acknowledges having examined and being familiar with the contract documents including the drawings, the Instructions to Bidders, General Conditions, Supplementary Conditions and the body of technical specifications.

3. The undersigned acknowledges receipt of Addenda number _____ through _____ inclusive.

4. Enclosed with this bid is bid security in the amount of not less than 5% of the bidder's proposed Contract Sum, the amount being _____ DOLLARS ($_____).

IF AN INDIVIDUAL

_____

_____ _____
Name of individual Residence address

_____ _____
Social Security Number Telephone Number

_____
Firm Name, If Any

_____

_____ _____
Address for communications Signature

IF A PARTNERSHIP

_____
Name of Partnership

_____
Partner

_____
Partner

_____

_____
Address for Communications

_____
Telephone Number

(State Name and Residence Address of All Partners)

_____

_____
Residence Address

_____

_____
Residence Address

_____
Federal Tax I.D. Number

_____
Signature of Either Partner

IF A CORPORATION

_____
Name of Corporation

_____
Name and Title of Officer

_____
Signature of officer

_____

_____
Address for Communications

_____
Telephone Number

Incorporated under the laws of the
State of_____

Corporate License No. _____
(If a corporation organized in a state other than Missouri, attach Certificate of Authority to do business in the State of Missouri.)

_____
Federal Tax I.D. Number

(ATTEST)

_____
(SEAL) Secretary

(Each bidder must complete the Bid Form by signing in the proper signature line above and by supplying the required information called for in connection with the signature. The information called for is necessary in the proper preparation of the contract and performance bond.)

SECTION 00430

SUBCONTRACTOR LISTING

1. For portions of Work equaling or exceeding 1% of the total proposed Contract Sum, the undersigned proposes to use the following subcontractors. Except as otherwise approved by the Owner, the undersigned proposes to perform all other portions of the Work with his own forces.

2.

Portion of the Work:	Subcontractor name and address:
_____	_____
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USE ADDITIONAL SHEETS IF REQUIRED

PROVIDE SIGNATURE IDENTICAL TO THAT SHOWN ON THE BID FORM

BIDDER:

_____

by_____

SECTION 00600

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____ ,
as Principal, and _____ ,
as Surety, are held firmly bound unto the State of Missouri (acting by and through the Missouri Highway and Transportation Commission) in the penal sum of _____ Dollars ($_____),
to be paid to the State of Missouri, or the Missouri Highway and Transportation Commission, to be credited to the State Road Fund and Principal and Surety binding themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Sealed with our seals and dated this _____ day of _____, 20_____

THE CONDITION OF THIS OBLIGATION is such that:
WHEREAS, the Principal is submitting herewith a bid to the Missouri Highway and Transportation Commission on Route(s) _____,
in _____ County(ies), Project(s) _____,
for construction or improvement as set out in said proposal.

NOW THEREFORE, if the Missouri Highway and Transportation Commission shall accept the bid of the Principal, and if said Principal shall properly execute and deliver to the Missouri Highway and Transportation Commission the Contract, Contract Bond, Specifications and evidence of insurance coverage in compliance with the requirements of the Proposal, to the satisfaction of the Missouri Highway and Transportation Commission, then this obligation shall be void and of no effect, otherwise to remain in full force and effect.

In the event the said Principal shall, in the judgment of the Missouri Highway and Transportation Commission, fail to comply with any requirement as set forth in the preceding paragraph, then the State of Missouri, acting through the Missouri Highway and Transportation Commission, shall immediately and forthwith be entitled to recover the fees, and any other expense of recovery.

_____ _____
Principal Surety

By_____ _____
Attorney in Fact (SEAL)

Attest: (CORPORATE SEAL)

_____
Corporate Secretary

Note: This bond must be executed by the Principal and by a Corporate Surety authorized to conduct surety business in the State of Missouri.

SECTION 01010

GENERAL CONDITIONS

1. General. The contractor shall do all things necessary to the performance of the contract in a substantial and acceptable manner in accordance with the specifications and plans.

2. Employer's Liability. Contractor shall furnish evidence to the Commission that with respect to the operations it performs, it either carries employers' liability or worker's compensation insurance or is qualified as self-insured under the provisions of law of the state relating to worker's compensation.

3. The Contractor shall purchase and maintain such insurance as will protect him from claims under workmen's compensation acts and other employee benefit acts, from claims for damages because of bodily injury, including death, and from claims for damages to property which may arise out of or result from the Contractor's operations under this Contract, whether such operations be by himself or by any Subcontractor or anyone directly or indirectly employed by any of them.

4. This insurance shall be written for not less than any limits of liability specified as part of this contract, or required by law, whichever is the greater, and shall include contractual liability insurance as applicable to the Contractor's obligations under this contract. Unless otherwise specified, insurance limits shall be as follows:

   A. Workmen's Compensation: Workers Compensation Insurance, including "Occupational Disease Act" requirements, must be maintained if required by law.

   B. Public Liability (includes property damage and personal injury):

      i Not less than $500,000 for any one person in a single accident or occurrence.

      ii. Not less than $3,000,000 for all claims arising out of a single occurrence.

5. Duration of Insurance. The evidence of insurance required by sections 2, 3, and 4 above shall be furnished to the Commission prior to the effective date of the Notice to Proceed. All insurance herein before specified shall be carried until all work required to be performed under the terms of the contract is satisfactorily completed as evidenced by the formal acceptance by the Commission and in the event that the limits of coverage for property damage are depleted or decreased by the payment of claims, the contractor shall procure a reinstatement of the limits. The cost of all insurance required to be carried by the contractor shall be considered as completely covered by the contract price.

6. Inspection of Work. Commission's engineer shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials and other data and records relating to the work. If requested by Commission's engineer, the contractor shall at any time before final acceptance of the work uncovers any portion of the finished work as directed for inspection. After examination, the contractor shall restore said portions of the work to the standards required by the contract. Should the work thus exposed and examined prove acceptable, the actual cost of uncovering, removing and replacing shall be paid by the Commission. Should the work so exposed and examined prove unacceptable, the uncovering, removing and replacing shall be at the expense of the contractor.

7. Change Orders. All departures from the plans and specifications will be considered unauthorized unless, before proceeding with the work, the contractor has had delivered to it a change order, signed by the Commission's engineer, authorizing and directing such changes or departures. All unauthorized work shall be at the contractor's expense and the engineer may order such unauthorized work removed and replaced at the contractor's expense.

8. Defective Work. All work which has been rejected shall be remedied, or if necessary, removed and replaced in an acceptable manner by the contractor at its expense. If the contractor fails to remedy or replace such defective work immediately after receiving written notice from the Commission's engineer, Commission may employ labor to correct the defective work, and the cost incurred in making such corrections shall be deducted from the payment due or to become due the contractor under this contract.

9. Contractor's Responsibility for Work. Until Commission's engineer accepts the work, it shall be in the custody and under the charge and care of the contractor. Contractor shall rebuild, repair, restore or make good at its own expense any lost or stolen Commission-owned material and all injuries or damages to any portion of the work caused by action of the elements or from any other reason before its completion and final acceptance. Issuance of a payment estimate on any part of the work done will not be considered as final acceptance of any work completed up to that time.

10. Preservation of Utilities and Monuments. The contractor shall be responsible for the preservation of all public and private utilities, wires, lines, pipes, poles, cables, and conduit at the site of the work and shall use every precaution necessary to prevent damage or injury thereto. The contractor shall not disturb or damage any land monument or property landmark until an authorized agent has witnessed or otherwise referenced, their location and shall not remove them until directed by Commission's engineer.

11. Cooperation with Other Contractors. The contractor shall arrange its work so as not to interfere with the operations of other contractors of the Commission which might be engaged in performing adjacent or nearby work. Whenever work being done by other contractors is contiguous or related to the work involved in this contract, the respective rights of the various contractors will be determined by the Commission's engineer in order to secure the completion of the work under all contracts in general harmony.

12. Temporary Suspension of Work. Commission's engineer shall have authority to suspend work, wholly orin part, for such period or periods of time as he may deem necessary when weather or other conditions are such that in the opinion of the engineer the work may be done at a later time with advantage to the Commission or for failure on the part of the contractor to comply with any of the provisions of the contract. The contractor may suspend work for reasonable cause with written approval of the engineer. Liquidated damages shall not accrue during the period in which work is suspended with the approval of the engineer, however, if the suspension is because of the contractor's failure to comply to any of the provisions of the contract, the contractor shall not be entitled to an extension of completion time nor to a waiver of liquidated damages. In the event work is suspended, the contractor shall store all materials in a manner that will protect them from damage, and shall take every precaution to prevent damage or deterioration of, the portions of the work completed. If work has been discontinued for any reason, the contractor shall give Commission's engineer written notice at least forty-eight (48) hours before resuming operations.

13. Contractor's Procedure for Claims. If the contractor considers additional compensation may be due for work or material not clearly covered in the contract or ordered in writing by the engineer as extra work, or if additional compensation may be requested beyond the scope of such provisions, the contractor shall notify the engineer in writing of the intention to make a claim before beginning the work in question. If notification is not given and the engineer is not afforded proper facilities by contractor to provide necessary inspection and for keeping strict account of actual cost, the contractor agrees to waive any claims for additional compensation. Notice by the contractor, and the fact that the engineer has kept account of the cost shall not be construed as substantiating the validity of the claim. The contractor shall file a written notice of claim for additional compensation in triplicate within 60 days after completing the work in question.

    If the claim is against the Commission, the notice of claim shall be personally delivered, or sent by certified mail to the office of the Secretary of the Commission in Jefferson City, Missouri. All notices of claims shall contain an itemized statement showing completely and fully the items and amounts forming the basis of the claim.

    Any claim or an item of any claim, not included in the notice and statement, or any claim included but not clearly defined and specifically set out and itemized or any claim not filed within the time and in the manner provided, shall be forever waived and shall neither constitute the basis of nor be included in any legal action, counterclaim, set-off, or arbitration.

    All claims filed with Missouri Highway and Transportation Commission's Secretary will be forwarded to the Missouri Department of Transportation's Claims Committee.

14. Overhead and Profit on Change Orders. The percentages for overhead and profit charged on Change Orders and Field Work Authorizations shall be negotiated and may vary according to the nature, extent and complexity of the work involved. However, the overhead and profit for the contractor or subcontractor actually performing the work shall not exceed 15%. When one or more tiers of subcontractors are used, in no event shall any contractor or subcontractor receive as overhead and profit more than 7% of the cost of the work performed by any of his subcontractors. In no case shall the total overhead and profit paid by the owner on any change order exceed twenty five percent (25%) of the cost of materials, labor and equipment necessary to put the change order work in place.

15. Review of Submittals. The architect's review of submittals is only for the limited purpose of checking for conformance with information given and seeing if they conform to design intent. The architect is not responsible for determining the accuracy of measurements and completeness of details, for verifying quantities, or for checking fabrication or installation procedures. The architect's review does not relieve the contractor of his or her responsibilities under the contract documents.

16. A working day. Is defined as any day when, soil and weather conditions would permit the major operation of the project for six hours or more unless other unavoidable conditions prevent the contractor's operation. If conditions require the contractor to stop work in less than six hours, the day will not be counted as a working day. Working days will begin as soon as notice to proceed is issued. In order for MoDOT not to change a workday due to unavoidable conditions, the contractor must have enough forces, equipment, and materials on site to begin the project. The contractor must notify MoDOT inspector before 12:00 noon of said working day if forces will not be present.

END OF SECTION

SECTION 01011

SUPPLEMENTARY CONDITIONS

A. The following supplements modify, change, delete from or add to the "General Conditions."

1. The proposed work includes the furnishing of all materials, equipment and labor for the work as set forth in the plans, proposal and specifications.

2. The contractor will be required to remove from the Highway and Transportation Commission's property all debris.

3. The contract price shall include any necessary permits and licenses required by law incidental to the work. Local ordinances requiring building permits are not applicable to the state. Contractor will comply with local laws involving safety in the prosecution of the work.

4. Contractor will provide a one-year warranty for parts and labor on all building material, and equipment or a standard manufacturer's warranty which ever is greater. All warranties, including extended service agreements shall begin on the date of Final Acceptance of this project.

5. The plans holders list may be obtained from the One Stop Facility located at 1320 Creek Trail Dr., Jefferson City, Mo 65102, by calling 573/751-4879 or electronically downloaded from http://www.modot.org/business/contractor_resources/FacilitiesConstructionandMaintenance.htm

B. DEFINITIONS

1. Architect: When the term "Architect" is used herein, it shall refer to Larry Carver, [Senior Facilities Designer], (573) 526-7934 or Jerrold Scarlett [Architect & submittal reviewer] Missouri Department of Transportation, General Services Division, (573) 526-7935, FAX (573) 526-6948.

2. Construction Inspector: When the term "Construction Inspector" is used herein, it shall refer to Kelly Hammack, Missouri Department of Transportation, General Services Division, (573) 526-7936, FAX (573) 526-6948.

END OF SECTION

SECTION 01019

CONTRACT CONSIDERATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Schedule of values.
B. Application for payment.
C. Change procedures.
D. Alternatives.

1.2 RELATED SECTIONS

A. Section 01600 - Material and Equipment: Product substitutions.

1.3 SCHEDULE OF VALUES

A. Submit a printed schedule on Contractor's standard form. Electronic media printout will be considered.

B. Submit Schedule of Values in duplicate within 20 days after date of Owner-Contractor Agreement.

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

1.4 APPLICATIONS FOR PAYMENT

A. Submit four copies of each application on Contractor's electronic media driven form.
B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
C. Payment Period: 30 days.
D. Submit waiver of liens from vendors.
E. Include an updated construction progress schedule.
F. Certified payroll records.

1.5 CHANGE PROCEDURES

A. The Architect/Engineer may issue a Notice of Change that includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required.

B. The Contractor may propose changes by submitting a request for change to the Architect/Engineer, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, the effect on the Contract Sum/Price and Contract Time, and a statement describing the effect on Work by the MoDOT District or other Contractors.

C. Stipulated Sum/Price Change Order: Based on Notice of Change and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Architect/Engineer.

D. Construction Change Directive: Architect/Engineer may issue a directive instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute the change.

E. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. Architect/Engineer will determine the change allowable in Contract Sum/Price and Contract Time as provided in the Contract Documents.

F. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

G. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.6 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specify requirements.
B. If, in the opinion of the Architect/Engineer, it is not practical to remove and replace the Work, the Architect/Engineer will direct an appropriate remedy or adjust payment.

1.7 ALTERNATIVES

A. Accepted Alternatives will be identified in Owner-Contractor Agreement.

END OF SECTION

SECTION 01039

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and project conditions.
B. Field engineering.
C. Preconstruction meeting.
D. Site mobilization meeting.
E. Progress meetings.
F. Preinstallation meetings.
G. Equipment electrical characteristics and components.
H. Examination.
I. Preparation.
J. Cutting and Patching.
K. Alteration project procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

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

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

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

D. In finished areas, except as otherwise indicated, conceal pipes, ducts and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion.

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

1.3 FIELD ENGINEERING

A. Employ a Land Surveyor registered in the State of Missouri and acceptable to Architect/Engineer.
B. Owner will locate and protect survey control and reference points.
C. Control datum for survey is that established by Owner provided survey.
D. Verify setbacks and easements; confirm drawing dimensions and elevations.
E. Provide field engineering services. Establish elevations, lines and levels, utilizing recognized engineering survey practices.

1.4 PRECONSTRUCTION MEETING

A. Architect/Engineer will schedule a meeting after Notice of Award.
B. Attendance Required: District engineer or representative, Architect/Engineer and Contractor.

C. Record minutes and distribute copies within 5 days after meeting to participants, with two copies to District Engineer, Architect/Engineer, participants and those affected by decisions made.

1.5 SITE MOBILIZATION MEETING

A. Architect/Engineer will schedule a meeting at the Project site prior to Contractor occupancy.

B. Architect/Engineer will record minutes and distributes copies within 5 days after meeting to participants, with two copies to Architect/Engineer, participants and those affected by decisions made.

1.6 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at when arranged by architect/engineer.

B. Architect/Engineer will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, District engineer representative, Architect/Engineer, as appropriate to agenda topics for each meeting.

D. Agenda:
1. Review of Work progress.
2. Field observations, problems, and decisions.
3. Identification of problems, which impede planned progress.
4. Maintenance of progress schedule.
5. Corrective measures to regain projected schedules.
6. Coordination of projected progress.
7. Effect of proposed changes on progress schedule and coordination.

E. Record minutes and distributes copies within 5 days after meeting to participants and those affected by decisions made.

1.7 PREINSTALLATION MEETING

A. When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.
B. Notify Architect/Engineer seven days in advance of meeting date.
C. Prepare agenda and preside at meeting:
1. Review conditions of installation, preparation and installation procedures.
2. Review coordination with related work.
D. Record minutes and distributes copies within 5 days after meeting to participants and those affected by decisions made.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements, which affect:

1. Structural integrity of element.
2. Integrity of weather-exposed or moisture-resistant elements.
3. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching to complete Work, and to:
1. Uncover Work to install or correct ill-timed Work.
2. Remove and replace defective and non-conforming Work.
3. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Cut masonry and concrete materials using masonry saw or core drill.

E. Fit Work tight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

F. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

G. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

H. Identify hazardous substances or conditions exposed during the Work to the Architect/Engineer for decision or remedy.

3.2 ALTERATION PROJECT PROCEDURES

A. Materials: As specified in Product sections; match existing Products and work for patching and extending work.

B. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.

C. When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and submit recommendation to Architect/Engineer for review.

D. Patch or replace portions of existing surfaces that are damaged, lifted, discolored or showing other imperfections.

E. Finish surfaces as specified in individual Product sections.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures.
B. Construction progress schedules.
C. Proposed Products list.
D. Product Data.
E. Shop Drawings.
F. Samples.
G. Design data.
H. Test reports.
I. Certificates.
J. Manufacturer's instructions.
K. Manufacturer's field reports.
L. Erection drawings.
M. Construction photographs.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals
B. Section 01400 - Quality Control: Manufacturers' field services and reports.
C. Section 01700 - Contract Closeout: Contract warranties, bonds, manufacturers' certificates and closeout submittals.

1.3 REFERENCES

A. AGC Associated General Contractors of America publication "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

1.4 SUBMITTAL PROCEDURES

A. Transmit each submittal with Architect/Engineer accepted form.

B. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number and specification section number, as appropriate.

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

D. Schedule submittals to expedite the Project, and deliver to Architect/Engineer at business address. Coordinate submission of related items.

E. For each submittal for review, allow 15 days excluding delivery time to and from the contractor.

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

G. Submittals not requested will not be recognized or processed.

1.5 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial schedule in duplicate within 15 days after date established in Notice to Proceed.
B. Revise and resubmit as required.
C. Submit revised schedules with each Application for Payment, identifying changes since previous version.
D. Submit a horizontal bar chart with separate line for each major portion of Work or operation, identifying first workday of each week.

1.6 PROPOSED PRODUCTS LIST

A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name and model number of each product.
B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation and reference standards.

1.7 PRODUCT DATA

A. Product Data For Review:
   1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
   2. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.

B. Product Data For Information:
   1. Submitted for the Architect/Engineer's knowledge as contract administrator or for the Owner.

C. Product Data For Project Closeout:
   1. Submitted for the Owner's benefit during and after project completion.

D. **Submit the number of hard copies, which the Contractor requires, plus two copies that will be retained by the Architect/Engineer.**

E. Mark each copy to identify applicable products, models, options and other data. Supplement manufacturers' standard data to provide information specific to this Project.

F. After review distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01700 - CONTRACT CLOSEOUT.

1.8 SHOP DRAWINGS

A. Shop Drawings For Review:
   1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
   2. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.

B. Shop Drawings For Information:
   1. Submitted for the Architect/Engineer's knowledge as contract administrator or for the Owner.

C. Shop Drawings For Project Closeout:
   1. Submitted for the Owner's benefit during and after project completion.

D. Indicate special utility and electrical characteristics, utility connection requirements and location of utility outlets for service for functional equipment and appliances.

E. Submit in the form of one reproducible transparency and one opaque reproduction.

1.9 SAMPLES

A. Samples For Review:
   1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
   2. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.

B. Samples For Information:
   1. Submitted for the Architect/Engineer's knowledge as contract administrator or for the Owner.

C. Samples For Selection:
   1. Submitted to Architect/Engineer for aesthetic, color, or finish selection.
   2. Submit samples of finishes for Architect/Engineer selection.
   3. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.

1.10 DESIGN DATA

A. Submit for the Architect/Engineer's knowledge as contract administrator or for the Owner.
B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.11 TEST REPORTS

A. Submit for the Architect/Engineer's knowledge as contract administrator or for the Owner.
B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.12 CERTIFICATES

A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to Architect/Engineer, in quantities specified for Product Data.
B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits and certifications as appropriate.
C. Certificates may be recent or previous test results on material or Product but must be acceptable to Architect/Engineer.

1.13 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, and start-up, adjusting and finishing, to Architect/Engineer for delivery to owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention and special environmental criteria required for application or installation.
C. Refer to Section 01400 - Quality Control, Manufacturers' Field Services article.

1.14 MANUFACTURER'S FIELD REPORTS

A. Submit reports for the Architect/Engineer's benefit as contract administrator or for the Owner.
B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.15 ERECTION DRAWINGS

A. Submit drawings for the Architect/Engineer's benefit as contract administrator or for the Owner.
B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
C. Data indicating inappropriate or unacceptable Work may be subject to action by the Architect/Engineer or Owner.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality assurance - control of installation.
B. Tolerances
C. References and standards.
D. Mock-up.
E. Inspecting and testing laboratory services.
F. Manufacturers' field services.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals: Submission of manufacturers' instructions and certificates.
B. Section 01600 - Material and Equipment: Requirements for material and product quality.
C. Section 01650 - Starting of Systems.

1.3 QUALITY ASSURANCE - CONTROL OF INSTALLATION

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

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

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

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

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

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

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

1.4 TOLERANCES

A. Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.
B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.5 REFERENCES AND STANDARDS

A. For Products or workmanship specified by association, trade or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date for receiving bids or date specified in the individual specification sections, except where a specific date is established by code.
C. Neither the contractual relationships, duties or responsibilities of the parties in Contract nor those of the Architect/Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.6 TESTING SERVICES

A. Contractor to provide all testing services as called out in these specifications.
B. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Architect/Engineer or the Owner.
C. Testing does not relieve Contractor to perform Work to contract requirements.
D. Re-testing required because of non-conformance to specified requirements shall be performed by the same MoDOT personnel on instructions by the Architect/Engineer.

1.7 INSPECTION SERVICES

A. Owner will employ MoDOT Personnel to perform inspection.
B. Inspecting may occur on or off the project site. Perform off-site inspecting as required by the Architect/Engineer or the Owner.
C. Inspecting does not relieve Contractor to perform Work to contract requirements.

1.8 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and the balancing of equipment as applicable and to initiate instructions when necessary.
B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
C. Refer to Section 01300 - SUBMITTALS, MANUFACTURERS' FIELD REPORTS article.

PART 2 EXECUTION

2.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

2.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.
B. Seal cracks or openings of substrate prior to applying next material or substance.
C. Apply manufacturer required or recommended substrate primer, sealer or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Electricity, telephone service, facsimile service and sanitary facilities.
B. Temporary Controls: enclosures and fencing, protection of the Work and water control.
C. Construction Facilities: progress cleaning and temporary buildings.

1.2 TEMPORARY ELECTRICITY

A. Cost: By Contractor; pay for temporary power service furnished by MoDOT.

1.3 TELEPHONE SERVICE

A. Provide, maintain, and pay for telephone service to field office and Architect/Engineer's field office at time of project mobilization.

1.4 FACSIMILE SERVICE

A. Provide, maintain and pay for facsimile service and a dedicated telephone line to field office and Architect/Engineer's field office at time of project mobilization.

1.5 TEMPORARY WATER SERVICE

A. Connect to existing water source as directed for construction operations at time of project mobilization.
B. Contractor will reimburse Owner for water used in construction as agreed upon at time of project mobilization.

1.6 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

1.7 FENCING

A. Construction: Use plastic mesh safety fencing or better.
B. Provide 48” high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.8 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate and maintain pumping equipment.
B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.9 EXTERIOR ENCLOSURES

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

1.10 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification sections.

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

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

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

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

F. Prohibit traffic from landscaped areas.

1.11 SECURITY

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

1.12 ACCESS ROADS

A. Provide and maintain access to fire hydrants, free of obstructions.
B. Provide means of removing mud from vehicle wheels before entering streets.
C. Designated existing on-site roads may be used for construction traffic.

1.13 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris and rubbish. Maintain site in a clean and orderly condition.
B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces and other closed or remote spaces, prior to enclosing the space.
C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.
D. Collect and remove waste materials, debris and rubbish from site periodically and dispose off-site.
E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.14 FIELD OFFICES AND SHEDS

A. Office: Weather tight, with lighting, electrical outlets, heating and ventilating equipment and equipped with drawing rack and drawing display table.
B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

1.15 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities and materials prior to Final Application for Payment inspection.
B. Clean and repair damage caused by installation or use of temporary work.
C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.
B. Transportation and handling.
C. Storage and protection.
D. Product options.
E. Substitutions.

1.2 RELATED SECTIONS

A. Instructions to Bidders: Product options and substitution procedures.
B. Section 01400 - Quality Control: Product quality monitoring.

1.3 PRODUCTS

A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
B. Provide interchangeable components of the same manufacture for components being replaced.

1.4 TRANSPORTATION AND HANDLING

A. Transport and handle Products in accordance with manufacturer's instructions.
B. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct and products are undamaged.
C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement or damage.

1.5 STORAGE AND PROTECTION

A. Store and protect Products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive Products in weather tight, climate controlled, enclosures in an environment favorable to Product.

D. For exterior storage of fabricated Products, place on sloped supports above ground.

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

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

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

H. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement or damage.

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

1.6 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description is acceptable.
B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.7 SUBSTITUTIONS

A. Architect/Engineer will consider requests for Substitutions only within 15 days after date established in Notice to Proceed.

B. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that the Contractor:
1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
2. Will provide the same warranty for the Substitution as for the specified Product.
3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Will reimburse Owner for review or redesign services associated with re-approval by authorities.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:
1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit shop drawings, product data and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
3. The Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01650

STARTING OF SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Starting systems.
B. Demonstration and instructions.
C. Testing, adjusting and balancing.

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control: Manufacturers field reports.
B. Section 01700 - Contract Closeout: System operation and maintenance data and extra materials.

1.3 STARTING SYSTEMS

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

B. Notify Architect/Engineer seven days prior to start-up of each item.

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

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

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

F. Execute start-up under supervision of applicable manufacturer's representative or Contractors' personnel in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up and to supervise placing equipment or system in operation.

H. Submit a written report in accordance with Section 01300 that equipment or system has been properly installed and is functioning correctly.

1.4 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Final Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

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

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance and shutdown of each item of equipment at agreed time, at equipment location.

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

F. The amount of time required for instruction on each item of equipment and system that's specified in individual sections.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures.
B. Final cleaning.
C. Adjusting.
D. Project record documents.
E. Operation and maintenance data.
F. Spare parts and maintenance Products.
G. Warranties.

1.2 RELATED SECTIONS

A. Section 01500 - Construction Facilities and Temporary Controls: Progress cleaning.
B. Section 01650 - Starting of Systems: System start-up, testing, adjusting and balancing.

1.3 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's review.
B. Provide submittals to Owner that is required by governing or other authorities.
C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments and sum remaining due.
D. Owner will occupy portions of the building as specified in Section 01010.

1.4 FINAL CLEANING

A. Execute final cleaning prior to final project assessment. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

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

C. Clean or replace filters of operating equipment used during construction and/or adjustment.

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

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

F. Remove waste and surplus materials, rubbish and construction facilities from the site.

1.5 ADJUSTING

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

1.6 PROJECT RECORD DOCUMENTS

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

B. Record information concurrent with construction progress.

C. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

D. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish main floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.

E. Submit documents to Architect/Engineer with claim for final Application for Payment.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit data bound in 8-1/2 x 11 inch (A4) text pages, three D side ring binders with durable plastic covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project and subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers, logically organized; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Submit 1 draft copy of completed volumes 15 days prior to final inspection. This copy will be reviewed and returned with Architect/Engineer comments. Revise content of all document sets as required prior to final submission.

E. Submit two sets of revised final volumes, within 10 days after final inspection.

1.8 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra Products in quantities specified individual specification sections.
B. Deliver to Project site; obtain receipt prior to final payment.
C. Examine system components at a frequency consistent with reliable operation. Clean, adjust and lubricate as required.
D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
E. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

1.9 WARRANTIES

A. Execute and assemble transferable warranty documents from Subcontractors, suppliers and manufacturers.
B. Submit prior to final Application for Payment.
C. For items of Work delayed beyond date of Final Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of the warranty period.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 02100

SITE PREPARATION

PART 1 SCOPE

A. The contractor shall visit the site and carefully examine the conditions of the premises to determine the amount of work and materials required for the work necessary to prepare the site in every respect for the construction of the parking lot, driveways, final grading, as required.

B. The contractor shall be responsible for determining the quantities of materials to be excavated and handled and for the amount of backfilling, filling and grading to be done in order to perform all work required on the plans.

C. Included in the site grading is final seeding and mulching.

PART 2 SEEDING AND MULCHING

A. All area disturbed during onstruction.

B. Fertilizing:

1. Soil Neutralization: Shall be at the rate of 1000 pounds of effective neutralization per acre as per Specification Section 801.2.2 of the Missouri Standard Specifications for Highway Construction.
2. Commercial Fertilizer: In accordance with Specification Section 801.2.3 of the Missouri Standard Specifications for Highway Construction, fertilizers shall be applied at the following rates:

(a)	Nitrogen	80 lb. per acre
(b)	Phosphoric Acid	240 lb. per acre
(c)	Potash	80 lb. per acre

C. Seeding: Seed shall be Champion 3 + 3 Fescue Blend as sold by Mangelsdorf Seed Company, or equivalent as approved by the owner. The seed shall be applied at a rate of 400 lb. per acre.

D. Mulching: The mulch shall be Type 1 mulch as per Specification Section 802 of the Missouri Standard Specifications for Highway Construction

END OF SECTION

SECTION 02220

EXCAVATING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.1 SUMMARY

A. Excavate, backfill, compact, and grade the site to the elevations as required and specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Use equipment adequate in size, capacity and numbers to accomplish the work of this Section in a timely manner.

C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the soil engineer.

1.3 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Fill and backfill materials:

1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 6" in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2-3/8" in their greatest dimension.
2. Fill material is subject to the approval of the soil engineer, and is that materials removed from excavations or imported from off-site borrow areas; predominantly granular, non-expansive soils free from roots and other deleterious matter.
3. Do not permit rocks having a dimension greater than 1" in the upper 12" of fill or embankment.
4. Cohesionless material used for structural backfill. Provide sand free from organic material and other foreign matter, and as approved by the soil engineer.
5. Where granular base is called for under building slabs, provide aggregate complying with requirements of Section 03300 of these Specifications.

2.2 WEED KILLER

A. Provide a dry, free-flowing, dust-free chemical compound, soluble in water, capable of inhibiting growth of vegetation, and approved for use on this Work by governmental agencies having jurisdiction.

2.3 TOPSOIL

A. Where and if shown on the Drawings or otherwise required, provide topsoil consisting of friable,

fertile soil of loamy character, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from subsoil, roots, heavy or stiff clay, stones larger than 2" in greatest dimension, noxious weeds, sticks, brush, litter and other deleterious matter.

B. Obtain topsoil/backfill from sources within the project limits as approved by Owner, or provide imported topsoil obtained from sources outside the project limits or from both sources.

2.4 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINISH ELEVATIONS AND LINES

A. Comply with pertinent provisions of Section 01050.

3.3 PROCEDURES

A. Utilities:
1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.
2. If active utility lines are encountered and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Architect and secure his instructions.
5. Do not proceed with permanent relocation of utilities until written instructions are received from the Architect.

B. Protection of persons and property:
1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.

C. Dewatering:
1. Remove all water, including rainwater encountered during trench and sub-structure work to an approved location by pumps, drains and other approved methods.
2. Keep excavations and site construction area free from water.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors and to other work being performed on or near the site.

E. Maintain access to adjacent areas at all times.

3.4 EXCAVATING

A. Perform excavating of every type of material encountered within the limits of the Work to the lines, grades and elevations indicated and specified herein.

B. Satisfactory excavated materials:
   1. Transport to and place in, fill or embankment areas within the limits of the Work.

C. Unsatisfactory excavated materials:
   1. Excavate to a distance below grade as directed by the soil engineer and replace with satisfactory materials.
   2. Include excavation of unsatisfactory materials and replacement by satisfactory materials, as parts of the work of this Section.

D. Surplus materials:
   1. Dispose of unsatisfactory excavated material, and surplus satisfactory excavated material, away from the site at disposal areas arranged and paid for by the Contractor.

E. Excavation of rock:
   1. Where rocks, boulders, granite, or similar material is encountered, and where such material cannot be removed or excavated by conventional earth moving or ripping equipment, take required steps to proceed with the general grading operations of the Work, and remove or excavate such material by means which will neither cause additional cost to the Owner nor endanger buildings or structures whether on or off the site.
   2. Do not use explosives without written permission from the Architect.

F. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

G. Borrow:
   1. Obtain material required for fill or embankment in excess of that produces within the grading limits of the Work from borrow areas selected and paid for by the Contractor and approved by the soil engineer.

H. Ditches and gutters:
   1. Cut accurately to the cross sections, grades and elevations shown.
   2. Maintain excavations free from detrimental quantities of leaves, sticks, trash, and other debris until completion of the Work.
   3. Dispose of excavated materials as shown on the Drawings or directed by the soil engineer; except do not, in any case, deposit materials less than 3'-0" from the edge of a ditch.

I. Unauthorized excavation:
   1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific instruction from the Architect or the soil engineer.
   2. Under footings, foundations, or retaining walls:
      a. Fill unauthorized excavations by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering the required top elevation.

      b. When acceptable to the soil engineer, lean concrete fill may be used to bring the bottom elevation to proper position.

3. Elsewhere backfill and compact unauthorized excavations as specified for authorized excavations, unless otherwise directed by the soil engineer.

J. Stability of excavations:
1. Slope sides of excavations to 1:1 or flatter, unless otherwise directed by the soil engineer.
2. Shore and brace where sloping is not possible because of space restrictions or stability of the materials being excavated.
3. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

K. Excavating for structures:
1. Conform to elevations and dimensions shown within a tolerance of 0.10 ft, and extending a sufficient distance from footings and foundations to permit placing and removing concrete formwork, installation of services, other construction required and for inspection.
2. In excavating for footings and foundations, take care not to disturb bottom of excavation:
   a. Excavate by hand tools to final grade just before concrete is placed.
   b. Trim bottoms to required lines and grades to leave solid base to receive concrete.
3. Excavate for footings and foundations only after general site excavating, filling and grading are complete.

L. Excavating for pavements:
1. Cut surface under pavements to comply with cross sections, elevations and grades.

M. Cold weather protection:
1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.5 FILLING AND BACKFILLING

A. General:
1. For each classification listed below, place acceptable soil material in layers to required subgrade elevations.
2. In excavations:
   a. Use satisfactory excavated or borrowed materials.
3. Under building slabs:
   a. Use subbase materials.
4. Under building slabs:
   a. Use granular fill, if so called for on the Drawings, complying with aggregate acceptable under Section 03300 of these Specifications.

B. Backfill excavations as promptly as progress of the Work permits, but not until completion of the following.
1. Acceptance of construction below finish grade including, where applicable, dampproofing and waterproofing.
2. Inspecting, testing, approving and recording locations of underground utilities.
3. Removing concrete formwork.
4. Removing shoring and bracing and backfilling of voids with satisfactory materials.
5. Removing trash and debris.
6. Placement of horizontal bracing on horizontally supported walls.

C. Ground surface preparation:
1. Remove vegetation, debris, unsatisfactory soil materials, obstructions and deleterious matter from ground surface prior to placement of fills.
2. Plow, strip, or break up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with existing surface.
3. When existing ground surface has a density less than that specified under "compacting" for the particular area, break up the ground surface, pulverize, moisture-condition to the

optimum moisture content and compact to required depth and percentage of maximum density.

D. Placing and compacting:
1. Place backfill and fill materials in layers not more than 8" in loose depth.
2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
3. Compact each layer to required percentage of maximum density for area.
4. Do not place backfill or fill material on surfaces that are muddy, frozen or containing frost or ice.
5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.
7. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the structural floors are in place and have attained sufficient strength to support the walls.

3.6 GRADING

A. General:
1. Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas.
2. Smooth the finished surfaces within specified tolerance.
3. Compact with uniform levels or slopes between points where elevations are shown on the Drawings, or between such points and existing grades.
3. Where a change of slope is indicated on the Drawings, construct a rolled transition section having a minimum radius of approximately 8'0", unless adjacent construction will not permit such a transition or if such a transition defeats positive control of drainage.

B. Grading outside building lines:
1. Grade areas adjacent to buildings to achieve drainage away from the structures and to prevent ponding.

2. Finish the surfaces to be free from irregular surface changes, and:
a. Shape the surface of areas scheduled to be under walks to line, grade and cross-section, with finished surface not more than 0.10 ft above or below the required subgrade elevation.
b. Shape the surface of areas scheduled to be under pavement to line, grade and cross-section, with finished surface not more than 0.05 ft above or below the required subgrade elevation.

3.7 COMPACTING

A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D1557.

B. Provide not less than the following maximum density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place and as approved by the soil engineer.
1. Structures:
a. Compact the top 8" of subgrade and each layer of fill material or backfill material at 90% of maximum density.

2. Lawn and unpaved areas:
a. Compact the top 8" of subgrade and each layer of fill material or backfill material at 90% of maximum density.

b. Compact the upper 12" of filled areas, or natural soils exposed by excavating, at 85% of maximum density.

3. Walks:
   a. Compact the top 8" of subgrade and each layer of fill material or backfill material at 90% of maximum density.
4. Pavements:
   a. Compact the top 8" of subgrade and each layer of fill material or backfill material at 90% of maximum density.

C. Moisture control:
1. Where subgrade or layer of soil material must be moisture-conditioned before compacting, uniformly apply water to surface of subgrade or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.
2. Remove and replace or scarify and air dry, soil material that is too wet to permit compacting to the specified density.
3. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the soil engineer.

3.8 MAINTENANCE

A. Protection of newly graded areas:
1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds;
2. Repair and establish grades in settled, eroded and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape and compact to the required density prior to further construction.

END OF SECTION

SECTION 02221

TRENCHING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.1 SUMMARY

A. Trench, backfill, and compact as specified herein and as needed for installation of underground utilities associated with the Work.
B. Related work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirement and the methods needed for proper performance of the work of this Section.
B. Use equipment adequate in size, capacity and numbers to accomplish the work in a timely manner.
C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the construction soil engineer.

1.3 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Fill and backfill materials:
1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 6" in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2-3/8" in their greatest dimension.
2. Fill material is subject to the approval of the owner/architect and is that material removed from excavations or imported from off-site borrow areas, predominantly granular, non-expansive soil free from roots and other deleterious matter.
3. Do not permit rocks having a dimension greater than 1" in the upper 12" of fill.
4. Cohesionless material used for backfill: Provide sand free from organic material and other foreign matter and as approved by the Owner/Architect

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINISH ELEVATIONS AND LINES

A. Comply with pertinent provision of Section 01050.

3.3 PROCEDURES

A. Utilities:
1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.
2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Architect and secure his instructions.
5. Do not proceed with permanent relocation of utilities until written instructions are received form the Architect.

B. Protection of persons and property:
1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.

C. Dewatering:
1. Remove all water, including rainwater, encountered during trench and sub-structure work to an approved location by pumps, drains and other approved methods.
2. Keep trenches and site construction area free from water.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors and to other work being performed on or near the site.

E. Maintain access to adjacent areas at all times.

3.4 TRENCHING

A. Comply with pertinent provisions of Section 02220 and the provisions of this Section.

B. Provide sheeting and shoring necessary for protection of the Work and for the safety of personnel.
1. Prior to backfilling, remove all sheeting.
2. Do not permit sheeting to remain in the trenches except when, in the opinion of the Architect, field conditions or the type of sheeting or methods of construction such as use of concrete bedding are such as to make removal of sheeting impracticable. In such cases, the Architect may permit portions of sheeting to be cut off and remain in the trench.

C. Open cut:
1. Excavate for utilities by open cut.
2. If conditions at the site prevent such open cut and if approved by the Architect, trenching may be used.
3. Short sections of a trench may be tunneled if, in the opinion of the Architect, the conductor can be installed safely and backfill can be compacted properly into such tunnel.

4. Where it becomes necessary to excavate beyond the limits of normal excavations lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects as directed by the construction soil engineer.
5. When the void is below the subgrade for the utility bedding, use suitable earth materials and compact to the relative density directed by the construction soil engineer, but in no case to a relative density less than 90%.
6. When the void is in the side of the utility trench or open cut, use suitable earth or sand compacted or consolidated as approved by the construction soil engineer but in no case to a relative density less than 80%.
7. Remove boulders and other interfering objects and backfill voids left by such removals, at no additional cost to the Owner.
8. Excavating for appurtenances:
    a. Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
    b. Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel or lean concrete as directed by the construction soil engineer and at no additional cost to the Owner.

D. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.

E. Depressions:
1. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
2. Except where rock is encountered, do not excavate below the depth indicated or specified.
3. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified.

F. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, cover and other requirements as set forth by legally constituted authority having jurisdiction but in no case less than the depth shown in the Contract Documents.

G. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.

H. Cover:
1. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or subgrade.
    a. Areas subject to vehicular traffic:
        (1) Sanitary sewers:
        (2) Storm drains:
    b. Areas not subject to vehicular traffic:
        (1) Sanitary sewers: 30";
        (2) Storm drains: 18".
    c. All areas:
        (1) Water lines: 30";
        (2) Natural gas lines: 24";
        (3) Electrical cables: 42";
        (4) Electrical ducts: 36".
    d. Concrete encased:
        (1) Pipe sleeves for water and gas lines: 24";
        (2) Sanitary sewers and storm drains: 12";
        (3) Electrical ducts: 24".

2. Where utilities are under a concrete structure slab or pavement, the minimum depth need only be sufficient to completely encase the conduit or pipe sleeve and electrical long-radius rigid metal conduit rise, provided it will not interfere with the structural integrity of the slab or pavement.
3. Where the minimum cover is not provided encase the pipes in concrete as indicated. Provide concrete with a minimum 28th day compressive strength of 2500 psi.

3.5 BEDDING

A. Provide bedding as indicated on the Drawings.

3.6 BACKFILLING

A. General:
1. Do not completely backfill trenches until required pressure and leakage tests have been performed, and until the utilities systems as installed conform to the requirements specified in the pertinent Sections of these Specifications.
2. Except as otherwise specified or directed for special conditions, backfill trenches to the ground surface with selected material approved by the construction soil engineer.
3. Reopen trenches that have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified or otherwise correct to the approval of the construction soil engineer.
4. Do not allow or cause any of the Work performed or installed to be covered up or enclosed by work of this Section prior to required inspections, tests and approvals.
5. Should any of the Work be so enclosed or covered up before it has been approved, uncover all such Work and, after approvals have been made, refill and compact as specified, all at no additional cost to the Owner.

B. Lower portion of trench:
1. Deposit approved backfill and bedding material in layers of 6" maximum thickness, and compact with suitable tampers to the density of the adjacent soil, or grade as specified herein, until there is a cover of not less than 24" over sewers and 12" over other utility lines.
2. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.

C. Remainder of trench:
1. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 6" or 1/2 the layered thickness, whichever is smaller, in any dimension.
2. Deposit backfill material in layers not exceeding the thickness specified and compact each layer to the minimum density directed by the construction soil engineer.

D. Adjacent to buildings: Mechanically compact backfill within ten feet of buildings.

E. Consolidation of backfill by jetting with water may be permitted, when specifically approved by the construction soil engineer, in areas other than building and pavement areas.

3.7 TEST FOR DISPLACEMENT OF SEWERS AND STORMDRAINS

A. Check sewers and storm drains to determine whether displacement has occurred after the trench has been backfilled to above the pipe and has been compacted as specified.
B. Flash a light between manholes or, if the manholes have not yet been constructed, between the locations of the manholes, by means of a flashlight or by reflecting sunlight with a mirror.
C. If the illuminated interior of the pipeline shows poor alignment, displaced pipes, or any other defects, correct the defects to specified conditions and at no additional cost to the Owner.

3.8 PIPE JACKING

A. The Contractor may, at his option, install steel pipe casings, tongue-and-groove reinforced concrete pipes, and steel pipes under existing roads or pavements by jacking into place using procedures approved by the governmental agencies having jurisdictional approved by the construction soil engineer.

3.9 TUNNELING OPERATIONS

A. The Contractor may, at his option, tunnel pipes into position using procedures approved by the construction soil engineer and the governmental agencies having jurisdiction.

3.10 FIELD QUALITY CONTROL

A. The construction soil engineer will inspect open cuts and trenches before installation of utilities, and will make the following tests:
   1. Assure that trenches are not backfilled until all tests have been completed.
   2. Check backfilling for proper layer thickness and compaction.
   3. Verify that test results conform to the specified requirements, and that sufficient tests are performed.
   4. Assure that defective work is removed and properly replaced.

END OF SECTION

SECTION 02280

TERMITE CONTROL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division One specification sections, apply to work of this Section.

B. Comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.

1.2 DESCRIPTION OF WORK

A. Extent of termite control work is as herein specified.

1.3 QUALITY ASSURANCE

A. Scope of Work: Contractor shall furnish all superintendence, labor, tools, materials, equipment and perform all operations to complete the termite control work as shown on the drawings and specified herein.

B. Engage a professional pest control operator licensed by the Missouri Department of Agriculture, Bureau of Pesticide Control, P.O. Box 630, Jefferson City, Missouri 65102, 573/751-2462, for application of termiticide soil treatment solutions.

1. Contractor shall be responsible for certifying that applicator of termiticides is licensed and in good standing (no blemishes on record) with the Missouri Department of Agriculture, Bureau of Pesticide Control for the application of termiticides.
2. Prior to commencement of termiticides application, applicator shall provide to the Construction Inspector certification of licensing and standing with the Missouri Department of Agriculture, Bureau of Pesticide Control for the application of termiticides.
3. Termiticides shall be applied by the certified applicator and not by uncertified employees.

C. Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations, and landscaping is completed, except as otherwise required in construction operations.

D. To insure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of soil toxicant manufacturer.

1.4 SUBMITTALS

A. Product Data: For information only, submit three copies of the manufacturer's technical data and application instructions.

1.5 JOB CONDITIONS

A. Inspection: The applicator shall examine the areas and conditions under which the termite control work is to be performed and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the applicator.

1. Applicator shall visually inspect the application areas to certify that building waste materials or organic matter has not been placed in the backfill materials.

1.6 WARRANTY

A. Furnish written warranty certifying that applied soil poisoning treatment will prevent infestation of subterranean termites and, if subterranean termite activity is discovered during warranty period, Contractor will re-treat soil and repair or replace damage caused by termite infestation.
   1. Provide warranty for a period of 5 years from date of treatment, signed by applicator and Contractor.

PART 2 PRODUCTS

2.1 MATERIALS & COMPONENTS

A. Soil Treatment Solution: Use emulsible concentrate insecticide for dilution with water, specifically formulated to prevent termite infestation. Provide a working solution of one of the following chemical elements that are accepted for registration by the Missouri Department of Agriculture.
   1. Chlorpyrifos.
      - Dursban TC — Dow Chemical Company
   2. Permethrin.
      - Dragnet FT — FMC Corporation
      - Torpedo — ICI Americas, Inc.
   3. Cypermethrine.
      - Prevail FT — FMC Corporation
      - Demon — ICI Americas, Inc.
   4. Fenvalerate.
      - Gold Coast Tribute — Du Pont
   5. Isofenphos.
      - Pryfon — Mobay Corporation
   6. Other solutions may be used by applicator, if accepted for registration by the Missouri Department of Agriculture for use as a termiticide.

PART 3 EXECUTION

3.1 PREPARATION

A. Written Application Procedures: The chemicals currently accepted for registration by the Missouri Department of Agriculture are highly toxic to aquatic life. The termiticide applicator shall provide written application procedures to the Contractor for approval by the Owner prior to application.

B. Surface Preparation: Remove foreign matter that could decrease effectiveness of treatment on areas to be treated. Loosen, rake and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placement of compacted fill under slabs, if recommended by toxicant manufacturer.

3.2 APPLICATION

A. Application Rates: Apply soil treatment solution at rates recommended by soil toxicant manufacturer and as submitted in the applicators written application procedures.

B. Provide temporary berms, catchment basins or other devices to restrain termiticides or termiticide treated soils from migrating from the application site.

C. Allow not less than 12 hours for drying after application, before beginning concrete placement or other construction activities.

D. Post signs in areas of application warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

END OF SECTION

SECTION 02500

PAVING AND SURFACING

PART 1 SCOPE

A. The contractor shall prepare the subgrade of the entrances and parking lot to the dimensions and contours mentioned in **the Contract Proposal Supplemental Civil/Site Plan Sheet in the Construction Documents**. A crushed rock base course and asphalt concrete surface course of uniform thickness, as shown in the plans, shall be laid and compacted in a manner to provide a smooth surface free of elevation variations capable of ponding water.

PART 2 MATERIAL

A. **Asphalt Design: See the Contract Proposal Supplemental Civil/Site Plan Sheet in the Construction Documents**.

PART 3 COMPACTION

A. The subgrade is to be prepared in a manner to be free of ruts and compacted to the degree obtained by three complete coverages with appropriate rollers or other equipment approved by the owner.

B. The base course shall contain sufficient moisture to allow substantial compaction and shall be compacted with three complete coverages of a roller or other equipment approved by the owner.

C. The asphalt surface shall be compacted with three complete coverages of a roller or other equipment approved by the owner. The finished surface shall be smooth and free from ruts, ridges or other imperfections.

END OF SECTION

SECTION 02660

WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Provide water distribution system as shown on the Drawings, specified herein and needed for a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
3. Names and addresses of the nearest service and maintenance organization that readily stocks repair parts.
4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. General:

1. Assume connection point to building service lines as being approximately five feet outside buildings and structures to which service is required.
2. Pipe materials 3" size and larger: Use cast iron, ductile iron, plastic or asbestos cement pipes unless otherwise indicated or approved in advance by the Architect.
3. Pipe materials less than 3" size: Use PVC or galvanized steel.

B. Pipe:

1. Cast iron pipe:
   a. Comply with ANSI A-21.6 or ANSI A-21.8, with working pressure of not less than 150 psi unless otherwise shown or specified.
   b. Use cement mortar lining complying with ANSI A-21.4 or AWWA C205,

standard thickness.

2. Ductile iron pipe:
   a. Comply with ANSI A-21.51, with working pressure of not less than 150 psi unless otherwise shown or specified.
   b. Use cement mortar lining complying with ANSI A-21.4 or AWWA C205, standard thickness.
3. Plastic pipe:
   a. Use acrylonitrile-butadine-styrene (ABS) complying with ASTM D15527; or
   b. Use polyvinyl-chloride (PVC) complying with ASTM D1785, schedule 40.
4. Galvanized steel:
   a. Use steel pipe risers and fittings, with PVC or ABS couplings below grade to steel risers for hose bibbs, and complying with ASTM A120.

C. Joints:
1. Cast iron or ductile iron pipe:
   a. Use mechanical joints of the stuffing-box type complying with ANSI A-21.11 as modified by ANSI A-21.51 for ductile iron pipe, with push-on joints complying with ANSI A-21.11 for cast iron, and ANSI A-21.51 for ductile iron; or
   b. Use rubber gaskets and lubricant complying with applicable requirements of ANSI A-21.11.
2. Plastic pipe:
   a. Use solvent cement for PVC joints complying with ASTM D2564.
   b. Use solvent cement for ABS joints complying with ASTM D2235.
3. Steel pipe fittings 2-1/2" or less in diameter:
   a. Use malleable iron bonded screw fittings, manufactured to standards of ANSI B-16.3.
   b. Use unions that are screwed, malleable iron, ground joint, 300 lb AAR, with bronze-to-iron seat.
4. Insulating joints:
   a. Provide between non-threaded ferrous and non-ferrous metallic pipe, fittings, and values.
   b. Use sandwich type flange insulating gasket of the dielectric type, insulating washers and insulating sleeves for flange bolts.
   c. Use full faced insulating gaskets with outside diameter equal to the flange outside diameter.
   d. Use full-length bolt insulating sleeves.
   e. Install in a manner to prevent metal-to-metal contact of dissimilar metallic piping elements.

D. Fittings and specials:
1. Cast iron pipe and ductile iron pipe:
   a. Use fittings and specials suitable for 150-psi pressure rating unless otherwise specified.
   b. For use with mechanical joint pipe, comply with ANSI A-21.10.
   c. For use with push-on joint pipe, comply with ANSI A21.10 and ANSI A-21.11.
   d. Use cement mortar lining complying with ANSI A-21.4, standard thickness.

2. Plastic pipe:
   a. Use fittings and specials suitable for schedule 40 rating, unless otherwise specified or directed.
   b. Use fittings and specials for PVC pipe complying with ASTM D2468.
   c. Use schedule 80 under paved areas with heavy truck traffic.
3. Steel pipe: Comply with ANSI B-16.3, using fittings and specials made for steel pipe.

E. Valves
1. Gate valves:

a. Use gate valves designed for a working pressure of not less than 150 p.s.i.
b. Provide connections as required for the piping in which they are installed.
c. Provide a clear waterway equal to the full nominal diameter of the valve, opens by turning counter clockwise.
d. Provide an arrow on the operating nut or wheel, cast in metal, indicating direction of opening.
e. Valves smaller than 3":
(1) Provide all bronze, screwed, single wedge disc, screw-in bonnet, packing gland and nut with non-rising stem.
(2) Buried valves: Install in suitable precast concrete hand hole with cover marked "WATER".
f. Valves 3" and larger:
(1) Design in accordance with AWWA C500, standard, bronze trimmed, non-rising stem and solid wedge disc valves.
(2) Buried valves: Provide 2" operating nuts and in a suitable valve box with extension and marked cover.
(3) Provide tee handle socket operating wrenches of suitable size.

2. Check valves:
a. Use check valves designed for a working pressure of not less than 150 p.s.i or as indicated or directed, with a clear waterway equal to the full nominal diameter of the valve.
b. Use valves designed to permit flow in one direction, when the inlet pressure is greater than the discharge pressure and to close tightly to prevent return flow when discharge pressure exceeds inlet pressure.
c. Distinctly cast on the body of each valve:
(1) Manufacturer's name, initials or trademark by which he can be identified readily;
(2) Valve size;
(3) Working pressure;
(4) Direction of flow.
d. Valves 2" and smaller: Provide all bronze, designed for screwed fittings.
e. Valves larger than 2":
(1) Provide iron body, bronze mounted, with flanged ends, of the non-slam type;
(2) Provide class 125 flanges complying with ANSI B-16.1.

F. Service fittings:
1. Asbestos cement main, 6" or less in diameter:
a. For 3/4" service diameter, use 3/4" corporation stop.
b. For service 1" in diameter to 2-1/2" in diameter, use double strap service clamp with corporation stop.
2. Asbestos cement main, 8" and larger in diameter:
a. For service 3/4" in diameter to 1" in diameter, use 1" corporation stop.
b. For service 1-1/2" in diameter to 2-1/2" in diameter; use double strap service clamp with corporation stop.

3. PVC mains smaller than 2" in diameter:
a. Make 3/4" maximum service with tees or plastic valve tees.
b. Acceptable products:
(1) As manufactured by Mueller Company, Decatur, Illinois.

4. PVC mains 2" to 3-1/2" in diameter: For 3/4" service to 1" service, use bronze service clamp and bronze corporation stop designed for PVC pipe.
5. Service clamps and corporation stops:
a. Use bronze.
b. Provide service clamp with flattened straps and molded neoprene gaskets.

6. Services larger than those stated above: Make with standard tees on new lines and tapping tees on existing lines.

2.2 TAPPING SLEEVES

A. Provide sleeve type coupling for existing water mains, furnished with outlet flanged to American 125 standard (ASA series 15):
1. Acceptable products:
a. Clow Corporation, Corona, California; boltless type:
(1) Model C1 series for existing cast iron mains, complying with AWWA class A;
(2) Model CA for class 150 and class 200 existing asbestos cement mains.
2. Coordinate requirements of tapping sleeves with gate valves and other fittings as required.

2.3 VALVE BOXES

A. Valves 3" and larger:
1. Use service box of cast iron, extension type of the required length, with screw adjustment.
2. Provide the word "WATER" cast into the cover.
3. Acceptable products:
a. Alhambra Foundry Company, Alhambra, California:
(1) For valves 6" and smaller: Model A-3004;
(2) For valves 8" and larger: Model 3005.

B. Valves 2-1/2" and smaller:
1. Use precast concrete box with the word "WATER" cast into the cover.
2. Provide risers on pipeline to place valve within box depth.
3. Acceptable products:
a. Manufactured by Brooks Products, Inc., El Monte, California.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FIELD MEASUREMENT

A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 HANDLING

A. Handle pipe accessories so as to ensure delivery to the trench in sound, undamaged condition:
1. Carry pipe into position; do not drag.
2. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.

B. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during laying operations by plugging or other method approved by the Architect.

C. Before installation, inspect each piece of pipe and each fitting for defects:
1. Material found to be defective before or after laying: Replace with sound material meeting the specified requirements and without additional cost to the Owner.

D. Rubber gaskets: Store in a cool dark place until just prior to time of installation.

3.4 PIPE CUTTING

A. Cut pipe neatly and without damage to the pipe.
B. Unless otherwise recommended by the pipe manufacturer, and authorized by the Architect, cut pipe with mechanical cutter only.
   1. Use wheel cutters when practicable.
   2. Cut plastic pipe square, and remove all burrs.

3.5 LOCATING

A. Locate water pipe at least ten feet away, horizontally, from sewer pipes.
   1. Where bottom of the water pipe will be at least 12" above top of the sewer pipe, locate water pipe at least six feet away, horizontally, from the sewer pipe.
B. Where water lines cross under gravity-flow sewer lines, fully encase the sewer pipe in concrete for a distance of at least ten feet each side of the crossing or provide pressure pipe with no joint located within 36" of the crossing.
   1. Cross water lines in cases above sewage force mains of inverted siphons at least 24" above the sewer line.
   2. Encase in concrete those joints in the sewer main closer, horizontally, than 36" to the crossing.
C. Do not place water lines in the same trench with sewer lines or electric wiring.

3.6 JOINT DEFLECTION

A. Cast iron pipe:
   1. Maximum allowable deflection will be given in AWWA C600.
   2. Table I shows maximum deflections for 18-foot lengths of pipe. For other lengths, deflection may vary proportionately.
   3. If alignment requires deflection-exceeding limits shown in Table I, furnish special bends or a sufficient number of shorter lengths of pipe to provide angular deflections within the limits shown.
   4. Table I, deflection in inches:

Diameter:	Push-on joint pipe:	Mechanical joint pipe:
3"	19"	31"
4"	19"	31"
6"	19"	27"
8"	19"	10"

B. Plastic pipe: Unless a lesser amount is recommended by the pipe manufacturer, maximum allowable deflections from a straight line or grade or offsets, will be five degrees.

3.7 PLACING AND LAYING

A. General:
   1. Lower pipe and accessories into trench by means of derrick, ropes, belt slings or other equipment approved by the Architect.
   2. Do not dump or drop any of the materials of this Section into the trench.
   3. Except where necessary in making connections to other lines, lay pipe with the bells facing in the direction of laying.
   4. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate bells, couplings and joints.

5. Take up and relay pipe that has the grade or joint disturbed after laying.
6. Do not lay pipe in water, or when trench conditions are unsuitable for the work; keep water out of the trench until jointing is completed.
7. Securely close open ends of pipe, fittings and valves when work is not in progress.
8. Where any part of coating or lining is damaged, repair to the approval of the Architect and at no additional cost to the Owner.

B. Plastic pipe:
1. Position pipe and fittings in trench in a manner that identifying markings will be readily visible for inspection.
2. Cutting and joining:
   a. Protect against abrasion from serrated holding devices.
   b. Remove burrs and glosses from surfaces to be jointed; use abrasive paper, file, or steel wool.
   c. Remove dirt, dust, and moisture by wiping clean with chemical cleaner or dry cloth.
   d. Using a pure bristle paint brush, apply an even coat of the specified solvent cement in the fitting socket and on the surface of the pipe to be joined.
   e. Promptly insert pipe into bottom of the fitting socket; turn the pipe slightly to assure an even distribution of cement.
   f. Remove excess solvent cement from exterior of the joint.
   g. Should cement begin to dry before the joint is made, reapply cement before assembling.
   h. Allow at least one hour for the joint to gain strength before handling or installing the pipe.
3. Do not thread plastic pipe; make connections only with the solvent cement or with special adapter fittings designed for the purpose
4. Align pipe system components without strain.
5. Support piping at intervals of not more than four feet, at ends, branch fittings and change of direction or elevation.
6. Support plastic pipe in trenches with a 3" layer of sand. Allow no rocks, debris, or potentially damaging substances within 6" of plastic pipe in trenches.
7. Provide an electrically continuous type TW insulated number 14 tracer wire in the trench along the pipe, fastened to the pipe at 20 foot intervals and terminating aboveground with a 12" lead taped around each riser.

C. Connections: Use special fittings to suit the actual conditions where connections are made between new work and existing mains. Use only those specials and fittings approved by the utility having jurisdiction.

D. Sleeves:
1. Where pipe passes through walls of valve pits or structures, provide cast iron wall sleeves.
2. Fill annular space between walls and sleeves with rich cement mortar.
3. Fill annular space between pipe and sleeves with mastic.

3.8 JOINTING

A. All joints:
1. Cast iron pipe, ductile iron pipe, mechanical joints, and push-on type joints: Install in accordance with AWWA C600, modified as necessary by the recommendation of the manufacturer to provide for special requirements of ductile iron pipe.
2. Make connections between different pipe and accessories with transition fittings.
3. Rubber gaskets: Handle, lubricate where necessary and install in strict accordance with the recommendations of the manufacturer.

3.9 SETTING VALVES AND VALVE BOXES

A. General:
1. Center valve boxes on the valves, setting plumb.
2. Tamp earth fill around each valve box to a distance of four feet on all sides or to the undisturbed trench face if less than four feet.
3. Tighten stuffing boxes and fully open and close each valve to assure that all parts are in working condition.

B. Service boxes:
1. Where water lines are located below paved streets having curbs, install boxes directly back of the curbs.
2. Where no curbing exists, install boxes in accessible locations beyond limits of street surfacing, walks, and driveways.

3.10 THRUST BLOCKS

A. General:
1. Provide thrust blocks, or metal tie rods and clamps or lugs, on plugs, caps, tees and bends deflecting 22-1/2 degrees or more either vertically or horizontally and on water lines 6" in diameter or larger.
2. Provide concrete thrust blocking with a compressive strength of 2500 p.s.i in 28 days.

B. Installation:
1. Locate thrust blocking between solid ground and the fitting to be anchored.
2. Unless otherwise shown or directed by the Architect, place the base and thrust bearing sides of thrust blocking directly against undisturbed earth.
3. Sides of thrust blocking not subject to thrust may be placed against forms.
4. Place thrust blocking so the fitting joints will be accessible for repair.
5. Protect steel rods and clamps by galvanizing or by coating with bituminous paint.

3.11 TESTING AND INSPECTING

A. Closing uninspected work: Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been completely inspected and tested and has been approved by the Architect/owner.

B. Hydrostatic tests:
1. Where any section of a water line is provided with concrete thrust blocking for fittings, do not make hydrostatic tests until at least five days after installation of the concrete thrust blocking, unless otherwise directed by the Architect/owner.
2. Devise a method for disposal of wastewater from hydrostatic tests and for disinfecting, as approved in advance by the Architect/owner.

C. Pressure tests:
1. After the pipe is laid, the joints completed, fire hydrants permanently installed and the trench partially backfilled leaving the joints exposed for examination, subject the newly laid piping and valved sections of water distribution and service piping to a hydrostatic pressure of 200 p.s.i.
2. Open and close each valve several times during the test.
3. Carefully examine exposed pipe, joints, fittings and valves.
4. Replace or remake joints showing visible leakage.
5. Remove cracked pipe, defective pipe and cracked or defective joints, fittings and valves. Replace with sound material and repeat the test until results are satisfactory.
6. Make repair and replacement without additional cost to the Owner.

D. Leakage test:

1. Conduct leakage test after the pressure test has been completed satisfactorily.
2. Duration of each leakage test: At least two hours.
3. During the test, subject water lines to a pressure of 200 p.s.i.
4. Leakage is defined as the quantity of water to be supplied into the newly laid pipe or any valved or approved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
5. No piping installation will be accepted until the leakage is less than the number of gallons per hour as determined by formula, "L = 0.00304 ND x sq root of P," where:
   a. L = allowable leakage in gallons per hour;
   b. N = number of joints in length of pipe under test;
   c. D = nominal diameter of pipe in inches; and
   d. P = average test pressure in lbs per sq inch.
6. The allowable leakage in gallons per hour, per joint, at 200-psi average test pressure shall be in accordance with Table II
7. Should any test of pipe disclose leakage greater than that specified in Table II, locate and repair the defective joint or joints until the leakage is within the specified allowance and at no additional cost to the Owner.
8. Table II:

Diameter:	Leakage in gal:	Diameter:	Leakage in gal:
2"	0.0153	12"	0.0915
3"	0.0231	14"	0.1070
4"	0.0306	16"	0.1225
6"	0.0458	18"	0.1375
8"	0.0610	20"	0.1530
10"	0.0765	24"	0.1830

E. Time for making test:

1. Except for joint material setting, or where concrete reaction backing necessitates a five day delay, pipelines jointed with rubber gaskets, mechanical, or push-on joints or couplings may be subjected to hydrostatic pressure, inspected and tested for leakage at any time after partial completion of backfill.
2. Asbestos cement pipe and cement mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.

F. Disinfecting:

1. Before acceptance of the potable water system, disinfect each unit of completed water supply, distribution and service line in accordance with AWWA C601.
2. Perform all such tests and disinfecting in a manner approved by government agencies having jurisdiction.
3. Furnish two copies of a Certificate of Disinfecting to the Architect.

3.12 PAINTING

A. Paint valves, pipe and vents in accordance with the provisions of Section 09900.

END OF SECTION

SECTION 02685

GAS DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Provide gas distribution system as shown on the Drawings, specified herein and needed for a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include but are not necessarily limited to. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Names and addresses of the nearest service and maintenance organization that readily stocks repair parts;
4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced inthe necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. Gas distribution main:

1. Use polyvinyl chloride pipe (PVC), polyethylene pipe (PE), or black steel pipe, as permitted by the utility company and other agencies having jurisdiction and as selected by the Contractor.
2. Where matching or joining existing mains, use the material being matched or joined unless otherwise specifically approved by the Architect.

B. Gas service lines:

1. Use same material used for gas distribution main.
2. Assume connection point to building service lines as being approximately five feet outside buildings and structures to which service is required.

C. Above ground, and within vaults and substations, use:
1. Pipe:
a. Black steel complying with ASTM A120, schedule 40; threaded ends on 2" and smaller, otherwise plain end beveled for butt-welding.
2. Fittings:
a. Black malleable iron complying with ANSI B-16.3.
3. Unions:
a. Black malleable iron complying with Fed Spec W-U-531.
4. Flanges:
a. Black steel slip-on welding.
5. Gaskets:
a. Neoprene, 1/16" thickness, 50 to 60 shore "A" hardness.
6. Fasteners:
a. Cadmium plated steel nuts, bolts, and washers.

D. For buried PVC systems, use:
1. Pipe design:
a. Comply with ASTM D2241, SDR 13.5 long term tested:
(1) PVC 2110, 160 p.s.i;
(2) PVC 2112, 200 p.s.i; or
(3) PVC 2116, 250 p.s.i.
2. Fittings:
a. Comply with ASTM D2467, schedule 80.
3. Cement:
a. Comply with ASTM D2564.
4. Gaskets:
a. Neoprene, 1/8" thickness, 50 to 60 shore "A" hardness.
5. Fasteners:
a. Monel nuts, bolts, and washers.

E. For PE systems:
1. Comply with ASTM D2513 with pipe and fittings compounded in accordance with ASTM D1248, type and grade as recommended by the manufacturer for natural gas installation.
2. Pipe:
a. Comply with ASTM D2239, SDR 11.5, 77 p.s.i, for pipes up to 4" diameter.
b. Greater wall thickness (smaller SDR number) is acceptable.
3. Fittings:
a. Comply with ASTM D2683, except that size 2" and larger may be butt fused, and fusion saddles with protective sleeves may be used for lines when branch is two or more pipe sizes smaller than size of main.
4. Gaskets and fasteners:
a. Use pertinent materials specified for PVC systems.

F. Risers for PVC or PE systems.
1. Use red brass pipe complying with ASTM B-43 with brazed bronze flange complying with ANSI B-16.24, and inside plastic coating or liner.
2. For sizes larger than 2-1/2", provide threaded ends aboveground.
3. For PVC systems, use only a manufacturer's standard transition fitting, UL listed for gas service, transition from plastic to brass pipe with O-ring seals and swaged gastight with metal insert.
4. For PE systems:
a. Use only a manufacturer's standard transition fitting consisting of steel nipple bonded to PE coupling with a copper sleeve pressed over the PE coupling.
b. Extend the copper sleeve at least 2" above finish grade.
c. Provide manufacturer-applied corrosion resistant enamel on exterior steel surfaces.

G. Transition fittings to existing pipe line or service branch:
1. Provide monel bolts, nuts, and washers.
2. Steel-to-plastic, PVC, or PE:
a. Use flanged fitting complying with ANSI B-16.5, 150 lb; or
b. Use transition fitting as specified for risers except designed for steel-to-plastic with a tapping tee.
3. Plastic-to-plastic, PVC-to-PVC, or PVC-to-PE:
a. Use manufacturer's standard bolt-on plastic tapping saddle tee, UL listed for gas service, rated for 100 psig, with O-ring seals.
b. On PVC-to-PVC, provide bolted flange ends or manufacturer's standard transitions.
4. Plastic-to-plastic, PE-to-PE:
a. Use manufacturer's standard fused tapping tee assembly with shut-off feature.

2.2 BURIED SHUT-OFF VALVES

A. Provide ball valves designed for close-off pressure in either direction:
1. Body and end connections:
a. Use gray or ductile cast iron, ANSI flanged ends or flangeless short pattern or configuration for installation between two 150 lb ANSI flanges.
2. Ball:
a. Stainless steel, chromium plated shell, or chromium plated ductile iron.
3. Stem, nuts, bolts, and washers:
a. Monel, except stem may be type 316 stainless steel.
4. Seal and stem seals:
a. Glass reinforced TFE (Teflon).
5. Handle:
a. For each series of valves requiring a common wrench provide two valve wrenches.

2.3 ABOVEGROUND VALVES

A. For shut-off valves size 2" and smaller, provide either:
1. Bronze body ball valve complying with Fed Spec WW-V-35, type I, class A, style 3, full port pattern, with reinforced Teflon seals and threaded ends; or
2. Bronze body plug valve, straightway, taper plug, regular pattern with port opening at least equal to the internal pipe area or round port full bore pattern, non-lubricated, Teflon packing, flat or square-head stem with lever operator, 325 psig WOG rating, and threaded ends.

2.4 VALVE BOXES

A. Provide and place service box of cast iron or precast concrete over valves. Do not locate valve boxes in concrete walks.

B. Valves 2-1/2" and smaller:
1. Use precast concrete valve box with the wording "GAS" cast into the cover.
2. Acceptable products:
a. Manufactured by Brooks Products, Inc., El Monte, California.
3. Provide risers on pipeline to place valve within the box depth.

C. Valves 3" and larger:
1. Use service box of cast iron, extension type of the required length, having screw adjustment.
2. Acceptable products:
a. Manufactured by Alhambra Foundry, Alhambra, California:

(1) Use model A-3004 for valves 6" in size and less;
(2) Use model A-3005 for valves 8" in size and more.

3. Provide cast iron cover with the wording "GAS" cast into the cover.

2.5 TRACER WIRE

A. Provide No. 14 TW insulated copper tracer wire on non-metallic pipes.

2.6 CASING

A. Where gas lines are below concrete pavement, provide galvanized pipe complying with ASTM A120, schedule 40, with extruded polyethylene coating, in pipe sizes 2 sizes larger than the gas line.

2.7 WARNING TAPE FOR BURIED GAS LINES

A. Provide polyethylene plastic tape manufactured specifically for warning and identification of buried utility lines:
1. Roll type, 6" minimum width, color coded for natural gas (orange), with warning and identification imprinted in bold black letters continuously and repeatedly over entire length of tape.
2. Code and lettering color: Permanent, unaffected by moisture and other substances contained in trench back fill materials.
3. Message: "CAUTION, BURIED GAS LINE BELOW," or similar message as approved by the Architect.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FIELD MEASUREMENT

A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 INSTALLATION

A. Install pipefittings in accordance with ANSI B-31.8, the Drawings and as specified herein.
B. Excavating and backfilling:
1. Comply with pertinent provisions of Section 02221.
2. Coordinate provision of utility warning and identification tape with backfill operations:
a. Provide the specified tape above all buried gas lines at a depth of 8" to 12" below finished grade.

C. Plastic pipe and fittings:
1. Handle pipe and fittings carefully.
2. Transport PVC pipe in a long-bed vehicle with pipe lying flat; do not subject the pipe to bending or concentrated external loads at any point.
3. Discard plastic pipe and fittings that have been dented or damaged.

D. Pipe cleaning:
1. Thoroughly clean inside of pipe and fittings before installing.
2. Blow lines clear by using 80 psig to 100-psig clean dry compressed air.

3. Rap steel lines sharply along entire length before blowing clear.
4. Cap or plug ends of pipe as necessary to maintain cleanliness throughout installation.

E. Aboveground steel lines:
1. Determine and establish measurements for piping at the job site.
2. Cut pipe accurately to determined length requirements.
3. Threaded joints:
   a. Use threaded joints for pipe of 2" size and smaller.
   b. Where possible, use pipe with factory-cut threads; otherwise cut pipe ends square, remove all fins and burrs and cut taper pipe threads in accordance with ANSI B-2.1.
   c. Make threads smooth, clean, and full cut.
   d. Apply joint compound to male joints only.
   e. Work piping into place without springing or forcing.
   f. Do not back-off joints to permit alignment.
   g. Engage threads so that not more than three threads remain exposed.
   h. Use unions for connections to valves for which no other means of disconnecting is provided.
4. Welded joints:
   a. Use welded joints for pipe in sizes larger than 2".
   b. Weld by the shielded metal-arc process, using covered electrodes and in accordance with procedures established and qualified in accordance with ANSI B-31.8.
   c. Qualify each welder and welder operator in accordance with ANSI procedures:
      (1) Provide required tests;
      (2) Upon request of the Architect, display certificates complying with ANSI B-31.8.
5. Flanged joints:
   a. Use flanged joints for connecting welded joint pipe and fittings to valves to provide for disconnection.
   b. Install joints so that flange faces bear uniformly on gaskets.
   c. Engage bolts so that there is complete threading through the nuts, and tighten so that bolts are uniformly stressed and equally torqued.
6. Valves:
   a. Install shut-off valves with stems either in the vertical position with operators (lever or handwheel) on top or in the horizontal position.
   b. Install pressure reducing valves with outlet pressure adjustment on top.
7. Pipe size changes:
   a. Use reducing fittings for changes in pipe size.
   b. Do not make size changes with bushings.

8. Painting:
   a. Paint ferrous metal piping, including supports, in accordance with the provisions of Section 09900.
   b. Do not apply paint until piping tests have been completed.
   c. Upon completion of painting, identify piping in accordance with MIL-STD-101, except use commercially manufactured piping identification tape and decals in lieu of stencils and paint.

F. Buried plastic lines:
1. For buried plastic lines, use either totally PE or totally PVC.
   a. Combinations of PE and PVC will not be acceptable.
   b. Install in accordance with the manufacturers' recommendations as approved by the Architect.
2. PVC piping:
   a. Remove fins and burrs.

b. Do not thread pipe.
c. Wipe the matting surfaces as recommended by pipe manufacturer to break surface film prior to applying solvent cement.
d. Do not solvent weld while raining, at temperatures below 50 degrees F, or under direct exposure to sun above 90 degrees F.

3. PE piping:
a. Prior to installation, demonstrate to the Architect that the installing personnel are thoroughly qualified by experience and training for installation of PE gas distribution piping.
b. For fittings, saddles, and butt connections, use the specified materials; for all other branch connections, provide protective sleeves as recommended by the pipe manufacturer and approved by the Architect.
c. Fusion weld joints, except where transitions are approved.
d. Use electrically heated tools, thermostatically controlled, with an indicating thermometer.

4. Tracer wire:
a. Place parallel to pipe; tape to pipe at least every 20 feet.
b. Terminate wires at gas terminals by taping the wire to riser 6" above grade.
c. Mechanically bond the wire ends together; wrap bare wire with plastic tape.

5. Plastic pipe installation:
a. Bury pipe 24" below finish grade or deeper where indicated.
b. PVC pipe:
(1) Snake the pipe from side to side of trench bottom to allow for expansion and contraction of the pipe.
(2) Backfill trenches when ambient temperature is 80 degrees F or less.
(3) If this not possible, flood trenches before and during backfilling.

6. Sand cushion:
a. Provide sand cushion in accordance with pertinent provisions of Section 02221.

G. Wrapping:
1. Where connection to existing lines is made underground, wrap all new steel transition fittings and all exposed existing pipe having damaged coating.
2. Clean pipe to bare metal.
3. Use 1-mil minimum thickness polyethylene tape.
4. Initially stretch tape to conform to the surface while spirally half-lapping.
5. Apply a second layer, half-lapped and spiraled as above but with spirals perpendicular to first wrapping.

3.4 CONNECTION

A. Make connection to utility company or agency service line or meter in accordance with the requirements of the utility having jurisdiction.

3.5 FIELD INSPECTIONS AND TESTS

A. Metal welding or brazing inspection:
1. Inspect for compliance with ANSI B-31.8.
2. Replace or repair defective welds and retest until compliance.

B. PE fusion welding inspection:
1. Visually inspect butt-fusion welds by comparing with manufacturer's visual joint appearance chart.
2. Inspect other joints for proper fused connection.
3. Replace unsatisfactory joints by cutting out defective joint or replacing fittings.
4. Inspect 100% of joints; inspect again for corrections.
5. For initial inspections, secure assistance of authorized representative of the pipe manufacturer.

C. Pressure tests:

1. Test pressure: 1-1/2 times working pressure, but in no case less than 50 psig.
2. Do not test until last solvent welded joint has set and cured at least 24 hours at temperatures above 70 degrees F.
3. Perform testing before backfilling. However, place sufficient backfill material between fittings to hold pipe in place during tests.
4. Test system gastight in accordance with ANSI B-31.8.
    a. Use clean dry air for testing. Purge if required prior to testing.
    b. Make tests on entire system or on sections that can be isolated by valves.
    c. After pressurization, isolate entire piping system from all sources of air during test period.
    d. Maintain test pressure for at least 8 hours between times of first and last reading of pressure and temperature.
    e. Do not take test readings during rapid weather changes.
    f. Verify that ambient temperature is same as actual trench temperature. Do not permit reduction in applied test pressure other than that due to a change in ambient temperature.
    g. Allow for ambient temperature change in accordance with the relationship: P + 14.7 = (Pl + 14.7) (T2 + 460) / (T1 + 460), in which "T" and "P" represent Fahrenheit temperature and gage pressure, respectively, "P1" and "P2" denote initial and final readings, and "P" is the calculated final pressure. If P exceeds the measured final pressure (final gage reading) by 1/2 p.s.i or more: isolate sections of the piping system, retest each section individually and apply a solution of warm soapy water to joints to each section for which a reduction in pressure occurs after allowing for ambient temperature change.
    h. Repair leaking joints and repeat test until no reduction in pressure occurs.
    i. Use a test gage calibrated in 1-psi increments and readable to 1/2 p.s.i.

D System purging:

1. After pressure tests, and before testing a gas-contaminated line, purge the line with nitrogen a junction with main line to remove all air and gas.
2. Clear the completed line by attaching a test pilot fixture at capped stub-in line at building location and let gas flow until test pilot ignites.
3. Use procedures complying with ANSI B-31.8.

END OF SECTION

SECTION 02720

STORM SEWERAGE SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Provide storm sewerage system where shown on the Drawings, as specified herein and as needed for a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 PRODUCTS

2.1 PIPE MATERIALS

A. Provide pipe and associated materials of the size indicated on the Drawings and meeting the following requirements.

1. Non-reinforced concrete pipe (NRCP): Provide "extra strength" complying ASTM C14.
2. Clay pipe (CP): Provide "extra strength" complying with ASTM C700.
3. Rectangular asbestos cement pipe (RACP) and transition units:
   a. Provide size as indicated on Drawings.
   b. Encase in concrete as shown on the Drawings.
   c. Acceptable products:
      (1) Manufactured by Industrial Building Materials Company, Los Angeles, California.
4. Polyvinyl chloride pipe (PVC):
   a. Acceptable products:
      (1) "Ringtite" plastic pipe and fittings, class 160, SDR 26, manufactured by Manville, Los Angeles, California.
5. Polyethylene material in plastic couplings: Comply with ASTM D2952.

6. Flexible watertight joints:
    a. Provide rubber type gaskets for concrete pipe, complying with ASTM C433 but with shore durometer hardness type A, 40-55, in lieu of the hardness specified.
    b. Provide factory-fabricated resilient materials for clay pipe, complying with ASTM C425.
    c. Provide gasket and jointing materials with not more than one splice, except that two splices of rubber-gasket type will be permitted if the nominal diameter of the basket exceeds 54"

2.2 DRAINAGE STRUCTURES

A. General:
1. Construct manholes, inlets, and junction structures of reinforced concrete or precast reinforced concrete, complete with metal frames and covers or gratings and with fixed ladder rungs where indicated on the Drawings or required by codes.
2. Individual wall-mounted aluminum, plastic-covered steel or galvanized steel rungs are acceptable.

B. Materials:
1. Concrete: Comply with provisions for 3000-psi concrete specified in Section 03300.
2. Mortar for pipe joints and connections to other drainage structures, and manhole construction:
    a. Comply with requirements of ASTM C270, type M, except the maximum placement time shall be one hour.
    b. Hydrated lime complying with ASTM C141, type B, may be added to the mixture of sand and cement in an amount equal to 25% of the volume of cement used.
    c. Provide a quantity of water in the mixture sufficient to produce a stiff workable mortar, which shall be clean and free from harmful acids, alkalis, and organic impurities. Use the mortar within 30 minutes after water is added to the mix.
3. Precast reinforced concrete manholes:
    a. Comply with ASTM C478, precast rings and cone sections.
    b. Fully bed the joints between precast concrete risers and tops in mortar and smooth both interior and exterior surfaces uniformly.
    c. Acceptable products:
        (1) Manufactured by Alhambra Foundry, Alhambra, California.
4. Reinforcement: Provide intermediate grade billet steel complying with ASTM A615, grade 40.
5. Frames and covers or gratings:
    a. Provide all gratings or covers from the same manufacturer.
    b. Provide standard black finish, supplied as a total unit, sized as shown on the Drawings or larger sizes except where in a pavement area and with the wording "STORM DRAIN" cast into the cover.
    c. Acceptable products:
        (1) Manufactured by Alhambra Foundry, Alhambra, California.
6. Precast concrete catch basins:
    a. Provide reinforced and bottom open for field pouring to ensure slope through the structure.
    b. Contractor may select this option in lieu of cast-in-place concrete catch basins.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 EXCAVATING, TRENCHING AND BEDDING

A. Excavate, trench, and bed for site drains in accordance with pertinent provisions of Section 02220, and the following.

B. Movement of construction machinery:
   1. Use means necessary to avoid displacement of and injury to, pipe and structures while compacting by rolling or operating equipment parallel to the pipe.
   2. Movement of construction machinery over a culvert or storm drain at any stage of construction is solely at the Contractor's risk.

C. Bedding:
   1. Provide a bedding surface for the pipe with a firm foundation of uniform density throughout the entire length of the pipe.
   2. Bed the pipe carefully in a soil foundation accurately shaped and rounded to conform to the lower 1/4 of the outside perimeter of circular pipe or set the pipe in a bed of sand.
   3. Tamp bedding where necessary.
   4. Provide bell holes and depressions for pipe joints of only the length, depth, and width required for making the particular pipe joint properly.
   5. Where plastic pipe is used, provide a minimum of 4" of sand bedding over the top and under the pipe.

3.3 INSTALLING PIPE

A. General:
   1. Carefully examine each pipe prior to placing.
      a. Promptly set aside defective pipe and damaged pipe.
      b. Clearly identify defects.
      c. Do not install defective pipe or damaged pipe.
   2. Place pipe to the grades and alignment indicated, with a tolerance of one in 1000 vertical and one in 500 horizontal, unless otherwise directed by the Architect.
   3. Provide adequate facilities for lowering pipe safely into the trenches.
   4. Do not place pipe in water, nor place pipe when trench or weather is unsuitable for that work.

B. Concrete and clay pipe: Place by proceeding upgrade with the spigot ends of bell and spigot pipe and the tongue ends of tongue and groove pipe, pointing in the direction of flow.

3.4 JOINTS

A. Joining concrete pipe and clay pipe:
   1. Use the specified mortar ingredients.
   2. Use the mortar within 60 minutes from the time water is first added to the mix.
   3. Wipe the inside of the joint clean and smooth. Perform wiping by dragging a suitable swab or long handled brush through the pipe as installation progresses.
   4. Protect the mortar bead on the outside from air and sun with suitable covering until cured.
   5. Unless otherwise directed by the Architect, use one of the following methods of jointing for bell and spigot and tongue and groove pipe:
      a. Cement mortar bell and spigot joint:
         (1) Bed the first pipe to the established gradeline, with the bell end placed upstream.
         (2) Clean surface of bell with wet brush, and fill lower portion with mortar to such depth as to bring the inner surfaces of the abutting pipes flush and even.
         (3) Clean the spigot end of each subsequent pipe with a wet brush and uniformly match the bell so that the sections are closely fitted.
         (4) After laying each section, fill remainder of joint with mortar and form a bead around the outside of the joint with cheesecloth to retain mortar in place.

b. Flexible watertight joints:
(1) Use the specified materials. Equal materials may be used when specifically approved in advance by the Architect.
(2) Install gaskets and joint materials in accordance with the manufacturers' recommendations as approved by the Architect.
(3) Protect from sun, blowing dust and other deleterious agents at all times.
(4) Align the pipe with previously installed pipe and pull the joint together. If, while making the joint, the gasket or jointing material becomes loose and can be seen through exterior joint recess when joint is pulled to within 1" of closure, remove pipe and remake the joint.
(5) Inspect gaskets, and replace loose and improperly affixed gaskets and jointing materials.

B. Polyvinyl chloride pipe joints: Install with the specified materials and in accordance with the manufacturers' recommendations as approved by the Architect, applying solvent cement to pipe and fitting as recommended in ASTM D2855.

C. Joining pipe of different materials: Provide fittings couplings made for the pipe material jointing, or provide a concrete collar as approved by the Architect.

D. Joining pipe of different sizes:
1. Provide reducer fittings to the larger pipe.
2. Where pipes are different materials as well as different sizes, use the same material for reducer fitting as in the larger pipe.
3. Use saddle connection when branch lines join a main or collector main.
4. Use eccentric collar joint when the slope of the pipe is less than 1%.

3.5 DRAINAGE STRUCTURES

A. Install drainage structures in accordance with the Drawings and with the manufacturers' recommendations as approved by the Architect.

3.6 BACKFILLING

A. Backfill and compact in accordance with pertinent provisions of Section 02220.

3.7 TESTING AND INSPECTING

A. Provide personnel and equipment necessary, and perform tests required to demonstrate that the work of this Section has been completed in accordance with the specified requirements.
B. Hydrostatic test on watertight joints:
1. Make a hydrostatic test on each watertight joint. Test one sample of each type watertight joint used. If one sample fails because of faulty workmanship, test an additional joint.
2. Demonstrate that joints in reinforced and unreinforced concrete pipe comply with ASTM C443.
3. Comply with ASTM C425 for tests of joints in clay pipe.
4. Make tests in concrete pipe and clay pipe at an internal hydrostatic pressure of 10 p.s.i for 24 hours.
5. Only joints within the building area and outside the building area but within ten feet of exterior walls or faces of the buildings need be tested.
6. Replace or repair joints found to be faulty. Repeat the test and repair cycle until joints are demonstrated to meet the specified requirements.

END OF SECTION

SECTION 02730

SANITARY SEWERAGE SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Provide sanitary sewerage system as shown on the Drawings, specified herein and needed for a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. Cast iron soil pipe and fittings (CIP):

1. Comply with ASTM A74, class SV.
2. Use rubber gaskets complying with ASTM C564 for compression joints.

B. Clay pipe and fittings (VCP):

1. Use extra strength, minimum of SDR 35.
2. Comply with ASTM D3034.

C. Polyvinyl chloride pipe and fitting (PVC)

1. Use extra strength, minimum of SDR 35.
2. Comply with ASTM D3034.

D. Acrylonitrile butadine styrene pipe and fittings (ABS):

1. Comply with ASTM D2680.

2.2 MANHOLES

A. Precast:
1. Provide reinforced precast concrete manhole sections complying with ASTM C478, except use Portland cement as specified below.
2. Provide joints of mortar, with approved mastic or rubber gasket or an approved combination of those types.
3. Provide precast units of concrete rings and eccentric cone section with ladder rungs cast into the units.
4. Approved manufacturer:
a. Ameron Pipe Products Group.

B. Portland cement:
1. For concrete in manholes, comply with ASTM C150, type II.
2. For concrete in cradle and encasement: Type optional with the Contractor.

C. Concrete:
1. Provide 3000 psi concrete in accordance with pertinent provisions of Section 03300 of these Specifications.

D. Mortar:
1. Comply with ASTM C270, type M.

2.3 FRAMES AND COVERS

A. Use cast iron frames and covers, with the wording "SEWER" cast into the covers in letters 2" high and plainly visible, as manufactured by Alhambra Foundry.

2.4 CLEANOUTS

A. Provide cleanouts as required and where shown on the Drawings.
1. Provide traffic weight covers and frames where clean-outs are within pavement, with the letters "SSCO" cast into the cover.
2. Acceptable products:
a. Alhambra Foundry, Model A_2100, 10" round cover, unless otherwise shown on the Drawings.

B. Where cleanout is within a graded area, construct as shown on the Drawings.

2.5 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FIELD MEASUREMENTS

A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 INSTALLATION

A. Trench, backfill, and compact for the work of this Section in strict accordance with pertinent provisions of Section 02221 of these Specifications.

B. Location:

1. Where the sewer location is not located clearly by dimensions on the Drawings, locate the sewer:
    a. Where the bottom of the water pipe will be at least 12" above the top of the sewer pipe, the horizontal spacing may be a minimum of six feet.
    b. Where the gravity flow sewers cross above water lines, fully encase the sewer pipe for a distance of ten feet on each side of the crossing; or
    c. Use acceptable pressure pipe with no joint closer horizontally than three feet from the crossing.
    d. Where concrete encasement is used, provide not less than 4" thickness including that on pipe joints.

C. Pipe laying:

1. Protect pipe during handling against shocks and free fall. Remove extraneous material from the pipe interior.
2. Lay pipe by proceeding upgrade with the spigot ends of bell-and-spigot pipe pointing in direction of flow.
3. Lay each pipe accurately to the indicated line and grade, aligning so the sewer has a uniform invert.
4. Continually clear interior of the pipe free from foreign material.
5. Before making pipe joints, clean and dry all surfaces of the pipe to be joined.
6. Use lubricants, primers, and adhesives recommended for the purpose by the pipe manufacturer.
7. Place, fit, join, and adjust the joints to obtain the degree of water tightness required.

3.4 WYE BRANCHES

A. Provide wye branches where sewer connections are indicated or required.

1. Where joining an existing line, join by placing a saddle over the line, and make connection in a manner that will not obstruct or interfere with the existing flow.
2. When conditions are such that connection pipe cannot be supported adequately on undisturbed earth or compacted fill, encase the pipe in a concrete backfill or support on a concrete cradle.

B. Provide concrete required because of conditions resulting from faulty construction methods or negligence, at no additional cost to the Owner.

3.5 MANHOLES

A. General:

1. Shape the invert channels to be smooth and semicircular, conforming to the inside of the adjacent sewer section.
2. Make changes in direction of flow with a smooth curve of as large a radius as the size of the manhole will permit.
3. Make changes in size and grade of channels smoothly and evenly.
4. Form the invert channels directly in the concrete of the manhole base, with mortar, or by laying full section sewer pipe through the manhole and breaking out the top half after surrounding concrete has hardened.
5. Smooth the floor of the manhole outside the channels, and slope toward the channels at not less than 1" per foot nor more than 2" per foot.
6. Prevent free drop inside the manholes exceeding 18" measured from the invert of the inlet pipe to the top of the floor of the manhole outside the channels.
7. Construct drop manholes whenever the free drop otherwise would be greater than 18".

B. Manhole rungs:
   1. Provide each manhole with individual wall-mounted rungs fabricated of aluminum, plastic-covered steel or galvanized steel.
   2. Comply with the requirements of governmental agencies having jurisdiction.

C. Jointing and plastering:
   1. Completely fill mortar joints, and leave smooth and free from surplus mortar on the inside of the manhole.

D. Frames and covers: Unless otherwise shown on the Drawings, set frames and covers:
   1. In paved areas: So that the top of the cover will be flush with the finished pavement; or
   2. In unpaved areas: 2" higher than finished grade.

3.6 MANHOLE OVER EXISTING PIPE

A. Construct new manhole as specified, breaking upper half of existing pipe after base of manhole is completed so as not to obstruct flow of the existing pipe.

3.7 BUILDING CONNECTIONS

A. Terminate building connections where shown on the Drawings.

B. Provide temporary closures at terminals where the building pipe is not installed.
   1. Place marker post at grade end of plugged line.
   2. Where building piping has been installed, make connection to the building piping system.

3.8 TESTING AND INSPECTING

A. Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been inspected and tested and has been approved by the Architect.

B. Leakage tests:
   1. Test lines for leakage by exhilaration tests.
      a. Prior to testing for leakage, backfill the trench to at least the lower half of the pipe.
      b. If required, place sufficient additional backfill to prevent pipe movement during testing, leaving the joints uncovered to permit inspection.
   2. Water exhilaration tests:
      a. Test each section of sewer line between successive manholes by closing the lower end of the sewer to be tested and the inlet sewer of the upper manhole, using stoppers.
      b. Fill the manhole and pipe with water to a point four feet above the invert of the sewer at the center of the upper manhole; or, if groundwater is present, four feet above the average adjacent groundwater level.
      c. Allowable leakage will be computed by the formula:
         (1) For mortared joints: $E = 0.0001\ LD\ H$;
         (2) For all other joints: $E = 0.0002\ LD\ H$;
         (3) "L" is the length of sewer and house connections tested, in feet;
         (4) "E" is the allowable leakage in gallons per minute of sewer test;
         (5) "D" is the internal pipe diameter in inches;
         (6) "H" is the difference in elevation between the water surface in the upper manhole and the invert of the pipe at the lower manhole; or, if groundwater is present above the invert of the pipe in the lower manhole, the difference in elevation between water surface in the upper manhole and the groundwater at the lower manhole.
   3. Water infiltration test:
      a. If, in the opinion of the Architect, excessive groundwater is encountered in the construction of a section of the sewer, the exhilaration test shall not be used.

b. Close the end of the sewer at the upper structure sufficiently to prevent the entrance of water.
c. Discontinue pumping of groundwater for at least three days, then test for infiltration.
d. Infiltration into each individual reach of sewer between adjoining manholes shall not exceed that allowed in the formula given for the exhilaration test, except that "H" in the formula shall be the difference between the groundwater surface and the invert of the sewer at the downstream manhole.

4. Provide and use measuring devices approved by the Architect.
5. Provide water, materials, and labor for making required tests.
6. Make tests in the presence of the Architect, gibing the Architect at least three days advance notice of being ready for test observation.

C. Submit test data to the Architect for review and approval.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
B. Openings for other work.
C. Form accessories.
D. Form stripping.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 03200 - Concrete Reinforcement
B. Section 03300 - Cast-in-Place Concrete: Supply of concrete accessories for placement by this section.
C. Section 05500 - Metal Fabrications: Supply of metal fabrications for placement by this section.

1.3 RELATED SECTIONS

A. Section 03200 - Concrete Reinforcement.
B. Section 03300 - Cast-in-Place Concrete.

1.4 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.
B. ACI 318 - Building Code Requirements for Reinforced Concrete.
C. ACI 347 - Recommended Practice For Concrete Formwork.
D. PS 1 - Construction and Industrial Plywood.

1.5 DESIGN REQUIREMENTS

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

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Product Data: Provide data on void form materials and installation requirements.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code for design, fabrication, erection and removal of formwork.

1.9 FIELD SAMPLES

A. Provide under provisions of Section 01400. Coordinate with requirements stated in Section 03100 and 03300.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.
B. Deliver void forms and installation instructions in manufacturer's packaging.
C. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.11 COORDINATION

A. Coordinate work under provisions of Section 01039.
B. Coordinate this Section with other Sections of work that require attachment of components to formwork.
C. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Plywood: Douglas Fir species; grade B/B plyform class 1 or 2; sound undamaged sheets with clean, true edges.
B. Lumber: Douglas Fir species; standard grade; with grade stamp clearly visible.

2.2 PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
B. Pan Type: Steel of size and profile required.
C. Tubular Column Type: Round, spirally wound laminated fiber material, surface treated with release agent, non-reusable, of sizes required.
D. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; 2 inches thick.

2.3 FORMWORK ACCESSORIES

A. Form Ties: Snap-off type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects that could leave holes larger than 1 inch in concrete surface.

B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.

C. Dovetail Anchor Slot: Galvanized steel, 22 gauge thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

D. Flashing Reglets: Galvanized steel, 22 gage thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

F. Waterstops: Rubber, minimum 1,750 p.s.i tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, wide, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 EARTH FORMS

A. Earth forms are not permitted except for spread and column footings, which are to be square and free of debris.

3.3 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with ACI 301.
B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over stressing by construction loads.
C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
D. Align joints and make watertight. Keep form joints to a minimum.
E. Obtain approval before framing openings in structural members that are not indicated on Drawings.
F. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

3.4 APPLICATION - FORM RELEASE AGENT

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

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.
B. Locate and set in place items which will be cast directly into concrete.
C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts and components of other Work.
D. Install accessories in accordance with manufacturer's instructions, straight, level and plumb. Ensure items are not disturbed during concrete placement.
E. Install water-stops continuous without displacing reinforcement. Heat seal joints watertight.
F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
G. Close temporary openings with tight fitting panels, flush with inside face of forms and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.
B. Clean formed cavities of debris prior to placing concrete.
C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.7 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

3.8 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design and that supports, fastenings, wedges, ties and items are secure.
B. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.9 FORM REMOVAL

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

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

A. Section 03100 - Concrete Formwork.
B. Section 03300 - Cast-in-Place Concrete.

1.3 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 318 - Building Code Requirements For Reinforced Concrete.

C. ACI SP-66 - American Concrete Institute - Detailing Manual.

D. ACI 315-99 – Details and Detailing of Concrete Reinforcement

E. ANSI/ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement.

F. ANSI/ASTM A184 - Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.

G. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

H. ANSI/AWS D1.4 - Structural Welding Code for Reinforcing Steel.

I. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

J. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.

K. CRSI - Concrete Reinforcing Steel Institute - Manual of Standard Practice.

L. CRSI - Placing Reinforcing Bars.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI - Manual of Standard Practice & ACI 318.

1.5 COORDINATION

A. Coordinate work under provisions of Section 01039.
B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

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

B. Reinforcing Steel Plain Bar and Rod Mats: ASTM A704, ASTM A615, Grade 60; steel bars or rods, unfinished.
C. Stirrup Steel: ANSI/ASTM A82, unfinished.
D. Welded Steel Wire Fabric: ASTM A815; in flat sheets.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum gage annealed type.
B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.
C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel; size and shape as required.

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI Manual of Practice ACI SP-66.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
B. Do not displace or damage vapor barrier.
C. Accommodate placement of formed openings.
D. Conform to applicable code for concrete cover over reinforcement.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cast-In-Place Concrete floors, shear walls, foundation walls and supported slabs.
B. Floors and slabs on grade.
C. Control, expansion and contraction joint devices associated with concrete work, including joint sealants.
D. Equipment pads, light pole base, flagpole base, thrust blocks and manholes.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 03100 - Concrete Formwork: Placement of joint device anchors in formwork.

1.3 RELATED SECTIONS

A. Section 03100 - Concrete Formwork: Formwork and accessories.
B. Section 03200 - Concrete Reinforcement.
C. Section 03346 - Concrete Floor Finishing.
D. Section 03370 - Concrete Curing.
E. Section 07900 - Joint Sealers.

1.4 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 302 - Guide for Concrete Floor and Slab Construction.

C. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

D. ACI 305R - Hot Weather Concreting.

E. ACI 306R - Cold Weather Concreting.

F. ACI 318 - Building Code Requirements for Reinforced Concrete.

G. ANSI/ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type).

H. ANSI/ASTM D1190 - Concrete Joint Sealer, Hot-Poured Elastic Type.

I. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

J. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

K. ASTM C33 - Concrete Aggregates.

L. ASTM C94 - Ready-Mixed Concrete.

M. ASTM C150 - Portland cement.

N. ASTM C260 - Air Entraining Admixtures for Concrete.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Product Data: Provide data on joint devices, attachment accessories and admixtures.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

1.7 COORDINATION

A. Coordinate work under provisions of Section 01039.
B. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal, Type II - Moderate, Type V - Sulfate Resistant.
B. Fine and Coarse Aggregates: ASTM C33.
C. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

A. Air Entrainment: ASTM C260.

2.3 ACCESSORIES

A. Bonding Agent: Polymer resin emulsion.
B. Vapor Barrier: thick clear polyethylene film.
C. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

2.4 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler Type A: ASTM D1751; ASTM D994; Asphalt impregnated fiberboard or felt, 1/2" thick; tongue and groove profile.
B. Joint Filler Type B: ASTM D1752; Closed cell polyvinyl chloride foam, resiliency recovery of 95 percent if not compressed more than 50 percent of original thickness.
C. Joint Filler Type C; ASTM D1752; Pre-molded sponge rubber fully compressible with recovery rate of minimum 95 percent.
D. Expansion Joint Devices: ASTM B221 alloy, extruded aluminum; resilient filler strip with a Shore A hardness of 35 to permit plus or minus 25 percent joint movement with full recovery; extruded aluminum cover plate, of longest manufactured length at each location, flush Mounted, color as selected.
E. Sealant: ASTM D1190; polymer based asphalt or coal tar and rubber compound.

2.5 CONCRETE MIX

A. All concrete shall be, Type 1 cement with a compressive strength of 4,000 p.s.i. at 28 days.
B. Mix concrete in accordance with ACI 304. Deliver concrete in accordance with ASTM C94.

C. Use accelerating admixtures in cold weather only when approved by Architect/Engineer. Use of admixtures will not relax cold weather placement requirements.
D. Use calcium chloride only when approved by Architect/Engineer.
E. Use set retarding admixtures during hot weather only when approved by Architect/Engineer.
F. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01039.
B. Verify requirements for concrete cover over reinforcement.
C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely and will not cause hardship in placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
B. In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 304 & ACI 301.

B. Notify Architect/Engineer minimum 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

D. Separate slabs on grade from vertical surfaces with ½" thick joint filler.

E. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

F. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07900 for finish joint sealer requirements.

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

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

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

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

K. Apply sealants in joint devices in accordance with Section 07900.

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

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

N. Place floor slabs in pattern indicated on drawings.

O. Saw cut joints within 24 hours after placing. Use 3/16" thick blade, cut into 1/4 depth of slab thickness. If in-slab-heating is used cut joints 1/2 inch deep

P. Screed floors and slabs on grade level, maintaining surface flatness of maximum.

3.4 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.
B. Place required dividers, edge strips, reinforcing, and other items to be cast in.
C. Apply bonding agent to substrate in accordance with manufacturer's instructions.

3.5 CONCRETE FINISHING

A. Provide formed concrete surfaces to be left exposed with smooth rubbed finish.
B. Finish concrete floor surfaces to requirements of Section 03346.

3.6 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
C. Cure concrete floor surfaces to requirements of Section 03370.
D. Cure floor surfaces in accordance with ACI 308.

3.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with ACI 301 and under provisions of Section 01400.
B. Provide free access to Work and cooperate with appointed firm.
C. Submit proposed mix design to architect for review prior to commencement of Work.
D. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.
E. Three concrete test cylinders will be taken for every 75 or less cu yards of concrete placed.
F. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.
G. One slump test will be taken for each set of test cylinders taken.

3.8 PATCHING

A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.
B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.
C. Patch imperfections as directed.

3.9 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
B. Repair or replacement of defective concrete will be determined by the Architect/Engineer.
C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

END OF SECTION

SECTION 03346

CONCRETE FLOOR FINISHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Finishing slabs-on-grade.
B. Surface treatment with concrete hardener, non-skid finish and sealer.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete: Prepared concrete floors ready to receive finish; control and formed expansion and contraction joints and joint devices.
B. Section 03370 - Concrete Curing.
C. Section 07900 - Joint Sealers.

1.3 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.
B. ACI 302 - Guide for Concrete Floor and Slab Construction.
C. ASTM E1155 - Determining Floor Flatness and Levelness Using the F-Number System.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Product Data: Provide data on concrete hardener, sealer and slip resistant treatment, compatibilities and limitations.

1.5 MAINTENANCE DATA

A. Submit under provisions of Section 01700.
B. Maintenance Data: Provide data on maintenance renewal of applied coatings.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 302.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01039.
B. Deliver materials in manufacturer's packaging including application instructions.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Temporary Lighting: Minimum 200 W light source, placed above the floor surface, for each 100 square feet of floor being finished.
B. Do not finish floors until the interior heating system is operational.
C. Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

1.9 COORDINATION

A. Coordinate work under provisions of Section 01039.
B. Coordinate the work with concrete floor placement and concrete floor curing.

PART 2 PRODUCTS

2.1 CURING/SEALING COMPOUNDS

A. Curing/sealing compound equal to Ashford Formula as distributed by:
Curecrete Chemical Company, Inc.
1201 W. Spring Creek Place
Springville, UT 84663
(801) 489-5663

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01039.
B. Verify that floor surfaces are acceptable to receive the work of this section.

3.2 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.
B. Steel trowel surfaces that will receive carpeting, resilient flooring and seamless flooring.
C. Steel trowel surfaces that areas scheduled to be exposed.
D. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains at nominal.

3.3 FLOOR SURFACE TREATMENT

A. Apply sealer in accordance with manufacturer's instructions on floor surfaces.

3.4 TOLERANCES

A. Maximum Variation of Surface Flatness For Exposed Concrete Floors: 1/4 inch.
B. Maximum Variation of Surface Flatness Under Seamless Resilient Flooring: 1/8 in.
C. Maximum Variation of Surface Flatness Under Carpeting: 1/8 in.

END OF SECTION

SECTION 03370

CONCRETE CURING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Initial and final curing of horizontal and vertical concrete surfaces.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete.
B. Section 03346 - Concrete Floor Finishing.

1.3 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.
B. ACI 302 - Recommended Practice for Concrete Floor and Slab Construction.
C. ACI 308 - Standard Practice for Curing Concrete.
D. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
E. ASTM D2103 - Polyethylene Film and Sheeting.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 302.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products under provisions of Section 01600.
B. Deliver curing materials in manufacturer's packaging including application instructions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Curing/sealing compound equal to Ashford Formula as distributed by:
Curecrete Chemical Company, Inc.
1201 W. Spring Creek Place
Springville, UT 84663
(801)489-5663

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate conditions under provisions of Section 01039.
B. Verify that substrate surfaces are ready to be cured.

3.2 EXECUTION - HORIZONTAL SURFACES

A. Cure floor surfaces in accordance with ACI 308.

3.3 EXECUTION - VERTICAL SURFACES

A. Cure surfaces in accordance with ACI 308.

3.4 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.
B. Do not permit traffic over unprotected floor surface.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated ferrous metal items.
B. Shop fabricated aluminum items.

1.2 RELATED SECTIONS

A. Section 05520 - Handrails and Railings.
B. Section 09900 - Painting: Paint finish.
C. Section 03300 - Cast-In-Place Concrete: Placement of metal fabrications in concrete.
D. Section 04300 - Unit Masonry System: Placement of metal fabrications in masonry.

1.3 REFERENCES

A. ASTM A36 - Structural Steel.
B. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
C. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
D. ASTM A283 - Carbon Steel Plates, Shapes and Bars.
E ASTM A307 - Carbon Steel Bolts and Studs, 60,000 p.s.i Tensile Strength.
F. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
G. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
H. AWS A2.0 - Standard Welding Symbols.
I. AWS D1.1 - Structural Welding Code.
J. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

A. Steel Sections: ASTM A36.
B. Steel Tubing: ASTM A500, Grade B.
C. Plates: ASTM A283.
D. Pipe: ASTM A53, Grade B, Schedule 40.
E. Bolts, Nuts, and Washers: ASTM A325 galvanized to ASTM A153 for galvanized components.
F. Welding Materials: AWS D1.1; type required for materials being welded.
G. Ladders: ANSI A14.3.
H. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

2.2 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.
B. Fabricate items with joints tightly fitted and secured.
C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush and hairline. Ease exposed edges to small uniform radius.
D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FABRICATION TOLERANCES

A. Squareness: 1/8-inch maximum difference in diagonal measurements.
B. Maximum Offset Between Faces: 1/16 inch.
C. Maximum Misalignment of Adjacent Members: 1/16 inch.
D. Maximum Bow: 1/8 inch in 48 inches.
E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

2.4 FINISHES - STEEL

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
B. Do not prime surfaces in direct contact with concrete or where field welding is required.
C. Prime paint items with one coat.
D. Structural Steel Members: Galvanize after fabrication to ASTM A123. [Provide minimum 1.25 oz/sq ft galvanized coating.]
E. Non-structural Items: Galvanized after fabrication to ASTM A123. Provide minimum 1.25 oz/sq ft galvanized coating.
F. Chrome Plating: ASTM B177, weight, nickel-chromium alloy, satin finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.
B. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
C. Field weld components indicated on Drawings.
D. Perform field welding in accordance with AWS D1.1.
E. Obtain approval prior to site cutting or making adjustments not scheduled.
F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
B. Maximum Offset From True Alignment: 1/4 inch.
C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05520

HANDRAILS AND RAILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel pipe or tube handrails, balusters and fittings.

1.2 RELATED SECTIONS

A. Section 05500: Attachment plates, angles and channels for metal stairs, including anchorage.
B. Section 05510 - Metal Stairs: Handrails other than those specified in this section.
C. Section 09900 - Painting: Paint finish.
D. Section 03300 - Cast-In-Place Concrete: Placement of anchors in concrete.
E. Section 04300 - Unit Masonry System: Placement of anchors in masonry.
F. Section 09260: Placement of anchors in partition and wall construction.

1.3 REFERENCES

A. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
B. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
C. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
D. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
E. ASTM E935 - Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
F. ASTM E985 - Permanent Metal Railing Systems and Rails for Buildings.
G. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.

1.4 DESIGN REQUIREMENTS

A. Railing assembly, wall rails, and attachments to resist lateral force of 75 lbs at any point without damage or permanent set. Test in accordance with ASTM A935.

1.5 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners and accessories.

PART 2 PRODUCTS

2.1 STEEL RAILING SYSTEM

A. Steel Tubing: ASTM A500, Grade B.
B. Rails and Posts: 1 1/2 inch diameter steel tubing; welded joints.
C. Fittings: Elbows, T-shapes, wall brackets, escutcheons; cast steel.
D. Mounting: Adjustable brackets and flanges, with steel inserts for casting in concrete. Prepare backing plate for mounting in wall construction.
E. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
F. Splice Connectors: Steel concealed spigots.
G. Galvanizing: To ASTM A123, provide minimum 1.25 oz/sq ft galvanized coating.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC 20 Type I inorganic: zinc rich.

2.2 FABRICATION

A. Fit and shop assemble components in largest practical sizes for delivery to site.

B. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

C. Provide anchors, plates, angles and channels required for connecting railings to structure.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located, consistent with design of component, except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where noted otherwise.

F. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.

G. Interior Components: Continuously seal joined pieces by continuous welds.

H. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush and hairline. Ease exposed edges to small uniform radius.

I. Accurately form components to suit stairs and landings, to each other and to building structure.

J. Accommodate for expansion and contraction of members and building movement without damage to connections or members.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.
B. Supply items required to be cast into concrete, embedded in masonry or placed in partitions with setting templates, to appropriate sections.

3.3 INSTALLATION

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

3.4 ERECTION TOLERANCES

A. Maximum variation from plumb: 1/4 inch per level.
B. Maximum offset from true alignment: 1/4 inch.
C. Out-of-position: 1/4 inch.

END OF SECTION

SECTION 05531

GRATINGS AND FLOOR PLATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formed floor, mezzanine and stair tread gratings.
B. Flat surface floor plating.
C. Perimeter closure.

1.2 RELATED SECTIONS

A. Section 03100: Framed concrete opening.
B. Section 05500 - Metal Fabrications.
C. Section 09900 - Painting: Field paint finish.
D. Section 03100: Placement of grating frames in concrete.

1.3 REFERENCES

A. ASTM A36/A36M - Structural Steel.

B. ASTM A123 - Zinc (Hot Galvanized) Coatings on Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strip.

C. ASTM A510 - Wire Rods and Coarse Round Wire, Carbon Steel.

D. ASTM A525 - Steel Sheet, Zinc-coated (Galvanized) by the Hot-Dip Process.

E. ASTM A569/A569M - Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.

F. AWS D1.1 - Structural Welding Code.

G. AWS A2.0 - Standard Welding Symbols.

H. NAAMM A202.1 - Metal Bar Grating Manual.

I. SSPC - Steel Structures Painting Council: Steel Structures Painting Manual.

1.4 PERFORMANCE REQUIREMENTS

A. Conform to BOCA code for applicable loads.
B. Maximum Spacing Between Bars: To restrict pedestrian shoe heels.3/8 inch.

1.5 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate details of gratings, plates, component supports, anchorage, openings and perimeter construction details.
C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

1.6 PROJECT CONDITIONS

A. Section 01039 - Coordination and Meetings.
B. Coordinate the Work with placement of frames, tolerances for placed frames and openings.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sheet Steel For Die Stamping: ASTM A525; with raised lug pattern.
B. Cross Bars: ASTM A510.
C. Welding Materials: AWS D1.1, type required for materials being welded.
D. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

2.2 ACCESSORIES

A. Fasteners and Saddle Clips: Flange Blocks: J-Hooks: Galvanized steel.
B. Perimeter Closure: Of same material as grating.
C. Edge Banding: At edges and at intermediate panel edges.

2.3 FABRICATION

A. Fabricate grates and plates to accommodate design loads.
B. Mechanically clinch joints of intersecting metal sections.
C. Fabricate support framing for openings.
D. Top Surface: Serrated or raised lug.

2.4 FINISHES

A. Clean surfaces of rust, scale, grease and foreign matter prior to finishing.
B. Do not prime surfaces in direct contact with concrete or where field welding is required.
C. Prime paint items with one coat.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting work.
B. Verify that opening sizes and dimensional tolerances are acceptable.
C. Verify that supports and anchors are correctly positioned.

3.2 INSTALLATION

A. Place frames in correct position, plumb and level.
B. Mechanically cut galvanized finish surfaces. Do not flame cut.
C. Anchor by welding to saddle clips or bolting to flange blocks.
D. Set perimeter closure flush with top of grating and surrounding construction.
E. Secure to prevent movement.

3.3 TOLERANCES

A. Conform to NAAMM A202.1.

3.4 CLEANING

A. Clean welds and damaged coatings and apply one coats of touch-up primer.

END OF SECTION

SECTION 06112

FRAMING AND SHEATHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural floor, wall and roof framing.
B. Built-up structural beams and columns.
C. Diaphragm trusses fabricated on site.
D. Floor, wall and roof sheathing.
E. Sill flashings.
F. Preservative treatment of wood.
G. Fire retardant treatment of wood.
H. Miscellaneous framing and sheathing.
I. Telephone and electrical panel back boards.
J. Concealed wood blocking for support of toilet and bath accessories, wall cabinets and wood trim.

1.2 RELATED SECTIONS

A. Section 04300: Setting anchors in concrete or masonry.
B. Section 05500: Prefabricated steel structural supports.
C. Sections 08111 and 08520: Window and Door openings to receive wood blocking.

1.3 REFERENCES

A. AHA (American Hardboard Association) A135.4 - Basic Hardboard.
B. ALSC (American Lumber Standards Committee) - Softwood Lumber Standards.
C. ANSI A208.1 - Mat-Formed Wood Particleboard.
D. APA (American Plywood Association).
E. NFPA (National Forest Products Association).
F. SPIB (Southern Pine Inspection Bureau).
G. WCLIB (West Coast Lumber Inspection Bureau).
H. WWPA (Western Wood Products Association).

1.4 SUBMITTALS FOR REVIEW

A. Shop Drawings For Site Fabricated Truss Frame: Indicate dimensions, wood species and grades, component profiles, drilled holes, fasteners, connectors, erection details and sequence.

1.5 QUALITY ASSURANCE

A. In lieu of grade stamping exposed to view lumber and plywood, submit manufacturer's certificate certifying that products meet or exceed specified requirements.
B. Design structural shop fabricated trusses under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Missouri.

1.6 DELIVERY, STORAGE AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect products.
B. Protect trusses from warping or other distortion by stacking in vertical position, braced to resist movement.

PART 2 PRODUCTS

2.1 SHEATHING MATERIALS

A. Plywood Roof Sheathing: APA Rated Sheathing Structural I Exposure Durability 1; unsanded.
B. Wall Sheathing: ANSI A208.1 Oriented Strand Board. (OSB)
C. Plywood Floor Sheathing: APA Rated Sheathing; Exposure Durability 2; sanded.
D. Telephone and Electrical Panel Boards: Plywood.

2.2 UNDERLAYMENT MATERIALS

A. Particleboard Underlayment: Structural Particleboard; wood flakes set with waterproof resin binder. Sanded faces.

2.3 SHEATHING AND UNDERLAYMENT LOCATIONS

A. Sloped Roof Sheathing: ½" thick, 48 x 96 inch sized sheets, square edges.
B. Above Grade Wall Sheathing: ½ inch thick, 48 x 96 inch sized sheets, square edges.
C. Floor Sheathing: ¾" thick, 48 x 96 inch sized sheets, tongue and groove edges.
D. Floor Underlayment: 3/8" thick, 48 x 96 inch sized sheets.

2.4 ACCESSORIES

A. Fasteners and Anchors:
   1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
B. Sill Flashing (Under Sill Gasket): Galvanized steel.
C. Subfloor Glue: APA AFG-01, waterproof of solvent base, air cure type, cartridge dispensed.
D. Building Paper: No.15 asphalt felt.
E. Termite Shield: Galvanized sheet steel.

PART 3 EXECUTION

3.1 FRAMING

A. Set structural members level and plumb, in correct position.

B. Make provisions for erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.

C. Place horizontal members, crown side up.

D. Construct load bearing framing members' full length without splices.

E. Double members at openings over 24 inches wide. Space short studs over and under opening to stud spacing.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists. Framed rigidly into joists.

G. Bridge joists or other framing in excess of 8 feet span at mid-span. Fit solid blocking at ends of members.

H. Place full width continuous sill flashings under framed walls on cementitious foundations. Lap flashing joint 4 inches.

I. Coordinate installation of wood decking, wood chord metal joists, glue laminated structural units, prefabricated wood trusses or plywood web joists.

3.2 SHEATHING

A. Secure roof sheathing with longer edge perpendicular to framing members and with ends staggered and sheet ends over bearing.

B. Use sheathing clips between sheets between roof framing members. Provide solid edge blocking between sheets. Fully engage tongue and groove edges.

C. Secure wall sheathing with long dimension parallel to wall studs, with ends over firm bearing and staggered.

D. Place plywood or structural-use panel sheeting at building corners for a horizontal distance of 48 inches.

E. Place building paper horizontally over wall sheathing; weather lap edges and ends.

F. Secure subfloor sheathing with longer edge perpendicular to floor framing and with end joints staggered and sheet ends over bearing. Attach with subfloor glue and drywall screws.

G. Place building paper between floor underlayment and subflooring.

H. Install flooring underlayment after dust and dirt generating activities have ceased and prior to application of finished flooring. Apply perpendicular to subflooring, stagger joints of underlayment.

I. Install telephone and electrical panel backboards with plywood sheathing material where required. Size the backboard by 12 inches beyond size of electrical panel.

3.3 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.
B. Surface Flatness of Floor: 1/4 inch in 10 feet maximum and 1/2 inch in 30 feet maximum.

END OF SECTION

SECTION 06196

PLYWOOD WEB JOISTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wood chord and plywood web joists for floor framing.
B. Bridging, bracing and anchorage.
C. Framing for openings.
D. Preservative treatment of wood.

1.2 RELATED SECTIONS

A. Sections 03300 and 04300: Setting anchors in concrete and masonry.
B. Section 06112 - Framing and Sheathing.

1.3 REFERENCES

A. ALSC (American Lumber Standards Committee) - Softwood Lumber Standards.
B. APA (American Plywood Association).
C. NFPA (National Forest Products Association).
D. SPIB (Southern Pine Inspection Bureau).
E. WCLIB (West Coast Lumber Inspection Bureau).
F. WWPA (Western Wood Products Association).

1.4 SYSTEM DESCRIPTION

A. Design Floor Live and Dead Load: 150-lbs/sq ft with deflection limited to 1/240 of span.
B. Minimum Joist Opening To Accommodate Mechanical Ducts: 24 x 24 inches.

1.5 SUBMITTALS FOR REVIEW

A. Shop Drawings: Indicate sizes and spacing of joists, fastener description and spacing, loads and joist cambers and framed openings. Submit design calculations.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with the following agencies:
   1. Lumber Grading Agency: Certified by ALSC.
   2. Plywood Grading Agency: Certified by APA.
B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
C. Design joists and associated components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Missouri.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for loads, seismic zoning and other governing load criteria.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect products.
B. Protect structural components from warping or other distortion by stacking in vertical position, braced to resist movement.

PART 2 PRODUCTS

2.1 MATERIALS

A. Lumber Grading Rules: NFPA, WWPA.
B. Plywood Web: APA Rated Sheathing, Grade C-D; Exposure Durability 2; unsanded.
C. Joist Bridging: Type, size and spacing recommended by joist manufacturer.

2.2 ACCESSORIES

A. Adhesive: Manufacturer's standard.
B. Wood Blocking: Softwood lumber, S/P/F Yellow pine species, construction grade, maximum moisture content of 19 percent.
C. Fasteners and Anchors:
    1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
    2. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.
D. Bearing Plates: Hot-dip galvanized.

2.3 FABRICATION

A. Fabricate joists to achieve structural requirements specified.
B. Brace members for support during transit.
C. Provide bottom and top chord extensions as indicated.
D. Fabricate to achieve minimum end bearing of:
    1. 2 1/2 inches on steel.
    2. 4 inches on masonry.
E. Frame special sized openings in web as detailed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that supports and openings are ready to receive joists.

3.2 PREPARATION

A. Coordinate placement of bearing or support items.

3.3 ERECTION

A. Install joists in accordance with manufacturer's instructions.
B. Set structural members level and plumb, in correct position.
C. Make provisions for erection loads and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.
D. Do not field cut or alter structural members without approval of Architect/Engineer.
E. Place headers and supports to frame openings.
F. Frame openings between joists with lumber in accordance with Section 06112.
G. Coordinate placement of decking with work of this section.

3.4 ERECTION TOLERANCES

A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

SECTION 06200

FINISH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Finish carpentry items.
B. Wood doorframes, glazed frames.
C. Wood casings and moldings.
D. Hardware and attachment accessories.

1.2 RELATED SECTIONS

A. Section 06410 - Custom Casework: Shop fabricated custom cabinetwork.
B. Section 08211 - Flush Wood Doors.
C. Section 09900 - Painting: Painting and finishing of finish carpentry items.
D. Section 12370 - Residential Casework: Shop fabricated cabinetwork.
E. Section 08710: Product requirements for hardware and attachment accessories for placement by this section.

1.3 REFERENCES

A. AHA A135.4 - Basic Hardboard; American Hardboard Association.

B. ANSI A208.1 - Wood Particleboard.

C. ASTM C1036 - Standard Specification for Flat Glass.

D. AWI P-200 - Architectural Woodwork Quality Standards; Architectural Woodwork Institute.

E. BHMA A156.9 - American National Standard for Cabinet Hardware.

F. HPVA HP-1 - Voluntary Standard for Hardwood and Decorative Plywood; Hardwood Plywood Manufacturer's Association.

G. NEMA LD 3 - High Pressure Decorative Laminates; National Electric Manufacturer's Association.

H. NIST PS 1 - Construction and Industrial Plywood.

I. NIST PS 20 - American Softwood Lumber Standard.

J. WIC - Manual of Millwork; Woodwork Institute of California.

1.4 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details and accessories, to a minimum scale of 1-1/2 inch to 1 ft.
C. Samples:
    1. Submit two samples of finish plywood, 12 x 12 inches in size illustrating wood grain and specified finish.
    2. Submit two samples of wood trim 24 inches long.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with AWI Architectural Woodwork Quality Standards, Custom Grade.

1.6 DELIVERY, STORAGE AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect products.
B. Protect work from moisture damage.

1.7 PROJECT CONDITIONS

A. Section 01039 - Coordination and Meetings.
B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
C. Coordinate the work with plumbing rough-in, electrical rough-in and installation of associated and adjacent components.

PART 2 PRODUCTS

2.1 LUMBER MATERIALS

A. Softwood Lumber: PS 20; Graded in accordance with AWI Custom species, maximum moisture content of 6 percent; with mixed grain of quality suitable for transparent finish.
B. Hardwood Lumber: Graded in accordance with AWI Custom [Premium]; oak species, quarter sawn, maximum moisture content of 6 percent; with mixed grain of quality suitable for transparent finish.

2.2 SHEET MATERIALS

A. Hardwood Plywood: HPVA HP-1; Graded in accordance with AWI Custom; lumber core, type of glue recommended for application; oak face species.

B. Prefinished Paneling: oak face species, vertical grain, V-cut vertical joint scoring; 1/4 inch thick, finished as satin.

C. Wood Particleboard: ANSI A208.1 Type 2; AWI standard, composed of wood chips, sawdust, or flakes of medium density, made with high waterproof resin binders; of grade to suit application; sanded faces.

D. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, standard grade, 1/4 inch thick, smooth two sides.

E. Pegboard: Pressed wood fiber with resin binder, tempered grade; 1/8 inch thick with 3/16 inch diameter holes at 1 inch on center or 1/4 inch thick with 9/32 inch diameter holes at 1 inch on center.

2.3 FASTENERS

A. Fasteners: Of size and type to suit application; galvanized finish in concealed locations and brass finish in exposed locations.
B. Concealed Joint Fasteners: Threaded steel.

2.4 ACCESSORIES

A. Lumber for Shimming and Blocking: Softwood lumber of pine species.

B. Plastic Edge Trim: Extruded flat shaped; smooth finish; self-locking serrated tongue; of width to match component thickness; color as selected.
C. Glass: Type FG-A as specified in Section 08800.
D. Primer: Alkyd primer sealer type.
E. Wood Filler: Solvent base, tinted to match surface finish color.

2.5 FABRICATION

A. Fabricate to AWI Custom standards.

B. Shop assemble work for delivery to site, permitting passage through building openings.

C. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.

D. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. Shop prepare and identify components for book match grain matching during site erection.

F. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

G. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Locate counter butt joints minimum 2 feet from sink cutouts.

H. Apply laminate backing sheet to reverse face of plastic laminate finished surfaces.

2.6 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.
B. Apply wood filler in exposed nail and screw indentations.
C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and of types recommended for applied finishes.
D. Finish work in accordance with AWI - Section 1500 System Transparent TR-2.
E. Prime paint or seal surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting work.
B. Verify adequacy of backing and support framing.
C. Verify mechanical, electrical and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION

A. Install work in accordance with AWI Custom quality standard.
B. Set and secure materials and components in place, plumb and level.
C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
D. Install trim with nails at 18 inches on center. Use wall adhesive by gun application.
E. Install prefinished paneling with full bed contact adhesive applied to substrate.
F. Install hardware supplied by Section 08710 in accordance with manufacturer's instructions.

3.3 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment in accordance with manufacturer's instructions.
B. Brush apply one coat of preservative treatment on wood in contact with cementitious materials, roofing and related metal flashings.
C. Allow preservative to dry prior to erecting members.

3.4 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand the work smooth.

3.5 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.
B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06240

PLASTIC LAMINATE

PART 1 GENERAL

1.1 SUMMARY

A. Provide laminated plastic where shown on the Drawings, as specified herein and as needed for a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01300.

B. Product data: Within 60 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.
2. Manufacturers' specifications and other data needed to demonstrate compliance with the specified requirements.
3. Samples of the full range of colors and patterns available in each of the specified grades from the proposed manufacturer.
4. Manufacturer's recommended methods of installation which, when approved by the Architect, will become the basis for acceptance or rejection of actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of Section 01600.

PART 2 PRODUCTS

2.1 LAMINATED PLASTICS

A. Acceptable manufacturers:

1. Wilsonart Division of Ralph Wilson Plastics, 600 Bruce Drive, Temple, Texas 76501 (817) 778-2711.
2. Nevamar Corporation, 8339 Telegraph Road, Odenton, Maryland 21113 (301) 569-5000.
3. Micarta Division of Westinghouse Electric Corporation, 304 Hoover Street, Hampton, South Carolina 29924 (803) 943-2311.

B. Colors and patterns: Provide "solid colors, textured finish" selected by the Architect from standard colors and finishes of the approved manufacturer.

C. Qualities and types: Provide general-purpose type, 0.050" thick, complying with NEMA LD3.

2.2 ADHESIVES

A. For installation of laminated plastic, use only "rigid set" (urea-resin) or "semi-rigid set" (PVC acetate) adhesives. Do not use so-called "contact" adhesives.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install the approved laminated plastic in strict accordance with the manufacturer's recommendations as approved by the Architect.

END OF SECTION

SECTION 06410

CUSTOM CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Special fabricated cabinet units.
   1. Cabinets to be plastic laminate on ¾" high-density particleboard with white melamine interiors.
B. Countertops.
C. Cabinet hardware.
D. Prefinished surfaces.
E. Preparation for installing utilities.

1.2 RELATED SECTIONS

A. Section 06114 – Wood Blocking and Curbing: Grounds and supports framing.
B. Section 06200 – Finish Carpentry: Related trim not specified in this section.

1.3 REFERENCES

A. ANSI A208.1 - Mat Formed Wood Particle board.
B. AWI (Architectural Woodwork Institute) - Quality Standards.
C. BHMA A156.9 - Cabinet Hardware.
D. FS MMM-A-130 - Adhesive, Contact.
E. HPMA (Hardwood Plywood Manufacturer's Association) HP - American Standard for Hardwood and Decorative Plywood.
F. PS 20 - American Softwood Lumber Standard.

1.4 SUBMITTALS FOR REVIEW

A. See section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
C. Samples: Submit two, 12 x 12 inch size samples, illustrating cabinet finish.
D. Samples: Submit two, 12 x 12 inch size samples, illustrating counter top finish.
E. Samples: Submit two samples of drawer pulls and hinges, illustrating hardware finish.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with AWI Custom quality.
B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.6 PRE-INSTALLATION MEETING

A. See section 01039 - Coordination and Meetings: Pre-installation meeting.
B. Convene one week before starting work of this section.

1.7 DELIVERY, STORAGE AND PROTECTION

A. See section 01600 - Material and Equipment: Transport, handle, store and protect products.
B. Protect units from moisture damage.

1.8 ENVIRONMENTAL REQUIREMENTS

A. See section 01600 - Material and Equipment: Environmental conditions affecting products on site.
B. During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

PART 2 PRODUCTS

2.1 PANEL MATERIALS

A. Hardwood Plywood: PS 51; HPMA; graded in accordance with AWI lumber, type of glue recommended for application.
B. Wood Particleboard: PS1; ANSI A208.1; AWI standard, composed of wood chips, medium density, made with high water proof resin binders; of grade to suit application; sanded faces.
C. Hardboard: ANSI A135.4; Pressed wood fiber with resin binder, tempered grade, ¼ inch thick, smooth one side.

2.2 LAMINATE MATERIALS

A. Plastic Laminate: AWI 0.040 inch Post Forming; 0.050 inch General Purpose quality; color, pattern and surface texture as selected.
B. Laminate Backing Sheet: 0.020 inch Backing Sheet grade, undecorated plastic laminate.

2.3 SOLID SURFACING

A. Hardwood Lumber Surfacing: Graded in accordance with AWI Custom; oak species, quarter sawn, maximum moisture content of 6 percent; exposed edge grain, of quality suitable for transparent finish.

2.4 ACCESSORIES

A. Adhesive: FS MMM-A-130 contact adhesive. Type recommended by laminate manufacturer to suit application.
B. Plastic Edge Trim: Extruded flat shaped; smooth finish; self-locking serrated tongue; of width to match component thickness; color as selected.
C. Fasteners: Size and type to suit application.
D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; Plain finish in concealed locations and brass finish in exposed locations.
E. Concealed Joint Fasteners: Threaded steel.

2.5 HARDWARE

A. Shelf Standards and Rests: formed steel channels and rests, cut for fitted rests spaced at 1 inch centers; satin finish.
B. Shelf brackets: Formed steel brackets, formed for attachment with lugs; satin finish.
C. Drawer and door pulls; Bronze with satin finish.
D. Catches: Magnetic.
E. Drawer Slides: Galvanized steel construction, ball bearings separating tracks, full extension type.
F. Hinges: Knuckle disappearing type, bronze with satin finish.

2.6 FINISHING MATERIALS

A. Stain, Varnish and Finishing Materials: As specified in Section 09900.
B. Finishing: Site finished as specified in Section 09900.

2.7 FABRICATION

A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
B. Fit shelves, doors, and exposed edges with 3/8 inch matching hardwood edging. Use one piece for full length only.
C. Cap exposed plastic laminate finish edges with material of same finish and pattern.
D. Door and Drawer Fronts: 3/4 inch thick; flush style, raised panels.
E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
F. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.
G. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, fixtures and fittings. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.8 FACTORY FINISHING

A. Sand work smooth and set exposed nails and screws.
B. Apply wood filler in exposed nail and screw indentations.
C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and of types recommended for applied finishes.
D. Finish work in accordance with AWI - Section 1500.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting work.
B. Verify adequacy of backing and support framing.
C. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

A. Set and secure casework in place; rigid, plumb and level.
B. Use fixture attachments in concealed locations for wall mounted components.
C. Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
E. Secure cabinet and counter bases to floor using appropriate angles and anchorages.
F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.3 ADJUSTING

A. Section 01400 - Quality Control: Adjust installed work. Test installed work for rigidity and ability to support loads.
B. Adjust moving or operating parts to function smoothly and correctly.
C. Clean casework, counters, shelves, hardware, fittings and fixtures.

END OF SECTION

SECTION 07210

BUILDING INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Provide building insulation where shown on the Drawings, as specified herein and as needed for a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Upon completion of this portion of the Work, complete and post a certificate of insulation compliance in accordance with pertinent requirements of governmental agencies having jurisdiction.

1.3 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide the following building insulation where shown on the Drawings or otherwise needed to achieve the degree of insulation required under pertinent regulations of governmental agencies having jurisdiction.

1. Exterior Wall Insulation - R-25 fiberglass batt insulation installed between the girts. Provide full height 6 mil. vapor barrier fabric between the girts and interior liner panels.
2. Roof Insulation - Equal to Simple Saver System, R-30 Double Layer System. The upper layer of fiberglass to be installed between the roof panels and the purlins, the lower layer to be installed between the purlins. The Simple Saver Suspension System to be all white with white grid system, fully encapsulating the purlins.
3. Interior Wall Insulation - 3-1/2" & 5-1/2” thick, unfaced glass fiber acoustical insulation complying with ASTM 665, Type I. Equal to Owens-Corning Fiberglass Corporation, Toledo, Ohio 43659. (Typical of all interior walls). See wall sections.
4. Mezzanine Insulation – 5-1/2” thick, unfaced glass fiber thermal sound batt insulation. Install between the joists of the mezzanine floor. Equal to Owens-Corning Fiberglass Corporation, Toledo, Ohio 43659.
5. Roof Insulation - R-30 fiberglass batt insulation installed between the roof trusses and above metal ceiling panel at Building E. Equal to Owens-Corning Fiberglass Corporation, Toledo, Ohio 43659.

2.2 OTHER MATERIALS

A. Provide 6 mil. vapor barrier where specified on drawings.

B. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Remove, or protect against, projections in construction framing that may damage or prevent proper insulation.

3.2 INSTALLATION

A. Install the work of this Section in strict accordance with the original design, requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position.

END OF SECTION

SECTION 07212

BOARD INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Board insulation at cavity wall construction, perimeter foundation wall and underside of floor slabs.

1.2 RELATED SECTIONS

A. Section 04300 - Cavity Wall Masonry System: Cavity space for thermal board insulation.

1.3 REFERENCES

A. ASTM C208 - Insulating Board (Cellulosic Fiber), Structural and Decorative.
B. ASTM C240 - Testing Cellular Glass Insulating Block.
C. ASTM C578 - Preformed, Cellular Polystyrene Thermal Insulation.
D. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation Board.
E. ASTM C728 - Perlite Thermal Insulation Board.
F. ASTM C578 - Preformed Cellular Polystyrene Thermal Insulation.
G. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.
H. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.

1.4 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements.
B. Materials of This Section: Provide thermal protection to vapor retarder in conjunction with vapor retarder materials.
C. Materials of This Section: Provide thermal protection to air seal materials at building enclosure elements in conjunction with air barrier materials.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.6 SEQUENCING

A. Sequence work under the provisions of Section 01010.
B. Sequence work to ensure fireproofing, firestop, vapor retarder and air barrier materials are in place before beginning the Work of this section.

1.7 COORDINATION

A. Coordinate work under provisions of Section 01039.
B. Coordinate the work with installation of vapor retarder and air seal materials.

1.8 ACCESSORIES

A. Sheet Vapor Retarder Type 1: Black polyethylene film for above grade application, 10 mil thick.
B. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

PART 2 PRODUCT

2.1 MATERIALS

A. Provide the following perimeter insulation where shown on the Drawings or otherwise needed to achieve the degree of insulation required under pertinent regulations of governmental agencies having jurisdiction.
1. 2" rigid insulation board having a minimum “R” - Value of 10 at 25 degrees F per ASTM tests C518.
a. Acceptable Products:
(1) "Styrofoam" brand, Square Edge as manufactured by Dow Chemical Company, 2020 Willard H. Dow Center, Midland, Michigan 48674, (800) 232-2436.
(2) Similar products may be substituted with prior approval from the Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01039.
B. Verify that substrate, adjacent materials and insulation boards are dry and ready to receive insulation and adhesive.
C. Verify substrate surface is flat, free of honeycomb, fins, irregularities or materials or substances that may impede adhesive bond.

3.2 INSTALLATION - FOUNDATION PERIMETER

A. Adhere a 6-inch wide strip of polyethylene sheet over construction joints with double beads of adhesive each side of joint.
1. Tape seal joints.
2. Extend sheet full height of joint.

B. Install boards on foundation wall or grade beam perimeter horizontally.
1. Place boards in a method to maximize contact bedding.
2. Stagger end joints.
3. Butt edges and ends tight to adjacent board and to protrusions.

C. Extend boards over control or expansion joints, unbonded to foundation 4 inches on one side of joint.

D. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

E. Immediately following application of board insulation, place protective boards over exposed insulation surfaces. Apply Type I adhesive in five continuous beads per board length.
1. Install boards horizontally base of foundation to top of insulation.
2. Butt board joints tight; stagger from insulation joints.

3.3 INSTALLATION - EXTERIOR WALLS

A. Adhere a 6 inch wide strip of polyethylene sheet over joint with double beads of Type I adhesive each side of joint.
1. Tape seal joints between sheets.
2. Extend sheet full height of joint.

B. Apply Type I adhesive in three continuous beads per board length to full bed 1/8 inch thick. Daub adhesive tight to protrusions.

C. Install boards on wall surface, vertically. Place membrane surface of insulation against the adhesive.

D. Place boards in a method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions.

E. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

F. Place 6-inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window or door frame. Tape seal in place to ensure continuity of vapor retarder and air seal.

G. Tape insulation board joints.

3.4 INSTALLATION - CAVITY WALLS

A. Secure impale fasteners to substrate at a frequency of 6 per insulation board.

B. Adhere a 6-inch wide strip of polyethylene sheet over control joint with double beads of Type I adhesive each side of joint between sheets. Extend sheet full height of joint.

C. Apply Type I adhesive in three continuous beads per board length to full bed 1/8 inch thick on substrate. Daub adhesive tight to protrusions to ensure continuity of vapor retarder and air seal.

D. Install boards horizontally between wall reinforcement.

E. Place membrane surface against adhesive. Tape seal board joints.

F. Place boards in a method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and no protrusions.

G. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

H. Place 66-inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window or door frame. Tape seal in place to ensure continuity of vapor retarder and air seal.

3.5 INSTALLATION - UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.
B. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.
C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.
B. Do not permit work to be damaged prior to covering insulation.

END OF SECTION

SECTION 07612

SHEET METAL ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pre-finished steel sheet roofing, associated flashings.
B. Counter flashings.
C. Snow guards.
D. Integral fascias.
E. Pre-finished steel vented soffit.

1.2 RELATED SECTIONS

A. Section 07631 - Gutters and Downspouts.
B. Section 07900 - Joint Sealers.

1.3 REFERENCES

A. AAMA 603.8 - Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.
B. AAMA 605.2 - Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
C. ASTM A526/A526M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.

1.4 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations and installation details.
C. Product Data: Provide data on metal types, finishes and characteristics.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements, except as otherwise noted.
B. Fabricator and Installer Qualifications: Company specializing in sheet metal roof installations with minimum four years experience.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store, and protect.
B. Stack material to prevent twisting, bending or abrasion and to provide ventilation. Slope metal sheets to ensure drainage.
C. Prevent contact with materials that may cause discoloration or staining.

1.7 WARRANTY

A. Section 01700 - Contract Closeout. 01740 - Warranties.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: National Sheet Metal Systems, Inc.; 2964 Alcove Dr., Scottsdale, GA 30079. Toll Free Tel: (877) 438-6385, Tel: (404) 298-9710, Web: www.nationalsheetmetal.com. Other manufacturer's as approved by the Architect.

2.2 SHEET MATERIALS

A. Metal panels are GALVALUME™ (Max Rib Ultra) 80,000# / SI minimum yield strength structural grade sheet steel. The paint process is a Kynar 500 / Hylar 5000 Fluorpon paint system. Utilizing the full strength 70% PVDF (fluoropolymer) resin and durable ceramic pigmentation. Panels shall be fastened with nails or screws, which are compatible to the panels in both life expectancy and environmental stability. All panels will be one piece unless lengths greater than 40 feet are required or the panels must be shortened to accommodate certain building features. GALVALUME™ is a trademark of the Bethlehem Steel Corporation. Kynar 500 is a registered trademark of Elf Atochem North America, Inc. Hylar 500 is a trademark of Ausimont USA, Inc. Fluropon is a registered trademark of the Valspar Corporation. Roofing and Siding color to match existing building

2.3 ACCESSORIES

A. Fasteners: The steel panels shall be fastened to building framing by plated steel sharp point screws with zinc/.aluminum/cast nonferrous alloy hex washer heads pre-assembled with aluminum bond seal washers, which cannot red rust and are compatible with steel panel. Woodzac by Construction Fasteners, Inc., or equal are acceptable.

B. Snow Guards: Equal to SnowBlox, SnoBar by Action Manufacturing, LLC, Engle, CO (phone 1.800.711.9724).
1. Design Requirements: Continuous linear roof snow retention system along front of building should have a minimum performance of 500# per linear foot of bar without deflection. Connection must be used at every roof seam.
2. Bar: 16 gauge galvanized steel with Polane Plus Enamel. Bar color to match metal roof or as selected by Architect.
3. Connection: Stainless steel U-bracket with stainless steel screws.
4. Substrate Below Roof Panel: 2-ply purlin at eave attachment line or double stagger line.
5. Quality Assurance: 5 years

D. Warranty:
1. Max Rib Steel Panels:
   a. 30 years against crack, peel, blister, or flake of paint coating
   b. 40 years against Chalk in excess of 8 per ASTM D-4214 Method D659
   c. 40 years against change of color in excess of 5 per ASTM D-2244

E. Trim and Flashing: 0.0158” minimum thickness steel on gables, ridge, corners, base with same prefinished paint, Kynar 500. Color selected from standard color samples.

F. Closure Strips: 1” wide closed-cell linked expanded polyurethane, to match panel corrugation.

G. Continuous Vented Steel Soffit Panels: 0.0158” minimum thickness steel on gables, ridge, corners, base with prefinished paint, Kynar 500. Color selected from standard color samples.
1. Performance Requirements:
   a. Soffits shall be fabricated and installed to withstand positive and negative wind pressure loads in accordance with applicable codes.

b. Soffit system to accommodate without damage to components or failure of weather barrier movement caused by seasonal temperature cycling and deflection of structural support framing.

c. Moisture entering or condensation occurring within soffit system shall drain to exterior.

2. Trim

a. Provide trim pieces as detailed on manufacturer's installation manual and as required for complete, weathertight, functional installation.

b. Steel Trim: Fabricate from same material as soffit to shape, dimensions, and profile required to accommodate soffit panel and project conditions. Provide with channels to receive panels, flanges for concealed weathertight attachment, and slotted attachment holes. Color shall match or coordinate with soffit color. In order to eliminate or minimize visible joints, form in longest possible lengths with 10' being minimum.

1. J-channel: ½" wide channel to receive soffit panels with ½" attachment flange.
2. Reverse Frieze Molding: F-shaped piece with ½" wide channel to receive soffit panels.
3. Soffit T-bar: Double channel to receive two soffit panels with exposed face.

2.4 FABRICATION

A. Form sections true to shape, accurate in size, square and free from distortion or defects.
B. Fabricate cleats of same material as sheet, minimum 3" wide, interlockable with sheet.
C. Fabricate starter strips of same material as sheet, intermittent to minimum 3 inches wide, interlockable with sheet.
D. Form pieces in longest practical lengths.
E. Hem exposed edges on underside ½", miter and seam corners.
F. Form material with standing seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
G. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
H. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
I. Fabricate flashings to allow toe to extend 2 inches over roofing. Return and brake edges.
J. Fabricate snow guards in accordance with SMACNA Plate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves or projections, properly sloped to drains, valleys and/or eaves.
B. Verify deck is dry and free of snow or ice.
C. Verify correct placement of wood nailers [and insulation positioning between nailers].
D. Verify roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set, reglets are in place and nailing strips located.
E. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.
B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
C. Back paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.3 INSTALLATION - FLASHINGS

A. Conform to SMACNA details.
B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
C. Cleat and seam all joints.
D. Apply plastic cement compound between metal flashings and felt flashings.
E. Fit flashings tight in place. Make corners square with surfaces true and straight in planes and lines accurate to profiles.
F. Seal metal joints watertight.

3.4 PROTECTION OF FINISHED WORK

A. Section 01700 - Contract Closeout: Protecting installed work.
B. Do not permit traffic over unprotected roof surface.

END OF SECTION

SECTION 07712

STEEL GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Prefinished continuous galvanized steel gutters and downspouts.
B. Fastening.

1.2 RELATED SECTIONS

A. Section 09900 - Painting: Field painting of metal surfaces.

1.3 REFERENCES

A. ASTM A361/A361M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process for Roofing and Siding.
B. ASTM B32 - Standard Specification for Solder Metal.
C. FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.
A. SMACNA (Sheet Metal and Air Conditioning Contractors National Association) - Architectural Sheet Metal Manual.
B. Pre-Finished Galvanized Steel Sheet: ASTM A755 coil coated.

1.4 DESIGN REQUIREMENTS

A. Conform to BOCA code for size and method of rainwater discharge.

1.5 DELIVERY, STORAGE, AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect.
B. Stack material to prevent twisting, bending or abrasion and to provide ventilation. Slope to drain.
C. Prevent contact with materials during storage that may cause discoloration, staining or damage.

1.6 PROJECT CONDITIONS

A. Section 01039 - Coordination and Meetings.
B. Coordinate the work with downspout discharge pipe inlet.

PART 2 PRODUCTS

2.1 MATERIALS

A. Galvanized Steel Sheet: ASTM A361/A361M, ASTM A446/A446M, Grade A or ASTM A526/A526M, G90 zinc coating; 26 gauge core steel.
B. Primer: Zinc molybdate Galvanized iron type.
C. Protective Backing Paint: FS TT-C-494, bituminous.
C. Solder: ASTM B32; 50/50 type
D. Base Metal: ASTM A653, zinc coating.
E. Exposed Finish: Silicone polyester or acrylic or electrolytic powder coating.

2.2 COMPONENTS

A. Gutters: CDA Square or profile as indicated on drawings.
B. Downspouts: CDA Rectangular or profile as indicated on drawings.
C. Anchors and Supports: Profiled to suit gutters and downspouts.
    1. Anchoring Devices: In accordance with CDA requirements.
    2. Gutter Supports: Spikes and ferrules.
    3. Downspout Supports: Brackets.
D. Fasteners: Same material and finish as gutters and downspouts, with soft neoprene washers.

2.3 ACCESSORIES

A. Downspout Boots: PVC or material compatible with storm sewer system.

2.4 FABRICATION

A. Form gutters and downspouts of profiles and size indicated and free of distortion or defects.
B. Fabricate trim, flashing and other metal components from same material as metal gutter sections.
C. Fabricate strap ties of compatible material as gutters, to interlock with gutter.
D. Fabricate connector/expansion clips of same material as gutter that interlock with gutter by mechanical fastener.
A. Form gutter and downspout sections in single length sheets.
B. Hem exposed edges on ½-inch miter.
C. Provide expansion joints (slip joints) on gutters exceeding 50 feet in length.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting work.
B. Verify that surfaces are ready to receive work.

3.2 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.3 INSTALLATION

A. Install gutters, downspouts and accessories in accordance with manufacturer's instructions.
B. Sheet Metal: Join lengths with formed seams sealed or soldered watertight. Flash and seal gutters to downspouts and accessories.
A. Solder metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.
B. Install gutters ¾ inches below slope of roof at outside edge.
C. Connect downspouts to downspout boots at 8 inches above grade or to existing storm sewer system.
D. Locate downspouts per Drawings.
E. Strap downspouts at maximum 30 inches on center.
H. Connect downspouts to storm sewerage system.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sealants and joint backing.
B. Precompressed foam sealers.
C. Hollow gaskets.

1.2 RELATED SECTIONS

A. Section 07311: Sealants required in conjunction with waterproofing.
B. Section 08800 - Glazing: Glazing sealants and accessories.
C. Section 09260 - Gypsum Board Systems: Acoustic sealant.

1.3 REFERENCES

A. ASTM C834 - Standard Specification for Latex Sealing Compounds.
B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
C. ASTM C1193 - Standard Guide for Use of Joint Sealants.
D. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
E. ASTM D1565 - Standard Specification for Flexible Cellular Materials -Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).
F. ASTM D1667 - Standard Specification for Flexible Cellular Materials -Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
B. Applicator Qualifications: Company specializing in performing the work of this section and approved by manufacturer.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.6 COORDINATION

A. Section 01039 - Coordination and Meetings: Coordination requirements.
B. Coordinate the work with all sections referencing this section.

1.7 WARRANTY

A. Section 01700 - Warranties.
B. Correct defective work within a five-year period after Date of Substantial Completion.
C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal and exhibit loss of adhesion or cohesion or do not cure.

1.8 SEALANTS

A. Type I - General Purpose Exterior Sealant: Polyurethane or Polysulfide; ASTM C920, Grade NS, Class 25, Uses M, G and A; single or multi- component.
   1. Standard colors matching finished surfaces.

B. Type II - Exterior Expansion Joint Sealer: Precompressed foam sealer; urethane with water-repellent:
   1. Face color: Gray.
   2. Size as required providing watertight seal when installed.
   3. Provide product recommended by manufacturer for traffic-bearing use.
   4. Applications: Use for:
      a. Exterior wall expansion joints
      b. Paving surface joints
      c. Set in floor components

C. Type III - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, non-drying, non-skinning, non-curing.
   1. Applications: Use for:
   a. Concealed sealant bead in sheet metal work.
   b. Concealed sealant bead in siding overlaps.

D. Type IV - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, single component, paintable.
   1. .Standard colors matching finished surfaces. Applications: Use for:
      a. Interior wall and ceiling control joints.
      b. Joints between door and window frames and wall surfaces.
      c. Other interior joints for which no other type of sealant is indicated.

E. Type V - Bathtub/Tile Sealant: White silicone; ASTM C920, Uses M and A; single component, mildew resistant.
   1. Applications: Use for:
      a. Joints between plumbing fixtures and floor and wall surfaces.
      b. Joints between kitchen and bath countertops and wall surfaces.

F. Type VI - Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single or multi-component.
   1. Approved by manufacturer for wide joints up to 1-1/2 inches.
   2. Standard colors matching finished surfaces.
   3. Applications: Use for:
      a. Expansion joints in floors.

G. Type VII - Sealant for Continuous Water Immersion: Polysulfide or Polyurethane; ASTM C920, Grade NS, Class 25, Uses M and A; approved by manufacturer for continuous water immersion; single or multi- component.
   1. Standard colors matching finished surfaces.
   2. Applications: Use for:
      a. Vehicle washing booths

H. Type VIII - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, M and A; single or multi-component.
   1. Gray color.
   2. Applications: Use for:
      a. Joints in sidewalks and vehicular paving.

PART 2 PRODUCTS

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
C. Joint Backing: Round foam rod compatible with sealant; ASTM D1056, sponge or expanded rubber; oversized 30 to 50 percent larger than joint width.
D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces and joint openings are ready to receive work.
B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter that might impair adhesion of sealant.
B. Clean and prime joints in accordance with manufacturer's instructions.
C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
D. Protect elements surrounding the work of this section from damage or disfiguration.

3.3 INSTALLATION

A. Perform installation in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Perform installation in accordance with ASTM C1193.
C .Measure joint dimensions and size joint backers to achieve width-to-depth ratio,neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
D. Install bond breaker where joint backing is not used.
E. Install sealant free of air pockets, foreign embedded matter, ridges and sags.
F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
G. Tool joints concave.
H. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.
I. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal all joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

3.4 CLEANING

A. Clean adjacent soiled surfaces.

3.5 PROTECTION OF FINISHED WORK

A. Protect sealants until cured.

END OF SECTION

SECTION 08111

STANDARD STEEL DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-rated, fire rated and thermally insulated steel doors and panels.
B. Louvers. Glass and glazing.

1.2 RELATED SECTIONS

A. Section 08112 - Standard Steel Frames.
B. Section 08710 - Door Hardware.
C. Section 08800 - Glazing: Glass for doors.
D. Section 09900 - Painting: Field painting of doors.

1.3 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
B. ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
C. ASTM E152 - Methods of Fire Tests of Door Assemblies.
D. NFPA 80 - Fire Doors and Windows.
E. NFPA 252 - Fire Tests for Door Assemblies.
F. SDI-100 - Standard Steel Doors and Frames.
G. UL 10B - Fire Tests of Door Assemblies.

1.4 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate door elevations, internal reinforcement, closure method and cutouts for glazing and louvers.

1.5 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals: Procedures for submittals.
B. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer: Specializing in manufacturing products specified in this section with three years experience.

1.7 REGULATORY REQUIREMENTS

A. Installed Door and Panel Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.8 DELIVERY, STORAGE AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect products.
B. Accept doors on site in manufacturer's packaging. Inspect for damage.
C. Break seal on site to permit ventilation.

1.9 PROJECT CONDITIONS

A. Section 01039 - Coordination and Meetings.
B. Coordinate frame installation with size, location, and installation of service utilities.
C. Coordinate the work with door opening construction, doorframes and door hardware installation.
D. Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

PART 2 PRODUCTS

2.1 ACCEPTABLE PRODUCTS:

A. Allied Steel Products, Inc.
B. Amweld/Div. American Welding & Mfg. Co.
C. Ceco Corp.
D. Curries Mfg., Inc.
E. Pioneer Builders Products Corp./Div. CORE Industries, Inc.
F. Steelcraft/Div. American Standard Co.
G. Republic Builders Products Corp./Subs. Republic Steel.

2.2 DOORS AND PANELS

A. Astragals for Double Doors: Steel T shaped, specifically for double doors (As required).
B. Fabricate doors with hardware reinforcement welded in place.
C. Attach fire rated label to each fire rated door unit.
D. Configure exterior doors with special profile to receive recessed weather stripping.
E. Type and Design:
    1. Tightly hemmed vertical seam on lock and hinge edges, with top flush channel and beveled lock edge, in the dimensions and types shown on the drawings, reinforced for the finish hardware being provided under Section 08710 of these Specifications, and in the following gauges:
        a. Interior Doors: 18 gauge honeycomb core. Labeled and/or Non-labeled.
        b. Exterior Doors: 16 gauge insulated core. Labeled and/or Non-labeled.

2.3 FINISH

A. Steel Sheet: Exterior doors to be galvanized to ASTM A525.
B. Primer: Air-dried.
C. Paint per Specification Section 09900: color as selected.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting work.
B. Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install doors in accordance with SDI-100 and DHI.
B. Coordinate installation of glass and glazing.
C. Install door louvers, plumb and level.
D. Coordinate installation of doors with installation of frames and hardware specified in Section 08710.
E. Touch-up finished doors.

3.3 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 ADJUSTING

A. Section 01650 - Starting of Systems: Adjusting installed work.
B. Adjust door for smooth and balanced door movement.

3.5 SCHEDULE

A. Refer to Door and Frame Schedule on architectural drawings.

END OF SECTION

SECTION 08112

STANDARD STEEL FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-rated and fire rated steel frames.
B. Interior and Exterior glazed light frames.

1.2 RELATED SECTIONS

A. Section 08111 - Standard Steel Doors.
B. Section 08710 - Door Hardware: Hardware, silencers and weather stripping.
C. Section 08800 - Glazing.

1.3 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
B. ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
C. ASTM E152 - Methods of Fire Tests of Door Assemblies.
D. DHI - Door Hardware Institute: The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.
E. NFPA 80 - Fire Doors and Windows.
F. NFPA 252 - Fire Tests for Door Assemblies.
G. SDI-100 - Standard Steel Doors and Frames.
H. UL 10B - Fire Tests of Door Assemblies.

1.4 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate frame elevations, reinforcement, anchor types and spacing, location of cutouts for hardware and finish.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Fire Rated Frame Construction: Conform to NFPA 252 or UL 10B.
B. Installed Frame Assembly: Conform to NFPA 80 for fire rated class same as fire door.

1.7 DELIVERY, STORAGE AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect products.
B. Accept frames on site in manufacturer's packaging. Inspect for damage.

1.8 PROJECT CONDITIONS

A. Section 01039 - Coordination and Meetings.
B. Coordinate the work with frame opening construction, door and hardware installation.

C. Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

1.9 FRAMES

A. Frames: To suit SDI-100 Grade and Model of door specified in Section 08111.

PART 2 PRODUCTS

2.1 FRAMES

A. 16 gauge. To suit SDI-100 Grade.
   1. Provide drywall wrap around frames for interior and exterior doors.

2.2 ACCESSORIES

A. Removable Stops: Rolled steel channel shape, butted corners; prepared for countersink style tamper proof screws.
B. Bituminous Coating: Fibered asphalt emulsion.
C. Primer: Zinc chromate type.
D. Silencers: Specified in Section 08710.
E. Weatherstripping: Specified in Section 08710.

2.3 FABRICATION

A. Fabricate frames as welded unit.
B. Mullions for Double Doors: Fixed type, of same profiles as jambs.
C. Transom Bars for Glazed Lights: Fixed type, of same profiles as jamb and head.
D. Fabricate frames with hardware reinforcement plates welded in place. Provide mortar guard boxes.
E. Reinforce frames wider than 4" with roll formed steel channels fitted tightly into frame head, flush with top.
F. Configure exterior frames with special profile to receive recessed weather stripping.
G. Attach fire rated label to each fire rated door unit.

2.4 FINISH

A. Steel Sheet: Galvanized.
B. Primer: Air-dried.
C. Paint per Specification Section 09900: color as selected.
D. Coat inside of frame profile with bituminous coating.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting work.
B. Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install frames in accordance with SDI-100 and DHI.
B. Coordinate with masonry, gypsum board or concrete wall construction for anchor placement.
C. Coordinate installation of glass and glazing.
D. Coordinate installation of frames with installation of hardware specified in Section 08710 and doors in Section 08111.

E. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

3.3 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/8" measured with straight edges, crossed corner to corner.

3.4 SCHEDULE

A. Refer to Door Schedule on drawings.

END OF SECTION

SECTION 08300

FIBERGLASS REINFORCED PLASTIC DOORS AND FRAMES

PART 1 GENERAL

1.1 SCOPE

A. This section applies to fiberglass reinforced plastic (FRP) doors and frames as manufactured by

1.2 SUBMITTALS

A. Shop drawings shall provide pertinent dimensions, hardware locations and door elevations.

1.3 PRODUCT HANDLING

A. All materials shall be delivered to the site in sealed, undamaged containers fully identified with the manufacturer's name, project number, the tag location, the door type, color and weight. The doors frames must be shipped in wood crates with wood perimeters. Store materials in original cartons, on edge in such a way to prevent falling or damage to face, corners and edges.

PART 2 PRODUCTS

2.1 DOORS

A. Doors shall be made of fiberglass reinforced plastic (FRP) using resins tailored to a specific corrosive environment (stated by the purchaser at the time the order is placed) and have a fiberglass content of 25% by weight. The doors shall be flush construction, having no seams or cracks. All mortises shall be molded in at the factory. The doors shall be 1-3/4" thick with a 15 mil (plus or minus 3 mils) color gelcoat and have an R-factor of 12. Secondary painting over pultrusions to achieve color is not acceptable.

1. Reinforcement - Adequate reinforcing and compression members shall be used to accommodate surface hinges, closures, locksets, kickplates, push or pull plates. When engineering considerations dictate, mild steel is buried in the fiberglass matrix to provide enhanced screw holding power. In no case should screws be used into the fiberglass matrix to provide holding for hinges, locks or closures or any structured attachment.
    a. Thrubolting is recommended for attachment of hinges, and closures in as much as the strength of thrubolting is five to six times as great as edge attaching with screws. When thrubolting is to occur, a compression member is to be located which will provide memory and resistance to the torquing of thrubolts.
    b. All voids between the doorplates shall be completely filled with the equivalent of 4-6 pounds expanded polyurethane foam, having a flame spread of 25 or less per ASTM E-84. A phenolic-coated kraft honeycomb may be substituted for urethane foam.
2. Flame Spread - All reinforcing resins shall contain a halogenated additive or co-reactant plus Antimony Troxide to achieve a flame spread of 25 or less per ASTM E-84 and shall be self-extinguishing per ASTM D-635.
3. Window Lites - Provide window openings of the size and shape shown on the door schedule. Window lites shall be structurally retained by at least 4 fiberglass glazing pins and sealed in such a manner that the integrity of the seals remain intact.
4. Color - The color of the door or frame shall be integrally molded as the part is made.

2.2 FRAMES

A. Frames shall be similar to the doors in construction and materials except the frames shall be solid fiberglass. The stop and frame will be molded all in one piece. The frame shall be integrally gelcoated to the customer's color when molded. Mortises will be molded in. It is not permitted to route in mortises or remove any material from the head or jambs, to provide mortises.

1. Reinforcement for mounting hinges, closures, etc., shall be of mild steel plates strategically located and buried in the resin-glass matrix so they will not be exposed to the elements.
2. The jamb shall be flat on the backside (against the opening) and uniform in thickness so as to provide a solid, uniform surface against the wall opening. No wood or blocks or spacers are permitted.

2.3 HARDWARE

A. Door hardware (locksets and hinges only) shall be supplied and installed by the door manufacturing plant. The hardware manufacturer's warranty shall be included with the hardware installation. All hardware shall be stainless steel or titanium.

2.4 ACCEPTABLE PRODUCTS

A. Tiger Door, Manufactured by Composite Structures Inc., 6200 North 16th Street, Omaha, Nebraska 68110-1005. Ph: 1-888-891-4416.

B. Chem-Pruf Door Co., Ltd., P.O. Box 4560, Brownsville, Texas 78523. Ph: 1-800-444-6924.

PART 3 INSTALLATION

A. Installation shall be in strict compliance with manufacturer's written instructions and specifications using non-corrosive materials and methods.

PART 4 GUARANTEE

A. Door company shall unconditionally guarantee its doors for ten years against failure due to corrosion from the specific environment named at the time of purchase.

END OF SECTION

SECTION 08351

OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Provide overhead coiling doors where shown on the Drawings, as specified herein and as needed for a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 45 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Shop Drawings in sufficient detail show fabrication, installation, anchorage and interface of the work of this Section with the work of adjacent trades.
4. Manufacturer's recommended installation procedures which, when approved or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workman who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for the proper performance of the work of this Section.

1.4 DELIVERY, STORAGE AND HANDLING

A. Comply with the pertinent provisions of Section 01620.

PART 2 PRODUCTS

2.1 OVERHEAD COILING DOORS

A. Provide standard rollup service doors of the dimensions and arrangements shown on the Drawings and with the following attributes:

1. Design wind load: 20PSF
2. Curtain: Interlocking, rolling formed, fully foamed-in-place, insulated, flat profile. The front slat shall be fabricated from minimum 22 gauge-galvanized steel, with the back slat to be fabricated from minimum 24 gauge.
3. Bottom Bar: Extruded aluminum member, to reinforce the curtain in the guides and will have a vinyl weather seal attached.
4. Guides: Roll-formed steel shapes attached to continuous steel wall angle for door(s). Three structural steel angles with a minimum thickness of 3/16"for door(s). Guides will be weather stripped with a vinyl weather seal at each jamb on the interior and exterior curtain side.
5. Brackets: Galvanized steel plate to support the counterbalance curtain and hood.
6. Counterbalance: Helical torsion springs housed in a galvanized steel tube.

7. Weatherseals: Vinyl bottom seal, exterior guide and internal hood seals. Include header brush or broom seal with aluminum extrusion.
8. Hood: Aluminum
9. Operation: Motor and chain.
10. Finish: Curtain slats shall be galvanizes per ASTM A-525 and shall receive a rust-inhibitive, roll coating process, including bonderizing, baked on prime paint to be .2 mils thick and a baked on polyester top coat to be .6 mils thick. All non-galvanized exposed ferrous surfaces will receive one coat of rust-inhibitive primer. All aluminum will be furnished in a clear mill finish. Door(s) to have factory white paint.
11. Electric Sensing Edge: Provide for each door. Provide safety edges by Air Wave, Miller Edge, Model number MTAW21YB-U-door width minus 2" with coil cord or equal, extend full width of the door. Provide AW12 Air Wave waterproof switch. Upon contact with an obstruction the downward travel of the door shall be stopped or reversed.
12. Track: Galvanized.

B. Provide electric motor operator with three position pushbutton operation, in capacity recommended by the manufacturer. See specification Section 08720.

C. Acceptable products:
1. Model 625 Series face mounted rolling service door manufactured by Overhead Door Corporation P.O. Box 809046, Dallas, Texas 75380. 1-800-887-3667
2. Equal products of other manufacturers when approved in advance by the Architect.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor to the approval of the Architect.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the area and conditions under which work of this Section will be performed. Correct conditions detrimental to the timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings per requirements of government agencies having jurisdiction, and the manufacturer's recommended installation procedures as approve by the Architect, anchoring all components firmly into position for long life under hard use.

C. Upon completion of the installation, put all items through at least ten operating cycles. Make required adjustments and assure that components are in optimum operating condition.

END OF SECTION

SECTION 08360

SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electric overhead sectional door.
B. Operating hardware, supports and controls.

1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Steel channel opening frame.
B. Section 08710 - Door Hardware: Cylinder locks.
D. Section 16100 – Electrical: Wiring.

1.3 REFERENCES

A. ANSI A216.1 - Sectional Overhead Type Door (NAGDM 102).
B. ASTM A526/A526M - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.
C. NEMA MG 1 - Motors and Generators.
D. NFPA 70 - National Electrical Code. Conform to BOCA code for motor and motor control requirements. Listed and classified by Underwriters Laboratories, Inc.

1.4 SYSTEM DESCRIPTION

A. Panels: Insulated with glazed panels.
B. Lift Type: Standard lift or High lift operating style with track and hardware.
C. Operation: Electric.
D. Loads: Design and size components to withstand dead and live loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with BOCA code.

1.5 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations and installation details.
C. Product Data: Provide component construction, anchorage method and hardware.
D. Samples: Submit two exterior and interior panel finish samples, 18 x 18 inches in size, illustrating color and finish.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01700 - Operation and Maintenance Data: Procedures for submittals.
B. Operation Data: Include electrical control adjustments.
C. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.
D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI A216.1, Application Type: Industrial. Maintain one copy on site.
B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
C. Installer: Company specializing in performing the work of this section and approved by manufacturer.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

1.9 WARRANTY

A. Section 01700 - Warranties.
B. Correct defective Work within a one-year period after Date of Substantial Completion.
C. Warranty: Include coverage for electric motor and transmission.
D. Provide a one-year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.1 SECTIONAL OVERHEAD DOORS (Insulated)

A. Provide standard sectional overhead doors of the dimensions and arrangements shown on the drawings, and with the following attributes: Equal to Overhead Doors Inc., 592 Series, Thermacore Insulated Steel Sectional Door.

1. Design wind load: Comply with NAGDM specification 102-1976, except that minimum wind load shall be 80 mph.

2. Door sections:
   a. Exterior: Roll-form from .016" hot-dip galvanized steel, with integral reinforcing ribs consisting of six longitudinal ribs and two flat bottom V-grooves.
   b. Provide meeting rails of double-rabbeted weatherproof interlocking joints functioning as integral struts and assuring alignment full width of each section.
   c. Provide a total thickness of 2", R-Value 17.5. U-Value of 0.057.

3. Glass openings: Provide insulated glass, sealed in automotive type rubber gaskets of the maximum size allowable, one per door in the 3rd section panel, size 24" x 7".

4. Track and Hardware:
   a. Tracks shall be 2" wide galvanized steel, mounted by continuous galvanized steel angle.
   b. Stainless Steel lift cables shall have a safety factor of 8 to 1.
   c. Roller shall be full-floating ball bearings with hardened steel racers.
   d. Counterbalance shall consist of a torsion spring mounted on a continuous thru solid steel shaft.
   e. Provide interior side locking device, which with a slide bar extends through the left and right side tracks.
   f. Astragal - Provide "U" type rubber astragal at the bottom edge of each door or an approved equal.

5. Finish: Provide the manufacturer's standard pre-finish system in color selected by the owner from the manufacturer's standard colors.

6. Insulation: Rigid foamed-in-place polyurethane core free of CFC's and will be fully encapsulated in non-permeable materials to prevent loss of thermal efficiency over time. Insulation shall have a back cover of .013" steel.

7. Electric Sensing Edge: Provide for each door. Provide safety edges by Air Wave, Miller Edge, Model number AW14K500 with coil cord or equal, extending the full width of the door. Upon contact with an obstruction the downward travel of the door shall be stopped or reversed.

8. Weather strip
   a. Between sections will be EPDM rubber tube seals fitted every joint.
   b. Jamb seals. Provide pliable bulb seals.

9. Springs: Springs will be 25,000 cycles.

2.2 SECTIONAL OVERHEAD DOORS (Non-Insulated)

A. Provide standard sectional overhead doors of the dimensions and arrangements shown on the drawings, and with the following attributes: Equal to Overhead Doors Inc., 420 Series, Non-Insulated Steel Sectional Door. Steel door assembly with rabbeted meeting rails to form weathertight joints and provide full-width interlocking structural rigidity. Units shall have the following characteristics.

1. Panel Thickness: 2".

2. Exterior Surface: Ribbed

3. Steel: Minimum 20 gauge, galvanized.

4. Center and End Stiles: 16 gauge.

5. Standard Springs: 10,000 cycles. (High cycles.)

6. Partial Glazing of Steel Panels: 1/8" double strength glass. (Not in Contract).

B. Finish Color: Factory-applied baked-on white polyester.

C. Windload Design: ANSI/DASMA 102 standards and as required by code.

D. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.

E. Lock: Interior mounted slide lock. (Keyed lock.)

F. Weatherstripping: Flexible PVC on bottom section. (Jamb seals.) (Header seals.)

G. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.

H. Manual Operation: Chain hoist. Include Pull rope release automatic opening device.

I. Electric Motor Operation: Section 08720. (Not in Contract).

J. Electric Sensing Edge: Provide for each door. Provide safety edges by Air Wave, Miller Edge, Model number AW14K500 with coil cord or equal, extending the full width of the door. Upon contact with an obstruction the downward travel of the door shall be stopped or reversed. (N.I.C.)

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.
B. Sheet Steel: ASTM A526/A526M galvanized to G60, pre-coated with silicone polyester finish, plain surface.
C. Exterior Surfaces: Factory painted. (White)
D. Interior Surfaces: Factory painted. (White)

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting work.
B. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
C. Verify that electric power is available and of the correct characteristics.

3.2 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

3.3 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.
B. Anchor assembly to wall construction and building framing without distortion or stress.
C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
D. Fit and align door assembly including hardware.
E. Coordinate installation of electrical service, power and control wiring by electrical contractor from disconnect to unit components.
F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.
G. Install perimeter trim and closures.

3.4 ERECTION TOLERANCES

A. Section 01400 - Quality Assurance: Tolerances.
B. Maximum Variation from Plumb: 1/16 inch.
C. Maximum Variation from Level: 1/16 inch.
D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.
E. Maintain dimensional tolerances and alignment with adjacent work.

3.5 MANUFACTURER'S FIELD SERVICES

A. Section 01650 - Starting of Systems: Prepare and start systems.
B. Ensure the operation and adjustments to door assembly for specified operation.

3.6 ADJUSTING

A. Section 01650 - Starting of Systems: Adjusting installed work.
B. Adjust door assembly to smooth operation and in full contact with weather stripping.

3.7 CLEANING

A. Section 01700 - Contract Closeout: Cleaning installed work.
B. Clean doors, frames and glass.
C. Remove temporary labels and visible markings.

3.8 PROTECTION OF FINISHED WORK

A. Section 01700 - Contract Closeout: Protecting installed work.
B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

3.9 SCHEDULES

Refer to Door Schedule on Architectural Drawings

END OF SECTION

SECTION 08520

ALUMINUM WINDOWS

PART 1 GENERAL

1.1 SUMMARY

A. Provide aluminum windows where shown on the Drawings, as specified herein and as needed for a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Shop Drawings in sufficient detail to shown fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. In addition to complying with pertinent regulations of governmental agencies having jurisdiction:

1. Comply with ANSI-AAMA 101-88 for the designations specified.
2. All windows shall bear the "AAMA Certification Program" gold label indicating conformance to ANSI/AAMA 101-88, "Heavy Commercial" grade.
3. All windows shall be warranted for one year against defects in material or workmanship under normal use.
    a. Finish shall be warranted for ten years against chipping, peeling, cracking or blistering.
    b. Insulated glass shall be warranted for five years against visual obstruction resulting from film formation or moisture collection between the internal glass surfaces.
    c. Installer shall provide warranty for one year performance on operation and air/water specified levels including labor to repair component parts.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01640.

PART 2 PRODUCTS

2.1 ALUMINUM WINDOWS

A. Provide aluminum windows of the types and dimensions shown on the Drawings, complete with anchors of the types needed for the installation and complying with the following standards as defined in NSI-AAMA 101-88:

1. Horizontal Sliding: HS-C20
2. Horizontal Sliding - **Receptionist Window. See Sheet 13.**

B. Finish:
1. Provide electrostatically applied acrylic or baked on polyester enamel on all window members.
2. The finish color shall be selected by the Owner from the manufacturer's standard color options.

C. Glass and Glazing
1. Each window shall be factory single glazed to 3/4" insulated glass with two lites of 1/8" (DSB). Glass units shall be tested, certified and carry the respective CBA level certification on glass spacer on each double hung.
2. Provide standard 1/8" (DSB), dual marine glazing on each horizontal sliding window.

D. Acceptable Products: Sliding
1. Quaker 1300 Series Single Horizontal Slider with full width hinged .028 dia. security screen with integral stainless steel insect screen, Quaker Window Company, Highway 63 South, P.O. Box 128, Freeburg, MO. 65035 Ph: 800-347-0438
2. Equal products with prior approval from the Architect/Owner

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Install the work of this Section in strict accordance with the manufacturer's recommendations as approved by the Architect, anchoring all units firmly into position square, plumb, straight and true.
B. Dissimilar materials:
1. Where aluminum surfaces come in contact with metals other than stainless steel, zinc or white bronze of small area, isolate the aluminum by one of the following methods:
a. Apply a good quality sealant material between the aluminum and the dissimilar metal.
b. Isolate the dissimilar metals with non-absorptive tape or gaskets.

3.2 CLEANING

A. Labels:
1. Leave all labels in place, intact and legible, until reviewed and approved by the Architect.
2. Do not at any time remove required AAMA labels.

B. Prior to completion of the Work, thoroughly clean all exposed surfaces of windows and screens.
1. Use only the cleaning materials and techniques recommended by the manufacturer of the material being cleaned.
2. Do not scratch of otherwise damage the glass, screen or aluminum finish.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hardware for wood, hollow steel and aluminum doors.
B. Thresholds.
C. Weatherstripping, seals and door gaskets.

1.2 RELATED SECTIONS

A. Section 08111 - Standard Steel Doors.
B. Section 08112 - Standard Steel Frames.
C. Section 08211 - Flush Wood Doors.
D. Section 08341 - Overhead Coiling Grilles: Lockable coiling grilles.
E. Section 08410 - Aluminum Entrances and Storefronts: Hardware for it.
F. Section 08410: Product requirements for hardware and thresholds for aluminum entrance doors.

1.3 REFERENCES

A. NFPA 80 - Fire Doors and Windows.
B. NFPA 101 - Life Safety Code.
C. NFPA 252 - Fire Tests of Door Assemblies.
D. UL 10B - Safety Fire Tests of Door Assemblies.

1.4 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings:
   1. Indicate locations and mounting heights of each type of hardware, schedules and catalog cuts.
   2. Submit manufacturer's parts lists and templates.
C. Samples:
   1. Submit 1 sample of hinge, latchset, lockset and closer, illustrating style, color and finish.
   2. Samples will be incorporated into the Work.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01700 - Operation and Maintenance Data.
B. Section 01300 - Procedures for submittals.
C. Maintenance Data: Include data on operating hardware, lubrication requirements and inspection procedures related to preventative maintenance.
D. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store, and protect products.

B. Package hardware items individually, label and identify each package with door opening code to match hardware schedule.

1.8 PROJECT CONDITIONS

A. Section 01039 - Coordination and Meetings.
B. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.
C. Sequence installation to ensure utility connections are achieved in an orderly andexpeditious manner.
D. Coordinate Owner's keying requirements during the course of the Work.

1.9 WARRANTY

A. Provide five-year manufacturer warranty for door closers.

1.10 MAINTENANCE PRODUCTS

A. Section 01730 - Operation and Maintenance Data.
B. Provide special wrenches and tools applicable to each different or special hardware component.
C. Provide maintenance tools and accessories supplied by hardware component manufacturer.

1.11 EXTRA MATERIALS

A. Section 01730 - Operation and Maintenance Data.

PART 2 PRODUCTS

2.1 KEYING

A. Door Locks: Keyed in like-groups. Master keyed.
B. Include construction keying, and control keying with removable core cylinders. Key to the existing keying system where requested.
C. Supply keys in the following quantities:
    1. Two master keys.
    2. Four construction keys.
    3. Three change keys for each lock.

2.2 KEY CABINET

A. Cabinet Construction: Sheet steel construction, piano hinged door with lockmaster keyed to building system.
B. Cabinet Size: Size for project keys plus 10 percent growth.
C. Hooks for all keys.
D. Horizontal plastic strips for key hook labeling with clear plastic strip cover over labels.
E. Finish: Baked enamel, finish, colors as selected.

2.3 HARDWARE GROUP

A. See Attachment in Construction Documents.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting work.
B. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.
C. Verify that electric power is available to power operated devices and is of the correct characteristics.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions.
B. Use templates provided by hardware item manufacturer.

3.3 FIELD QUALITY CONTROL

A. Section 01400 - Quality Control 01650 - Starting of Systems: Field inspection, testing, and adjusting.
B. Architectural Hardware Consultant will inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.4 ADJUSTING

A. Section: 01650 - Starting of Systems: Adjusting installed work.
B. Adjust hardware for smooth operation.

END OF SECTION

SECTION 08720

ELECTRIC DOOR OPERATORS

PART 1 GENERAL

1.1 SUMMARY

A. Provide electric trolley type sectional overhead door operator and electric rolling door operator, where shown on the Drawings, as specified herein and as needed for a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturers' specifications and other data needed to prove compliance with the specified requirements;
3. Shop drawings showing general layout, installation, materials, construction and assembly wiring.
4. Manufacturers' recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

B. Upon completion of this portion of the work and as a condition of its acceptance, deliver to the owner three copies of the operation and maintenance manual.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Comply with all governmental agencies having jurisdiction in this work.

C. Each operator shall have a minimum one (1) year manufacturer's warranty.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 PRODUCTS AND MATERIAL

2.1 REQUIRED ATTRIBUTES

A. Trolley Type:

1. Motor - 115/230V single phase, 1/2 hp instant reversing with automatic reset thermal overload. Equal to Overhead Door Corp. Model “JST”.
2. Reversing Contactor - Heavy duty, electrically and mechanically interlocked.
3. Limit Switches - Adjustable rotary type synchronized with door operation.
4. Control Circuit - 24 volt class 2, three button, OPEN-CLOSE-STOP.
5. Reduction - Primary-V-belt, secondary-chain and sprocket.
6. Clutch - Adjustable disc friction type.
7. Brake - Solenoid actuated drum type.

8. Where required provide car wash modification, electrical enclosure and 3-button station meeting NEMA 1.
9. Electric bottom safety edge with coil cord.

B. Front of Hood Mount Type: (with car wash modification)
1. Motor - 115/230V single phase, 1/2 hp. Model "RDB" with hand chain hoist & 24V three button open-close-stop control, NEMA 4, from Overhead Door Corp. or equal.
2. Reversing Contactor - Heavy Duty, electrically and mechanically interlocked.
3. Electric bottom safety edge with coil cord.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install the work of this section in strict accordance with the manufacturer's recommendations and shop drawings and in accordance with pertinent requirements of governmental agencies having jurisdiction.
B. Electrical contractor will run electricity to the electric door operator. Final connection to the door operator shall be the responsibility of the electric door operator installer.

3.3 ADJUSTMENTS AND INSTRUCTIONS

A. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in the proper location, adequately anchored and adjusted to achieve optimum operation.
B. Demonstrate to the owner, operation and maintenance procedures.

END OF SECTION

SECTION 08800

GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass and glazing for hollow metal work, windows, glazed walls and doors.
B. Glass for cabinet doors and view panels.

1.2 RELATED SECTIONS

A. Section 08111 - Standard Steel Doors: Glazed doors.
B. Section 08360 - Sectional Overhead Doors.
C. Section 08520 - Aluminum Windows: Glazed windows.
D. Section 10800 - Toilet and Bath Accessories: Mirrors.

1.3 REFERENCES

A. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
B. ASTM C669 - Glazing Compounds for Back Bedding and Face Glazing of Metal Sash.
C. ASTM C804 - Use of Solvent-Release Type Sealants.
D. ASTM C1036 - Flat Glass.
E. ASTM C1048 - Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
F. ASTM C1172 - Laminated Architectural Safety Glass.
G. ASTM E84 - Surface Burning Characteristics of Building Materials.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Material and Equipment: Environmental conditions affecting products on site.
B. Do not install glazing when ambient temperature is less than 50 degrees F.
C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.6 WARRANTY

A. 01700 - Warranties and Bonds.
B. Provide a five (5) year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting and replacement of it.
C. Provide a five (5) year warranty to include coverage for delamination of laminated glass and replacement of it.

PART 2 PRODUCTS

2.1 FLAT GLASS MATERIALS

A. Float Glass (Type FG-A): Clear.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting work.
B. Verify that openings for glazing are correctly sized and within tolerance.
C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement; weeps are clear and ready to receive glazing.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.
B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
C. Prime surfaces scheduled to receive sealant.
D. Perform installation in accordance with ASTM C804 for solvent release sealants.

3.3 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.
B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
D. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.
E. Trim protruding tape edge.

3.4 CLEANING

A. Remove glazing materials from finish surfaces.
B. Remove labels after Work is complete.
C. Clean glass and adjacent surfaces.

3.5 PROTECTION OF FINISHED WORK

A. After installation, mark pane with an 'X' by using removable plastic tape or paste. Do not mark heat absorbing or reflective glass units.

END OF SECTION

SECTION 09260

GYPSUM BOARD SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Gypsum board and joint treatment.
B. Gypsum sheathing.

1.2 RELATED SECTIONS

A. Section 06112 - Framing and Sheathing: Building wood framing system.
B. Section 06112 - Wood Blocking and Curbing.
C. Section 07212 - Batt Insulation: Thermal insulation.

1.3 REFERENCES

A. ASTM C36 - Standard Specification for Gypsum Wallboard.
B. ASTM C79 - Standard Specification for Gypsum Sheathing Board.
C. ASTM C442 - Standard Specification for Gypsum Backing Board and Coreboard.
D. ASTM C475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
E. ASTM C630 - Standard Specification for Water-Resistant Gypsum Backing Board.
F. ASTM C645 - Standard Specification for Non-Load (Axial) Bearing Steel Studs,Runners (Track) and Rigid Furring Channels for Screw Application of Gypsum Board.
G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
I. ASTM C1002 - Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
J. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
K. GA-201 - Using Gypsum Board for Walls and Ceilings.
L. GA-214 - Recommended Specification: Levels of Gypsum Board Finish.
M. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.
N. GA-600 - Fire Resistance Design Manual.
O. UL - Fire Resistance Directory.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C840.
B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience.

PART 2 PRODUCTS

2.1 GYPSUM BOARD MATERIALS

A. Standard Gypsum Board: ASTM C36; 1/2 or 5/8 inch thick, maximum available length in place; ends square cut, tapered edges.
B. Fire Rated Gypsum Board: ASTM C36; fire resistive type, UL or WH rated; 5/8 inch thick, maximum available length in place; ends square cut, tapered edges.
C. Moisture Resistant Gypsum Board: ASTM C630; 5/8 inch thick, maximum available length in place; ends square cut, tapered edges.

D. Gypsum Backing Board: ASTM C442; standard or fire rated type; 3/8 thick; square edges, ends square cut, maximum available size in place.
E. Gypsum Sheathing Board: ASTM C79; moisture resistant type; 5/8 inch thick, maximum available size in place; ends square cut, tongue and grooved edges; water repellent paper faces.
F. Cementitious Backing Board: High density, glass fiber reinforced, 1/2 inch thick; 2 inch wide, coated glass fiber tape for joints and corners.

2.2 ACCESSORIES

A. Corner Beads: Metal.
B. Edge Trim: GA-201 and GA-216; Type LC exposed reveal bead.
C. Joint Materials: ASTM C475; reinforcing tape, joint compound, adhesive and water.
D. Textured Finish Materials: Latex based texturing material, containing fine aggregate.
E. Fasteners: ASTM C1002, Type S12 and GA-216.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting work.
B. Verify that site conditions are ready to receive work and opening dimensions are as indicated on drawings.

3.2 WALL FURRING INSTALLATION

A. Erect wall furring for direct attachment to concrete masonry and/or concrete walls.
B. Erect furring channels horizontally; space maximum 16 inches o.c., not more than 4 inches from floor and ceiling lines or abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.

3.3 FURRING FOR FIRE RATINGS

A. Install furring as required for fire resistance ratings indicated and to GA-600 requirements.

3.4 CEILING FRAMING INSTALLATION

A. Install in accordance with ASTM C754.
B. Coordinate location of hangers with other work.
C. Install ceiling framing independent of walls, columns and above ceiling work.
D. Reinforce openings in ceiling suspension system that interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.
E. Laterally brace entire suspension system.

3.5 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with GA-201, GA-216 and GA-600.
B. Erect single layer standard gypsum board horizontal, with ends and edges occurring over firm bearing.
C. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
D. Erect exterior gypsum sheathing horizontally, with edges butted tight and ends occurring over firm bearing.

E. Use screws when fastening gypsum board to metal furring or framing.
F. Double Layer Applications: Use gypsum-backing board for first layer, placed perpendicular to framing or furring members. Use fire rated gypsum-backing board for fire rated partitions and ceilings.
G. Place second layer perpendicular to first layer. Offset joints of second layer from joints of first layer.
H. Treat cut edges and holes in moisture resistant gypsum board with sealant.
I. Place control joints 12 feet apart, or consistent with lines of building spaces as directed.
J. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.
K. Install backing board over plywood sheet in accordance with manufacturer's instructions.

3.6 JOINT TREATMENT

A. Tape, fill, and sand exposed joints, edges and corners to produce smooth surface ready to receive finishes.
B. Feather coats on to adjoining surfaces so that camber is maximum 1/32 inch.

3.7 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09511

SUSPENDED ACOUSTIC CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system and perimeter trim.
B. Acoustic tile.

1.2 RELATED SECTIONS

A. Section 15325 - Sprinkler Systems: Sprinkler heads in ceiling system.
B. Section 15940 - Air Outlets and Inlets: Air diffusion devices in ceiling system.
C. Section 16510 - Interior Luminaries: Light fixtures in ceiling system.
D. Section 16721 - Fire Alarm Systems: Fire alarm components in ceiling system.
E. Section 15140: Placement of special anchors or inserts for suspension system.

1.3 REFERENCES

A. ASTM C635 - Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
B. ASTM C636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
C. ASTM E580 - Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.
D. ASTM E1264 - Classification of Acoustical Ceiling Products.
E. UL - Fire Resistance Directory.

1.4 SYSTEM DESCRIPTION

A. Installed System: Conform to UL Design for ceiling and floor assembly.
B. Suspension System: Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1:240.

1.5 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system.
C. Product Data: Provide data on metal grid system components and acoustic units.
D. Samples: Submit two full size samples illustrating material and finish of acoustic units.

1.6 QUALITY ASSURANCE

A. Conform to CISCA requirements.
B. Grid Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
C. Acoustic Unit Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated assembly and combustibility requirements for materials.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Material and Equipment: Environmental conditions affecting products on site.
B. Maintain uniform temperature of minimum 60 degrees F and maximum humidity of 65 percent prior to, during and after acoustic unit installation.

1.9 PROJECT CONDITIONS

A. Section 01039 - Coordination and Meetings.
B. Sequence work to ensure acoustic ceilings are not installed until building is enclosed, sufficient heat is provided, dust-generating activities have terminated and overhead work is completed, tested and approved.
C. Install acoustic units after interior wet work is dry.

1.10 EXTRA MATERIALS

A. Section 01730 - Operation and Maintenance Data.
B. Provide 64 sq. ft. of extra tile to Owner.

PART 2 PRODUCTS

2.1 SUSPENSION SYSTEM MATERIALS

A. Fire Rated Grid: ASTM C635, intermediate duty, listed by UL for use in a one-hour assembly, exposed T.
B. Grid Materials: Commercial quality cold rolled steel with galvanized coating.
C. Exposed Grid Surface Width: 15/16 inch with reveal.
D. Grid Finish: color as selected.
E. Accessories: Stabilizer bars, clips, splices, perimeter moldings, and hold down clips required for suspended grid system.
F. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements and ceiling system flatness requirement specified.

2.2 ACOUSTIC UNIT MATERIALS

A. Acoustic Panels: ASTM E1264, conforming to the following:
    1. Size: 24 x 24 inches.
    2. Thickness: 5/8 inches.
    3. Composition: Mineral.

2.3 ACCESSORIES

A. Gypsum Board: Fire rated type; 5/8 inch thick, ends and edges square, paper faced.
B. Touch-up Paint: Type and color to match acoustic and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting work.
B. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - LAY-IN GRID SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636 and as supplemented in this section.

B. Install system in accordance with ASTM E580.

C. Install system capable of supporting imposed loads to a deflection of 1/240 maximum.

D. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustic unit size.

E. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

F. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner or support components independently.

I. Do not eccentrically load system, or produce rotation of runners.

J. Perimeter Molding:
   1. Install edge molding at intersection of ceiling and vertical surfaces with continuous gasket.
   2. Use longest practical lengths.
   3. Miter corners.
   4. Provide at junctions with other interruptions.

K. Form expansion joints as required. Form to accommodate plus or minus 1-inch movement. Maintain visual closure.

L. Install light fixture boxes constructed of gypsum board above light fixtures in accordance with UL assembly requirements and light fixture ventilation requirements.

3.3 INSTALLATION - ACOUSTIC UNITS

A. Install acoustic units in accordance with manufacturer's instructions.

B. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units one way with pattern parallel to longest room axis. Fit border trim neatly against abutting surfaces.

D. Install units after above ceiling work is complete.

E. Install acoustic units level, in uniform plane, and free from twist, warp and dents.

F. Cutting Acoustic Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Cut square reveal edges to field cut units.
   3. Double cut and field paint exposed edges of tegular units.

G. Install hold-down clips to retain panels tight to grid system within 20 ft. of an exterior door.

3.4 ERECTION TOLERANCES

A. Section 01400 - Quality Control: Tolerances.
B. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
C. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09900

PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.
B. Field application of paints, stains, varnishes and other coatings.

1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Shop primed items.
B. Section 05500 - Metal Stairs: Shop primed items.
C. Section 06410: Shop finished cabinetwork.

1.3 REFERENCES

A. ASTM D16 - Standard Terminology Relating to Paint, Varnish, Lacquer and Related Products.
B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
C. NACE (National Association of Corrosion Engineers) - Industrial Maintenance Painting.
D. NPCA - Guide to U.S. Government Paint Specifications; National Paint and Coatings Association.
E. PDCA - Architectural Specifications Manual; Painting and Decorating Contractors of America.
F. SSPC - Steel Structures Painting Manual; Steel Structures Painting Council.

1.4 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.5 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Samples:
    1. Submit two paper chip samples, 2 x 4 inches in size illustrating range of colors and textures available for each surface finishing product scheduled.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.7 DELIVERY, STORAGE AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect products.
B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
C. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation and instructions for mixing and reducing.
D. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Material and Equipment: Environmental conditions affecting products on site.
B. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
C. Do not apply exterior coatings during rain or snow or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior, unless required otherwise by manufacturer's instructions.
E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.9 PROJECT CONDITIONS

A. Section 01039 - Coordination and Meetings.
B. Sequence application to the following:
    1. Do not apply finish coats until paintable sealant is applied.
    2. Back prime wood trim before installation of trim.

1.10 EXTRA MATERIALS

A. Section 01730 - Operation and Maintenance Data.
B. Supply 1 gallons of each color, type and surface texture; store where directed.
C. Label each container with color, type, texture and room locations in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 MATERIALS

A. Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:
    1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
    2. For good flow and brushing properties.
    3. Capable of drying or curing free of streaks or sags.
B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.
C. Patching Materials: Latex filler.
D. Fastener Head Cover Materials: Latex filler.

2.2 FINISHES

A. Refer to finish schedule on drawings for surface finish.

2.3 BRAND OF PAINT

A. Sherwin-Williams or equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting Work.

B. Verify that surfaces and substrate conditions are ready to receive Work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:

1. Plaster and Gypsum Wallboard: 12 percent.
2. Masonry, Concrete and Concrete Unit Masonry: 12%.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
5. Concrete Floors: 8 percent.

3.2 PREPARATION

A. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons and fittings prior to preparing surfaces or finishing.

B. Surfaces: Correct defects and clean surfaces that affect work of this section.

C. Marks: Seal with shellac those that may bleed through surface finishes.

D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

E. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

F. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt and rust. Where heavy coatings of scale are evident, remove by [hand] [power tool] wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts and nuts are similarly cleaned. Spot prime paint after repairs.

G. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with a solvent. Prime paint bare steel surfaces.

H. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

I. Metal Doors Scheduled for Painting: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

D. Sand wood surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

G. Prime concealed surfaces of interior woodwork with primer paint.

H. Prime concealed surfaces of interior wood surfaces scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with thinner.

3.4 CLEANING

A. Collect waste material that may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.5 SCHEDULE - EXTERIOR SURFACES

A. Wood - Painted (Opaque):
   1. One coat of latex primer sealer.
   2. Two coats of alkyd enamel, semi-gloss.

B. Steel - Unprimed:
   1. One coat of alkyd primer.
   2. Two coats of alkyd enamel, gloss.

C. Steel - Shop Primed:
   1. Touch-up with zinc chromate primer.
   2. Two coats of alkyd enamel, gloss.

3.6 SCHEDULE - INTERIOR SURFACES

A. Wood - Painted:
   1. One coat of latex prime sealer.
   2. One coat of alkyd enamel, semi-gloss.

B. Wood - Transparent:
   1. Filler coat (for open grained wood only).
   2. One coat of stain.
   3. One coat sealer.
   4. Two coats of varnish, satin.

C. Interior Gypsum Drywall
   1. One coat of vinyl latex primer sealer.
   2. Two coats of latex eggshell enamel.

D. Steel - Unprimed:
   1. One coat of alkyd primer.
   2. Two coats of alkyd enamel, gloss.

E. Steel - Shop Primed:
   1. Touch-up with zinc chromate primer.
   2. Two coats of alkyd enamel, gloss.

END OF SECTION

SECTION 09971

FIBERGLASS WALL PANELS

PART 1 GENERAL

1.1 SUMMARY

A. Provide fiberglass wall panels where shown on the Drawings, as specified herein and as needed for a complete and proper installation.
B. Related work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, supplementary Conditions and Sections in division 1 of these Specifications.

1.2 SUBMITTAL

A. Comply with pertinent provisions of Section 01340.
B. Product data: Within 45 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 PRODUCTS

2.1 WALL PANELS

A. Where "fiberglass panels" or similar terms are shown on the Drawings, provide .030" thick white polyester fiberglass sheet factory laminated on 1/2" thick exterior grade plywood.
B. Acceptable products:
Nudo Products, Inc. distributed from 1500 Taylor Ave., Springfield, IL. 62703 1-800-826-4132. Fax 217-528-8722.
1. Fiber-Corr, 7/16” pvc panel #F3C400-10. Color: White. Size: 4’ x 10’. Surface: Textured.
2. Equal products of other manufacturers approved in advance by the Architect.

2.2 OTHER MATERIALS

A. Provide General Electric "Silicone Sealant SE 1200."
B. Provide continuous inside and outside corner beads where required.
C. Provide white low profile pancake head Quadrex Drive screws with spacing as recommended by the panel manufacturer.

D. Provide other materials, not specifically described but required for a complete and proper Installation, as selected by the Contractor subject to the approval of the Architect.

E. Provide 7/8” steel hat channels where required @ 16” O.C.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Securely install the approved products in accordance with the manufacturer's recommendations as approved by the Architect, setting panels straight, plumb, level and true to the lines and levels shown on the Drawings, attached to the walls with the specified nails at 6" centers both ways.

B. Finish butt joints, wall juncture, wall/ceiling and wall/curb joints with the specified sealant, tooling to a smooth finish.

END OF SECTION

SECTION 10508

METAL WARDROBE LOCKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Locker units with hinged doors. **(20 Total)**
B. Metal bases and filler panels.

1.2 REFERENCES

A. ASTM A446/A446M - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
B. ASTM A526/A526M - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.

1.3 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.
B. Shop Drawings: Indicate locker plan layout and numbering plan.

1.4 DELIVERY, STORAGE AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect products.
B. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sheet Steel: ASTM A446 Grade D, ASTM A526, Coating Designation G90), stretcher leveled; to the following minimum thickness:
   1. Body and Shelf: 24 gauge 0.024 inch
   2. Door Outer Face: 18 gauge 0.048 inch
   3. Door Inner Face: 20 gauge 0.036 inch
   4. Door Frame: 16 gauge 0.060 inch
   5. Hinges: 14 gauge 0.075 inch
   6. Base: 20 gauge 0.036 inch
   7. Sloping Top: 20 gauge 0.036 inch

2.2 ACCESSORIES

A. For Each Locker: Two single prong wall hooks and hat shelf.

2.3 FABRICATION

A. Locker Characteristics
   1. Locker Units:
   2. Width: 12 inches.
   3. Depth: 18 inches.
   4. Height: 72 inches.
   5. Configuration: single tier.
   6. Mounting: Surface mounted.

7. Base: Metal base.
8. Base Height: 4 inch.
9. Top: Sloped metal with closures.
10. Locking: Equipped for padlock hasps.
11. Ventilation: Door louvers.
12. Type: Conventional.

B. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot-welded.
C. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets.
D. Doors: Hollow sandwich construction, 1 3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
E. Hinges: Two for doors under 42 inches high; three for doors over 42 inches high; weld securely to locker body and door.
F. Locking device supplied by Owner.
G. Number Plates: Provide oval shaped brass plates. Form numbers1 inch high of block font style with ADA designation, in contrasting color.
H. Provide ventilation openings at top and bottom of each locker door.
I. Form recess for operating handle and locking device.
J. Finish edges smooth without burrs.
K. Fabricate sloped metal tops and closure pieces.
L. Provide end panels and filler strips.
M. Fabricate 4-inch high steel bases with end closures.

2.4 FINISHES

A. Clean, degrease, and neutralize metal; prime and finish with two coats of baked enamel.
B. Color: as selected from manufacturer's standard range.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install lockers plumb and square.
C. Place and secure on prepared base.
D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb.
E. Bolt adjoining locker units together to provide rigid installation.
F. Install end panels, filler panels, sloped tops and bases.
G. Install accessories.
H. Replace components that do not operate smoothly.

3.2 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 10800

TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Toilet and shower room accessories.

1.2 RELATED SECTIONS

A. Section 05500: In wall framing and plates for support of accessories.
B. Section 06112: Placement of concealed anchor devices and placement of backing plate reinforcement.
C. Section 08800 - Glazing: Other mirrors.
D. Section 10160 - Metal Toilet Compartments.

1.3 REFERENCES

A. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
C. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
D. ASTM C1036 - Standard Specification for Flat Glass.
E. FS DD-M-411C -- Mirrors, Glass.

1.4 COORDINATION

A. Section 01039 - Coordination and Meetings.
B. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS

2.1 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with fittings, steel anchor plates, adapters and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
B. Keys: Provide 3 keys for each accessory to Owner.
C. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof type.
D. Expansion Shields: Fiber, lead or rubber as recommended by accessory manufacturer for component and substrate.

2.2 FINISHES

A. Chrome/Nickel Plating: ASTM B456, Type SC 2, satin finish, unless otherwise noted.
B. Baked Enamel: Pretreat to clean condition, apply one coat of primer and minimum two coats epoxy baked enamel.
C. Galvanizing for Items other than Sheet: ASTM A123 to 1.25 oz/sq yd. Galvanize ferrous metal and fastening devices.
D. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

E. Back paint components where contact is made with building finishes to prevent electrolysis.

2.3 TOILET ROOM ACCESSORIES (Bobrick or equal)

A. Toilet Paper Dispenser: Double roll surface mounted bracket type, chrome-plated zinc alloy brackets eccentric-shaped plastic spindle for 1/2 revolution delivery designed to prevent theft of tissue roll.
B. Paper Towel Dispenser: Folded paper type, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.
   1. Capacity: 400 C-fold minimum.
C. Soap Dispenser: Equal to Bobrick B-2111 surface mounted soap dispenser for liquid and lotion soaps and detergents.
   1. Minimum Capacity: 40 ounces.
   2. Surface mounted Type 304 stainless steel with satin finish.
   3. Corrosion resistant valve.
D. Soap Dispenser: Wall mounted translucent high-impact plastic container, 1.5-gallon capacity. To be located by the service sink.
E. Mirrors: Stainless steel framed, 6 mm thick float glass, abrasion-resistant coated mirror.
   1. Size: As indicated on drawings.
   2. Frame: 0.05 inch channel shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 bright annealed finish.
   3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and non-absorptive filler material.
F. Grab Bars: Stainless steel, 1-1/4 inches outside diameter, minimum 0.05 inch wall thickness, non-slip grasping surface finish, exposed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar. Length and Configuration: As indicated on drawings.
G. Hat and Coat Hook: Equal to Bobrick B-682.
   1. Wall Mounting Flange: 2”x 2” bright polished stainless steel.
   2. Hook: 1” wide x 6-1/4” high, bright polished stainless steel with 3” projection.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting work.
B. Verify exact location of accessories for installation.
C. Verify that field measurements are as indicated on product data.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.
B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions.
B. Install plumb and level, securely and rigidly anchored to substrate.
C. Mounting Heights and Locations: As required by accessibility regulations.

END OF SECTION

SECTION 11452

RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Refrigerator
B. Microwave

1.2 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals: Procedures for submittals.
B. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.3 DELIVERY, STORAGE, AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store and protect products.
B. Accept appliances on site in manufacturer's packaging. Inspect for damage.

PART 2 PRODUCTS

2.1 TOP-MOUNT REFRIGERATOR

A. Equal to Hotpoint 14 Cu. Ft. Top-Mount Refrigerator, Model CTX14CAX as manufactured by General Electric Company.
   1. White on white.
   2. 14.4 cubic foot capacity.
   3. 3.86 cubic foot freezer.
   4. Automatic icemaker.

2.2 MICROWAVE OVEN

A. Equal to GE SpaceMaker II Microwave Oven, Model JEM25WY as manufactured by General Electric Company.
   1. White on white.
   2. .9 cu. ft. oven capacity.
   3. 800 watts.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install appliances plumb and square.
C. Place and secure on prepared surfaces.
D. Secure appliances with anchor devices to suit substrate materials.

3.2 CLEANING

A. Clean appliances interiors and exterior surfaces.

END OF SECTION

SECTION 11480

SELF-SERVE WASH BAY EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Provide self-service wash bay equipment, where shown on the drawings, as herein specified and as needed for complete and proper installation.

B. Related work:

1. Documents affection work of this section include, but are not necessarily limited to, General conditions, Supplementary conditions, Plumbing and Electrical sections of these specifications and manufacturer's specifications and recommended installation procedures.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work in their section.

1.3 SUBMITTALS

A. Within 30 calendar days after the contractor has received the owners "Notice to Proceed" submit:

1. Materials list of the items proposed to be provided under this section
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Shop drawings showing fabrication and installation.
4. Manufacturer's recommended installation procedures, which when approved, will become the basis for accepting or rejecting actual installation procedure.

PART 2 PRODUCTS

2.1 SELF SERVICE WASH BAY EQUIPMENT

A. Where shown on the drawings, provide the following equipment or equals, approved in advance by the Architect/Owner.

1. Stainless steel pumping modular with 530 cat pump, 5HP, 1 phase motor, 3 way suction diverter valve for hot wash and cold rinse and freeze control valves. No discharge diverter valves. Unit to deliver 5 g.p.m. @ 1,500 p.s.i. Low voltage controls.
2. Stainless steel holding tank with float valve and Motortrol valve for hot wash and cold rinse.
3. Wash equipment includes 90”, 360-degree boom, and 16’ x 3/8" wand hose, trigger wand and wand holster.
4. Two 10-gallon stainless steel automatic mixing tanks with #507 Hydrominder installed, one for hot water, high-pressure wash and one for foam brush.
5. Self-service control box with rotary switch for on/off; wash/rinse and foam brush.
6. Freeze protection system-single thermostat control with valves for manual switching from hot to cold water. Valve opens with power failure. Includes control unit and thermostat.
7. 60,000 grain on demand water softener with fiberglass resin tank, automatic control demand valve, plastic brine tank and mechanical control.
8. Water heater Ray-Pak 183,000 BTU recirculating or Paloma 178,500 BTU demand type, natural gas. **Verify if/not needed. See Solar Supplement in Construction Documents.**
9. Foam brush system complete with foam generator and boom system for foam brush hose and brush.

10. See Pluming Fixture Schedule for the air compressor to be supplied by General Contractor but shared with carwash equipment for a complete and functional operating system by the carwash equipment installer/contractor.
11. Also see Wash Equipment notes on Plumbing Plan.

B. Acceptable Products:

1. KO Manufacturing, Inc. 2720 East Division P.O. Box 3574, Springfield, MO. Ph: 1-888-353-5677

2. Midland Car Wash Services, LLC, 1402 East Third St., Maryville, MO 64468 Ph: 660-582-2813.

3. Grinnell Water Systems, 2413 East Chestnut Expressway, Springfield, MO 65802 Toll Free Ph: 800-424-4930. Fax 417-862-4950.

4. Double Check Company, Inc., 4000 Raytown Road, Kansas City, MO 64129 Ph: 816-921-5032.

2.2 OTHER MATERIALS

1. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the contractor, subject to the approval of the Architect/Owner. See Plumbing Plans.
2. Detergent tank shall be filled with the proper solution, as recommended by the manufacturer. Water softener shall be filled with salt as required.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine all areas and conditions that work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades to interface with work in this section.
B. Install this work in accordance with the manufacturer's installation recommendations, these specifications and with pertinent requirements of government agencies having jurisdiction.
C. Upon completion of installation and hookup, put each operating components through at least five complete operating cycles, adjust as needed to secure optimum operation level.

END OF SECTION

SECTION 13121

PRE-ENGINEERED BUILDINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pre-engineered, shop fabricated structural steel building frame.
B. Insulated metal wall and sloped roof system including soffits, gutters and downspouts, roof mounted equipment curbs and wall mounted equipment frames.

1.2 RELATED SECTIONS

A. Section 03300: Concrete footings, grade beams and floor slab.
B. Section 07210: Subgrade insulation at foundation perimeter.
C. Section 07900: Joint Sealers.
D. Section 08110: Metal doors and frames.
E. Section 08360: Overhead doors.
F. Section 08520: Aluminum windows.
G. Section 09900: Painting: Finish painting of exterior primed steel surfaces, inside surface of liner sheet, and steel doors and frames.

1.3 REFERENCES

A. AISC - Specification for Structural Steel for Buildings - Allowable Stress Design and Plastic Design.
B. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
C. ASTM A325/A325M - High Strength Bolts for Structural Steel Joints.
D. ASTM A446/A446M - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
E. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
F. ASTM A529/A529M - Structural Steel with 42 k.s.i. Minimum Yield Point (1/2 in Maximum Thickness).
G. ASTM C991 - Flexible Glass Fiber Insulation for Pre-Engineered Metal Buildings.
H. AWS A2.0 - Standard Welding Symbols.
I. AWS D1.1 - Structural Welding Code - Steel.
J. MBMA (Metal Building Manufacturers Association) - Metal Building Systems Manual.
K. UL - Building Materials Directory - Roof Deck Construction.

1.4 SYSTEM DESCRIPTION

A. Clear span equal gabled slope rigid frame with uniform depth columns and tapered rafter sections of shop welded steel plates. Refer to Drawings.

1.5 DESIGN REQUIREMENTS

A. Thermal resistance of Installed Wall System: R-value of 25.

B. Thermal Resistance of Installed Roof System: R-value of 30.

C. Design members to withstand 20 p.s.f. nominal snow load, 20 p.s.f. live load and 5 p.s.f. collateral load **(minimum + verify & include the Solar Panel loads)** or as determined by the collaboration of equipment suppliers and 80 mph design loads due to pressure and suction of wind.

D. Exterior wall and roof system shall withstand imposed loads with maximum allowable deflection of span: 1/180.

E. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

F. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of -15 to +115 degrees F.

G. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

1.6 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

B. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments and openings; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, method of installation; framing anchor bolt settings, sizes and locations from datum and foundation loads; indicate welded connections with AWS A2.0 welding symbols; provide professional seal and signature.

C. Samples: Submit two samples of precoated metal panels for each color selected, 12x12 inch in size illustrating color and texture of finish.

D. Perform Work in accordance with MBMA 1999.

E. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

F. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience or approved by manufacturer.

G. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Missouri.

1.7 PRE-INSTALLATION MEETING

A. Section 01039 - Coordination and Meetings: Pre-installation meeting.
B. Convene one week before starting work of this section.

1.8 WARRANTY

A. Provide a five-year warranty for weather tightness of building enclosure elements after installation.

PART 2 PRODUCTS

2.1 MATERIALS - FRAMING

A. Structural Steel Members: ASTM A36/A36M.
B. Structural Tubing: ASTM A500, Grade B
C. Plate or Bar Stock: ASTM A529/A529M.
D. Anchor Bolts: ASTM A307, unprimed.
E. Bolts, Nuts, and Washers: ASTM [A325, galvanized to ASTM A153.
F. Welding Materials: AWS D1.1; type required for materials being welded.

G. Primer: 1 to 2 mils. Keeping with Steel Structures Painting Council Paint Specification No. 25 and Federal Specifications TT-P-636-D and TT-P-664-C.
H. Grout: ASTM C1107, Non-shrink type, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 2,400 p.s.i., in two days and 7,000 p.s.i. in 28 days.

2.2 FABRICATION - WALL AND ROOF SYSTEMS

A. Siding: Minimum 26 gauge; metal thickness, profile indicated, 1 3/16 inch deep, lapped edges.
B. Roofing: Minimum 24 gauge; metal thickness, Standing seam profile, lapped edges fitted with continuous gaskets.
C. Soffit Panels: Minimum 26 gauge; flat, perforated for ventilation.
D. Interior Liner Panels: Minimum 26 gauge metal thickness, ribbed wall panels, lapped edges.
E. Girts/Purlins: Rolled formed structural shape to receive siding, roofing and liner sheet.
F. Internal and External Corners: Same material thickness and finish as adjacent material, profile shop cut and factory mitered to required angles. Back brace mitered internal corners.
G. Flashings, Closure Pieces, Fascia, Infills and Caps. Same material and finish as adjacent material, profile to suit system.
H. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

2.3 FABRICATION - GUTTERS AND DOWNSPOUTS

A. Gutters and Downspouts: Minimum 26 gauge metal thickness.
B. Form gutters and downspouts and scuppers of profile and size as recommended by building Manufacturer to collect and remove water. Fabricate with connection pieces.
C. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.
D. Fabricate support straps of same material and finish as wall metal, color as selected.

2.4 FINISHES

A. Framing Members: Clean, prepare and shop prime. Do not prime surfaces to be field welded.
B. Exterior Surfaces of Wall Components and Accessories: Precoated enamel on steel of flouropolymer (Kynar) finish, color as selected from manufacturer's standard range.
C. Exterior Surfaces of Roof Components and Accessories: Galvalum finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01039 - Coordination and Meetings: Verification of existing conditions before starting work.
B. Verify that foundation, floor slab, mechanical and electrical utilities and placed anchors are in correct position

3.2 ERECTION - FRAMING

A. Erect framing in accordance with AISC Specification.
B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated on drawings.
C. Set column base plates with non-shrink grout to achieve full plate bearing.
D. Do not field cut or alter structural members without approval.
E. After erection, prime welds, abrasions and surfaces not shop primed.

3.3 ERECTION - WALL AND ROOFING SYSTEMS

A. Install in accordance with manufacturer's instructions.
B. Exercise care when cutting prefinished material to ensure cuttings does not remain on finish surface.
C. Fasten cladding system to structural supports, aligned level and plumb.
D. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.
E. Provide expansion joints where indicated.
F. Use concealed fasteners on roof.
G. Install insulation and vapor retarder utilizing adhesive for attachment. Install the vapor retarder for support between framing members.
H. Install sealant and gaskets to prevent weather penetration.
I. Thermal-break mastic strip continuous horizontally along the outside of all exterior girts before the attachment of the exterior metal panels.

3.4 ERECTION - GUTTER AND DOWNSPOUT

A. Rigidly support and secure components. Joint lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.
B. Apply bituminous paint on surfaces in contact with cementitious materials.
C. Slope gutters minimum 1/8 inch/ft.
D. Connect downspouts to storm sewer system.

3.5 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.
B. Siding and Roofing: 1/8 inch from true position.

3.6 SNOW GUARDS

A. Equal to SnowBlox, SnoBar by Action Manufacturing, LLC, Engle, CO Ph: (800) 711-9724.

B. Design Requirements: Continuous linear roof snow retention system along front of building should have a minimum performance of 500# per lineal foot of bar without deflection. Connection must be used at every roof seam.

C. Bar: 16 ga. galvanized steel with Polane Plus Enamel. Bar color to match metal roof or as selected by Architect.

D. Connection: Stainless steel U- Bracket with stainless steel screws.

E. Substrate Below Roof Panel: 2-Ply purlin at eave attachment line or double stagger line.

F. Quality Assurance: 5-years.

END OF SECTION

SECTION 13125

PRE-ENGINEERED POLE STRUCTURES

PART 1 GENERAL

The following Pre-Engineered Pole Structure specifications are based on requirements of Stockade Buildings other manufacturer's meeting these specifications will be accepted.

Laminated Foundation Columns and Footings:

The structural nail laminated foundation columns shall be three members No. 1 or better Southern Pine, Kiln dried to 19% moisture content. Foundation columns shall be pressure treated with a wood preservative to a retention of 0.8 pounds per cubic foot and kiln dried after treating to 19% maximum moisture content. The wood preservative shall be Chromated Copper Arsenate Type III, Oxide type; or equal as listed in Federal Specification TT-W-571J. The preservative shall penetrate 100% of the sapwood. A letter of certification from the wood preserver shall be furnished with certifies the 0.8 pcf preservative retention for a 0 to 0.75" assay zone.

The foundation columns shall be accurately placed and shall extend 4'-0" minimum below grade. The foundation column shall have a ½" diameter x 10" long steel rod, located 3-1/2" up from the base, and extending through all (3) members. Base of column shall be set in a footing of 28 day test verified 3,000 psi compressive strength dry concrete mix, half under and half around to permanently attach the footing and foundation column. The footing shall bear on undisturbed soil. Footing size shall be determined from applied structural loads and 4,000 #/S.F. presumptive soil bearing capacity. After accurate placement of foundation column and specified footing, hole shall be backfilled with dry, debris-free dirt compacted in 8" lifts.

Laminated Upper Columns:

No. 1 or better Southern Pine nail and glue laminated repetitive S4S members of 19% maximum moisture content shall be sized according to dimensions of structure and required structural loads.

Foundation Column to Upper Column Connection:

Structural design shall show, by test or calculation, the foundation column to upper column connection to be adequate for all imposed bending and axial forces.

Splash Boards:

Splashboards are No. 2 or better Southern Pine nominal 2x8 S4S pressure treated to a net retention of 0.4 pounds per cubic foot with MCQ in accordance with American Wood Preservers Association Specification C2.

Eave board:

Sidewall eave boards shall be 2x6 No. 2 Spruce-Pine-Fir or better, and shall be beveled on the top edge at the same degree as the roof slope.

Framing Lumber:

Wall girts shall be 2x6 No. 2 Southern Pine, 19% maximum moisture content spaced approximately 30" o.c., with all ends bearing into wide face of column. Roof purlins shall be recessed between trusses, on edge, and attached to trusses with adequate fasteners. Continuous 2x4 lateral bracing shall be provided as required in truss specification. All other framing lumber shall be standard grade or better unless specified differently on plans. All lumber shall be free of warping, twisting, or splitting.

Specification for Metal Plate Connected Wood Trusses:

1. All lumber used in the design of wood trusses must be cured and graded in accordance with the current grading rules. Design stresses allowed are those listed in the current editions of respective lumber association's grading rules.
2. The design of wood members must be in accordance with the formulas published in the latest edition of the National Design Specification for Wood Construction as revised to current date.
3. Metal connector plates and joint design must conform to specifications as set forth in the 1995 edition of the recommended design practice of the Truss Plate Institute, Inc. Entitled Design Specification for Metal Plate Connected Wood Trusses (TPI-95) as Revised to current date.
4. Truss members and joints must be designed in accordance with TPI-95. All trusses Designs must be accompanied by complete and accurate shop drawings bearing the seal of a Professional or Structural Engineer, registered in the project State, and contains the following information:
    (a) Slope of depth, span and spacing of the truss.
    (b) Location of all joints.
    (c) Bearing width.
    (d) Design loading to include, as applicable:
        (1) Top chord live load.
        (2) Top chord dead load.
        (3) Bottom chord live load.
        (4) Bottom chord deal load.
        (5) Concentrated loads and their points of application.
    (e) Adjustments to lumber and plate design vales to include modification for, as Applicable:
        (1) Moisture service conditions.
        (2) Temperature.
        (3) Preservative treatment.
        (4) Fire retardant treated wood.
        (5) Duration of load.
        (6) Flexure.
        (7) Shear.
    (f) Each reaction force.
    (g) Each axial force (Heel panel axial forces shall not exceed 25,000#)
    (h) Lateral bracing requirements:
        (1) Top chord brace (roof purlins) spacing.
        (2) Bottom chord brace spacing.
        (3) Web bracing, as applicable.
    (i) Plate type, thickness or gauge, size; basic plate design value (specifying gross or Net value); and the dimensioned location of each plate except where symmetrically located relative to the joint interface.
    (j) Lumber size, species, and grade for each member.
5. Design calculations for bending moments shall be available from the designer.

Roofing and Siding Panels:

Metal panels are GALVALUME ™ (Max Rib Ultra) 80,000#/SI minimum yield strength structural grade sheet steel. The paint process is a Kynar 500/Hylar 5000 Fluropon paint system. Utilizing the full strength 70% PVDF (fluoropolymer) resin and durable ceramic pigmentation. Panels shall be fastened with nails or screws, which are compatible to the panels in both life expectance and environmental stability. All panels will be one piece unless lengths greater than 40 feet are required or the panels must be shortened to accommodate certain building features. (GALVALUME ™) is a trademark of the Bethlehem Steel Corporation. Kynar 500 is a registered trademark of Elf Atochem North America, Inc. Hylar 5000 is a trademark of Ausimont USA, Inc. Fluropon is a registered trademark of the Valspar Corporation.

Steel Panel Attachment:

Screw Fastener:

The steel panels shall be fastened to building framing by plated steel sharp point screws with zinc/aluminum/cast nonferrous alloy hex washer heads pre-assembled with aluminum bond seal washers, which cannot red rust and are compatible with steel panel. Woodzac by Construction Fasteners, Inc., or equal are acceptable.

Nail Fasteners – Framing:

9 gauge x 3-1/2" length 16d oil quench hardened lock ring shank framing nails – galvanized when in contact with pressure treated lumber.

Closure Strips:

1" wide closed-cell linked expanded polyurethane, to match panel corrugation.

Openings:

All openings shall be framed to proper size and trimmed to cover all exterior edges with pre-painted flashings.

Trim:

0.0158-inch min. thickness steel on gables, ridge, corners, base, windows, and doors with same paint finish as roofing and siding panels.

Gutters and Downspouts:

Gutters shall be 5" O.G. or Style K type gutters installed on all eaves of the building, and provide 2" x 3" downspouts to match trim with same paint finish as roofing and siding panels and to be selected by owner.

Design Requirements:

Design members to withstand 15 p.s.f. non-reducible snow load, and 5 p.s.f. collateral load (minimum) or as determined by the collaboration of equipment suppliers and 90 mph design loads due to pressure and suction of wind Exposure "B". Design shall conform to 2003 International Building Code.

Warranty:

1. Treated Wood Columns: Minimum 40 Years against Decay and Insect Damage when in Contact with Soil.
2. Max-Rib Steel Panels:
   a. 30 Years against Crack, Peel, Blister or Flake of Paint Coating
   b. 40 Years against Chalk in Excess of 8 Per ASTM D-4214 Method D659
   c. 40 Years against Change of Color in Excess of 5 per ASTM D-2244

Snow Guard:

Equal to SnowBlox, SnoBar by Action Manufacturing, LLC, Engle, CO Ph: (800) 711-9724.

Design Requirements: Continuous linear roof snow retention system along front of building should have a minimum performance of 500# per lineal foot of bar without deflection. Connection must be used at every roof seam.

Bar: 16 ga. galvanized steel with Polane Plus Enamel. Bar color to match metal roof or as selected by Architect.

Connection: Stainless steel U- Bracket with stainless steel screws.

Substrate Below Roof Panel: 2-Ply purlin at eave attachment line or double stagger line.

Quality Assurance: 5-years.

END OF SECTION

SECTION 15050

MATERIALS AND METHODS

PART 1 GENERAL

1.1 OPERATION PRIOR TO ACCEPTANCE

A. When any equipment is operable, and it is to the advantage of the Contractor to operate the equipment, he may do so provided that he properly supervises the operation, and retains full responsibility for the equipment operated. Before final acceptance by the owner, the Contractor shall properly clean the equipment, install clean filter media, make all required adjustments and complete all punch list items.

1.2 WARRANTY

A. Warrant to Owner that materials, equipment, and workmanship provided under this Division of the Specifications will be free from defects for a period of one year from the date of acceptance by Owner. Additional equipment warranty requirements are stated in other sections of the specifications.

PART 2 PRODUCTS

2.1 MATERIALS

A. Products are to be new and free from defects, and are to be installed by competent specialist for each trade in accordance with the manufacturer's recommendations. Materials or equipment not meeting these standards, or the acceptance of the Engineer, may be rejected and will be replaced at no additional costs to the owner.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

A. Conceal piping in pipe chases, walls, furred spaces and above ceiling, unless otherwise indicated.
B. Should any condition arise which would cause piping or ductwork to be exposed in finished areas, it will be called to the architect/owner's attention immediately and corrected in accordance with the architect/owner's instructions.

3.2 HANGERS AND SUPPORTS

A. Provide and install per ANSI Standards SP-58 and SP-69.

B. Adequately support pipes throughout the buildings, both horizontal and vertical.

C. Hanger Schedule

PIPE SERVICE	HANGER SIZE	TYPE	GRINNELL NO.
Uninsulated Steel	2" & smaller	Split Ring	108 with 114
Uninsulated Copper	2" & smaller	Ring	CT 99
Cast Iron Soil Pipe	All	Clevis	590
Insulated Steel	4" & smaller	Clevis	260 with shield
Insulated Copper	2" & smaller	Clevis	CT 65

D. Multiple or Trapeze Hangers" Steel channels with angles or unistrut spacers and hanger rods.

E. Wall Support 2 1/2 inch and over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Provide copper plated hangers and supports for copper piping or provide sheet plastic tape wrapping between hanger or support and piping.

H. Equivalent products of Fee and Mason or Elcen are acceptable substitutes for the Grinnell hangers specified.

I. Maximum horizontal pipe hanger support spacing and minimum rod diameter for rigid rod hangers (see chart).

J. Install hangers to provide minimum 1/2-inch clear space between finished covering and adjacent work.

K. Place a hanger within one foot of each horizontal elbow.

L. Support horizontal soil pipe near each hub, with 10 feet maximum spacing between hangers.

M. Support PVC piping per manufacturer's recommendations.

3.3 ELECTRICAL WIRING OF MOTORS AND EQUIPMENT

A. Follow manufacturer's published directions in the delivery, storage, protection, installation, piping and wiring and start-up of equipment and materials.

3.4 ACCESS PANELS AND DOORS

A. Install access panels and doors for concealed equipment and valves.

3.5 TESTS

A. Field test mechanical equipment furnished and installed under this Contract as required by the Engineer Tests.

B. Perform tests required by governing authorities, in addition to tests specified in individual Sections.
C. Complete final installation and testing 14 days prior to Contract Substantial Completion Date.
D. All pipe work shall be tested at the pressure equal to the design working pressure of the pipe for the intended service and maintain this pressure for not less than two hours with not more than 1% drop in pressure.
E. Notify architect/owner of any test failures. Submit weekly pipe test log listing service; section tested, initial and final pressure, time and temperature.

END OF SECTION

SECTION 15400

PLUMBING SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Water piping.
   2. Sanitary drainage.
   3. Condensate piping.
   4. Testing.

B. Comply with other Division 15 Sections, as applicable. Refer to other Divisions for coordination of work.

1.2 SUBMITTALS

A. Make submittals for all products specified in the specification.

PART 2 PRODUCTS

2.1 MATERIALS

A. Water Piping Above Grade, Type "L" hard drawn, seamless copper water tube, ASTM B88 and Federal Specification WW-T-799. Joined with wrought copper pressure fittings, ANSI B16.22. Make joints using "lead free" solder and a non-corrosive paste-type flux. Core solder is not allowed. Solder will be solid string or wire type. Where soldered copper piping is connected to threaded brass piping, use a cast brass adaptor.

B. Water Piping Below Grade, Type "K" hard drawn, seamless copper water tube, ASTM B88 and Federal Specification WW-T-799. Joined with wrought copper pressure fittings, ANSI B16.22. Make joints using "lead free" solder and a non-corrosive paste-type flux. Core solder is not allowed. Solder will be solid string or wire type. Where soldered copper piping is connected to threaded brass piping, use a cast brass adaptor.

C. Make piping connections to fixtures and equipment with chrome-plated seamless brass tube, ASTM B-125 and Federal Specification WW-T0791. No ferrous piping or materials are allowed in water piping smaller than 4 inches.

2.2 SANITARY DRAINAGE

A. Sanitary Drainage lines (Soil, Waste and Vent): Cast iron soil pipe and fittings, coating inside and outside, ASTM A74 and Federal Specification WW-P-401. Label with Cast Iron Soil Pipe Institutes' "Mark of Quality and Permanence". Weights of pipe are required by code for location and duty. Joints shall be fabricated by use of "Push-On" type gasketed joints (above or below ground) or "No-Hub" mechanical joints (above ground only). Where permitted by local codes, PVC-DWV Plastic Schedule 40, NSF Seal CS-272 may be used for sanitary drainage pipes (soil, waste, and vent), with solvent-welded joints.

2.3 VALVES

A. Valves for Domestic Water Piping Systems: Nibco S580 or equal.

2.4 PRESSURE REDUCING VALVE

A. When the water system static pressure is greater than 75 PSI, furnish and install a pressure-reducing valve ahead of all fixtures and located in an accessible place. Set pressure at 50 PSI downstream of backflow preventer. Contractor to verify supply pressure.

2.5 COMMERCIAL TYPE WATER HAMMER ARRESTERS

A. Provide commercial type water hammer arrester on hot and cold water supplies as generally indicated, with precise location and sizing to be in accordance with PD1-WH201.
B. Water hammer arresters, where concealed, shall be accessible by means of access doors or removable panels.
C. Water hammer arresters shall be in accordance with PD1-WH201, as furnished by Watt, Josam or equal.
D. Vertical capped pipe columns will not be permitted.

2.6 BACKFLOW PREVENTER

A. Provide a Watts #909 reduced pressure backflow preventer for the domestic water service.

2.6 PLUMBING FIXTURES

A. Provide and install fixtures as shown on plans.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

A. Install piping neatly and parallel with or perpendicular to lines of the structure. Install pipe hangers to maintain accurately aligned piping systems, adequately supported both laterally and vertically. Install horizontal soil, waste, and vent pipe with a grade of 1/4" per foot where possible and not less than 1/8" per foot. Where practicable, connect two or more vents together and extend as one vent through roof. Make vent connections to stacks by appropriate use of 45 wyes, long sweep quarter bends, sixth, eighth or sixteenth bends, except that sanitary tees may be used on the vertical stacks.
B. Extend condensate drain piping from units with condensate discharge.
C. Install drains at all low points and vents at high points in water distribution system.

3.2 PIPING

A. Refer to Section 15700 for insulation requirements.

3.3 PIPE TESTS

A. Test water piping before installing equipment and before insulation is applied, using specified methods and conditions. Subject piping to test for not less than 24 hours under inspection by the Engineer. Make necessary replacements and repairs and repeat tests until entire system is accepted as satisfactory. Work includes testing equipment. After installation of equipment, operate systems; clean out scale, dirt, oil, waste and foreign matter, and correct additional leaks. Test underground piping prior to backfilling.
B. Test plumbing drainage systems under 10 foot static head. Test water systems under 150 PSIG hydrostatic pressure.

C. Flush system thoroughly of dirt and foreign matter, then fill with water treated with 50 ppm of chlorine. During filling process, open valves and faucets several times to assure treatment of entire system. Leave treated water in system for 24 hours after which time system may be flushed; if residual chlorine is not less than 10 p.p.m., repeat flushing. After sterilization, receive approval by regulatory agency on samples of water in system.

END OF SECTION

SECTION 15410

COMPRESSED AIR PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. High Pressure Air System (Over 100 p.s.i)
   2. Low Pressure Air System (Below 100 p.s.i)

B. Work includes but is not limited to the following:
   1. Piping
   2. Valves
   3. Test Procedures

1.2 QUALITY ASSURANCE

A. Regulatory Requirements
   1. Compressed Air Piping: Compressed air piping shall meet the requirements of ANSI B31.1.
   2. Rotating Equipment. Fully guard couplings, motor shafts, gears and other exposed rotating or rapidly moving parts in accordance with OSHA 29 CFR 1920.219. Provide rigid and suitable secured guard parts readily removable without disassembling guarded unit.
   3. Welding: Safety in welding and cutting of pipe shall conform to ANSI Z49.1

B. Standard Products
   1. Materials and equipment shall be the standard products of manufacturers regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

PART 2 PRODUCTS

2.1 HIGH PRESSURE AIR PIPING

A. High Pressure Pipe and Fittings
   1. Piping shall be black steel, schedule 40 seamless, ASTM A106 or A53.
   2. Fittings shall be schedule 40 but weld fittings for pipe 2 1/2 inches and larger and 300# malleable iron fittings for pipe 2 inches and smaller.

B. Low Pressure Pipe and Fittings
   1. Piping shall be black steel, schedule 40 ASTM A53.
   2. Fittings shall be schedule 40, but weld fittings for pipe 2 1/2 inches and larger and 150# malleable iron fittings for pipe 2 inches and smaller.

2.2 VALVES AND SPECIALTIES

A. Compressed Air Piping Valves
   1. 150 pound class bronze gate valves, Type II, Class B, or globe Valves. Checkvalves: Lift or swing type. Ball Valves: Valves shall be full-port type with bolted body cap. Ball and stem shall be hard chrome-plated carbon steel.

B. Pressure Gauges
   1. Steel or brass case, and non-shatterable safety glass, and a pressure blowout back to prevent glass from flying out in case of an explosion. Gauges shall have a 3 1/2 inch minimum diameter dial and a dial range of approximately twice working pressure. Provide gauge cock for each pressure gauge.

C. Provide Pressure Reducing Valves

1. Spring loaded type, with nominal pressure rating of not less than inlet system pressure indicated. Provide pressure-reducing valves capable of being adjusted to specified flow and pressure, and suitable for intended service.

D. Hose connectors shall be all brass, of the size and type indicated on the drawings.

E. Filter and/or lubricator shall be suitable for the intended flow and pressure.

F. Traps shall be rated at not less than the system pressure and shall be capable of draining water and other liquids from the system.

G. Pressure reducing valves shall be pressure rated of not less than the system inlet pressure. The outlet pressure shall be capable of adjustment to specified flow and pressure.

H. Air hose shall be rated at nominal 100 psi and shall have a rubber or neoprene tube with 2 ply construction with abrasion resistant cover.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation of Compressed Air System

1. Accomplish installation of air piping and equipment in accordance with ANSI B31.1 and only by competent personnel. The compressors and equipment shall be installed under the supervision of the compressor manufacturer's representative. The compressor and associated equipment shall be installed in accordance with the manufacturer's recommendations
2. Work material and equipment into complete, convenient, and economical system or systems; and provide apparatus, parts, materials and accessories that are necessary to accomplish this result. Piping shall follow general arrangement shown, cut accurately to measurements established for work by the Contractor, and work into place without springing or forcing. Install piping and equipment within buildings entirely out of the way of lighting fixtures and doors, windows and other openings. Run overhead piping in buildings in the most inconspicuous positions. Make provision for expansion and contraction of pipelines. Install in accordance with the best method of practice. Do not conceal piping until it has been inspected, tested and approved. Protect materials and equipment from the weather.
3. Install compressors on pad type isolators as specified in paragraph 15250-2.02-B.

B. Drainage and Flexibility

1. Compressed air piping shall be free of unnecessary pockets and pitched approximately 3 inches per 100 feet in the direction of flow to low points. Where pipes must be sloped so that condensate flows in opposite direction to air flow, slope 6 inches per 100 feet or greater. Provide flexibility by use of fittings, loops and offsets in piping. Install branches at top of a main to prevent carryover of condensate and foreign matter.
2. Provide traps to eliminate liquids from the system.

C. Cleaning

1. Before assembly and installation, clean piping, fittings, valves, unions and other components of the systems of dirt, oil and other contaminants. Piping for oil free systems shall be oil-free prior to and during installation.

D. Anchoring, Guiding, and Supporting Piping

1. Anchor and support piping in a manner such that expansion and contraction will take place in direction desired and prevent vibration by use of vibration dampeners and prevent undue strains on equipment served. Fabricate hangers used for support of piping 2-inch nominal pipe size and larger to permit adequate adjustment after erection while still supporting load. Use wall brackets where pipes are adjacent to walls or other vertical surfaces that may be used for supports. Furnish and install supports to adequately carry weight of lines. Provide inserts and sleeves in concrete where necessary. Design and fabrication of hanger, supports and anchors shall conform to ANSI B31.1. Space pipe supports at intervals specified in Section 15050 Materials and Methods.

E. Pressure reducing valves, filters, lubricators, quick couplers and other accessories shall be provided as indicated on the drawings.

3.2 TESTING

A. General Requirements

1. The Contractor shall perform all field tests and shall provide everything required for the tests. Make tests under the direction and subject to approval of the Engineer.
2. Qualified personnel shall test compressed air systems, pressurize each piping system individually and check to assure that there are no cross connections between different systems prior to operational tests. Test all piping to one and one half times the normal system operating pressure.

END OF SECTION

SECTION 15440

PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Plumbing fixtures and trim.
B. Related Sections:
   1. Refer to other Divisions for coordination of work.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature for all products specified.

PART 2 PRODUCTS

2.1 FITTINGS AND PIPING

A. Provide brass fittings and piping in connection with plumbing fixtures; polished chrome-plated where exposed to view.
B. Provide tight-fitting wall or floor escutcheons of chrome-plated brass wherever pipes pass through floors, walls or ceilings.
C. Provide required water, waste, soil, and vent connections to plumbing fixtures and equipment, together with fittings, supports, fastening devices, cocks, valves and traps, leaving all in complete working order.

2.2 FIXTURES

A. Provide new plumbing fixtures, first quality, free from mars or chips. Sufficient means to support each fixture in an adequate and rigid manner that permits no perceptible movement of fixture by manually applied forces. Fixtures to be standard products as manufactured by American Standard, Crane, Eljer or Kohler. The space between fixtures and floor or walls to be sealed with silicone sealant.
B. Each fixture shall be complete with required trim, and exposed piping and trim shall be polished chrome-plated brass. Each fixture shall be furnished with stop valves having metal-to-metal seats.
C. Provide for each lavatory and sink, a flow-limiting device that will limit flow to not more than 3 g.p.m. Devices shall be integral with fixture trim, wherever possible and shall be products of the fixture trim Manufacturer in all cases.
D. Provide plumbing fixtures as scheduled on Drawings.
E. See Specification Section 15410 - Compressed Air Piping, 2.2 Valves and Specialties.

PART 3 EXECUTION

3.1 INSTALLATION

A. Plumbing fixtures and equipment shall be set in place at locations indicated on the Drawings, leveled and connected. Fixtures shall be protected from damage during construction.
B. Installation procedures shall be in accordance with these Specifications and the Manufacturer's directions.

3.2 ADJUSTING AND CLEANING

A. Prior to final acceptance, inspect faucets, flush valves, stop valves, and similar devices, to determine that they operate properly and discharge the proper quantities of water. Correct any deficiencies as directed by the Engineer.

B. Clean fixtures, trim and accessories of foreign materials, including labels.

END OF SECTION

SECTION 15500

HEATING, VENTILATING AND AIR CONDITIONING

PART 1 GENERAL

1.1 SUMMARY

A. Provide heating, ventilating, and air conditioning systems where shown on the Drawings, as specified herein and as needed for a complete and proper installation including but not necessarily limited to:
   1. Heating and Central Air Condenser Unit.
   2. Air conditioning supply and return ductwork system with grilles and diffusers.
   3. Gas-fired, ceiling-hung Unit Heaters
   4. Temperature control system including low-voltage wiring.
   5. Acoustical and thermal insulation of ducts.
   6. Engineering and design, refer to drawings.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Manufacturers catalogs, samples and other items needed to fully demonstrate the quality of the proposed materials and equipment.

C. Record drawings:
   1. Comply with pertinent provisions of Section 01720.
   2. Include a copy of the Record Drawings in each copy of the operation and maintenance manual described below.

D. Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to the Architect two copies of an operation and maintenance manual compiled in accordance with the provisions of Section 01730 of these Specifications.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.
C. Provide minimum 1-year manufacturer's warranty on all units.

1.4 DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 PRODUCTS

2.1 DUCTWORK

A. For exhaust systems and for the heating, ventilating, and air conditioning systems, provide galvanized sheet metal ducts fabricated and installed to pertinent ASHRAE and SMACNA standards or to the requirements of governmental agencies having jurisdiction, whichever requirement is more stringent.
B. Size the ducts for pressure drop of 0.1" H20 per 100 feet.
C. Seal all duct seams, transverse and longitudinal, air tight with 6 ox canvas secured in place with "WC800" or equal duct sealing compound, an approved lagging adhesive or duct tape.

2.2 FLEXIBLE DUCT

A. Provide factory fabricated insulated low-pressure flexible duct with the following attributes:
1. Zinc-coated spring steel helix, with 1" thick fiberglass insulation, sheathed in a seamless vapor barrier jacket.
2. Interior fire-resistive coated to prevent fiber erosion;
3. Straight run sound absorption of 3 db per ft, and 5 db per ft sound absorption at 45 degree bends;
4. Composite assembly, including insulation and vapor barrier, meeting Class 1 requirements of flame spread of 25 or less and smoke developed of 50 or less as set forth in NFPA Bulletin 90-A and bearing UL label as an air duct.

B. Provide flexible duct in fully extended condition, free from sags and kinks.
1. Use only the minimum length required to make the connection.
2. Do not exceed 8'-0" in length.
3. Where horizontal support is required, provide at least 3/4" wide banding material hangers at not more than 36" centers.
4. Make joints and connections with 1/2" wide positive locking steel straps.

C. Acceptable products:
1. Insulated low pressure flexible duct "Type S-181" manufactured by Glass Insulation Co., Los Angeles.
2. For toilet exhaust or return air connectors and runouts, aluminum flexible ducts such as "Flexmaster" or "Van-guard" may be used if acceptable to the governmental agencies having jurisdiction.

2.3 INSULATION

A. General:
1. Provide materials complying with NFPA Bulletin 90-A, as determined by UL method NFPA 225-ASTM E84, and complying with the governing code, with flame spread rating under 25 and smoke developed rating under 50.
2. Where vapor barriers are used, provide intact and continuous throughout.
3. Acceptable manufacturers:
a. Owens/Corning Fiberglass;
b. Manville
c. Certainteed.

B. All supply ducts:
1. Insulate supply ducts with 1" thick fiberglass blanket such as Fiberglas "FRK ED-100," or equal approved in advance by the Architect.
2. Insulate return ducts with 3/4-pcf 1" thick fiberglass duct wrap blanket.

C. Acoustical duct liner: For ducts exposed to the weather and for supply ducts from supply fan to first branch ducts:
   1. Line with one of the following 1" thick materials:
      a. CSG No. 300, coated;
      b. PPG 3 pcf;
      c. Superine (or Textrafine) Fiberglass PF-615;
      d. Manville 3 pcf Micortex coated duct liner.
   2. Apply duct liner with coated side facing air stream and secured to the sheet metal with "ED104" adhesive or with mechanical clips recommended by the manufacturer.
   3. Make joints tightly butted and heavily sized with "Lag-gas" or "Arabolt Lagging Adhesive," assuring continuity of surfaces.

2.4 AIR OUTLETS

A. Ceiling diffusers:
   1. Provide Hart & Cooley or Approved Equal, in size, capacity and pattern noted on the Drawings.
   2. Provide insulated adaptor boxes above each diffuser neck to permit connection of flexible duct.
B. Grilles: Provide Hart & Cooley or Approved Equal in size, capacity and pattern noted on drawings.
C. Provide factory-applied or site-applied black coating on the inside of all air outlets and connecting plenums.
D. Provide sponge rubber under all flanges.

2.5 VIBRATION ISOLATION AND FLEXIBLE CONNECTIONS

A. At ducts to equipment, provide vent-fabric flexible connections with a minimum of 6" full length and approved by the governmental agencies having jurisdiction.
B. Provide additional sound isolation as required limiting the noise level in conditioned space to a maximum of NC-40.

2.6 HEATING AND CENTRAL AIR UNIT

A. Install High Efficiency, Direct Vent, Condensing Upflow Gas Furnaces with necessary appurtenances, per HVAC Schedule. See Construction Documents, equal to Carrier.
B. Install High Efficiency Air Conditioners with necessary appurtenances, per Split Systems HVAC Units Schedule sheet 26 of 29, equal to Carrier.
C. Install Carrier Model TSTATCCPAC01-B 7 day programmable thermostats, or approved equals, per manufacturer's instructions and specifications.
D. Location of units per drawings
E. Vent furnace unit per Manufacturer's instructions and specifications and as per drawings.

2.7 UNIT HEATERS

A. Unit Heater. Furnish gas fired, propeller fan and unit heaters as manufactured by one of the following companies: Crane, Reznor, National, Pearless, Carrier, Tran Bryant, or equal in the capacity shown on the plans. Units shall be A.G.A. certified, completely assembled and be operationally tested before shipment from factory.

B. Unit Heater Exchanger. Shall be stainless steel seam or arc welded with tubes and headers not lighter than 20 gauge thickness. Draft diverters shall be aluminized steel or equal. Electrical characteristics as required.

C. Burners. The burners shall be of cast iron or stainless steel construction that will give quiet, smooth ignition throughout the length of the burner. They shall be equipped with adjustable air shutters to regulate flame characteristics for maximum efficiency. All burners shall be individually removable.

D. Pilot. Shall be of the intermittent pilot systems type using gas only when the system calls for heat, is lit by high voltage capacitive discharge spark, turns off automatically when demand for heat is satisfied or flame is lost. If flame is lost, unit shuts off main valve, re-starts ignition sequence.

E. Wiring. Units shall be factory wired for high limit and fan control. Fan motor shall be 115 volt, single phase, 60 cycle totally enclosed with overload protection.

F. Gas Valve. The gas valve shall be standard type 24-volt single phase, 60 cycle arranged for 100% safety shut off on main and pilot burner. 115/24-volt transformer to be supplied with unit heater and factory wired on low voltage side to gas valve.

2.8 PIPING

A. For refrigerant piping, provide Type "L" copper, refrigerant grade, with wrought copper fittings, and with joints thoroughly cleaned prior to soldering.

2.9 AUTOMATIC TEMPERATURE CONTROL

A. Provide a system of temperature control with the attributes listed below.
1. Include thermostats, sensors, temperature controllers, and air piping as requiring for a complete and operable system compatible with approved Heating and Central Air Unit.
2. Provide devices calibrated and adjusted with the actual operating conditions.

2.10 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 COORDINATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.3 EQUIPMENT INTERFACE

A. Provide all required shutoff valves, unions and final connections of piping to the work of this Section.
B. For electrically operated equipment, verify the electrical characteristics actually available for the work of this Section and provide equipment meeting those characteristics.

3.4 PAINTING

A. Paint inside of all air outlets and connecting plenums with one coat of black paint or provide all such items factory preprinted.

3.5 INSULATION

A. Wrap insulation firmly around ductwork, covering all surfaces including standing seams and with all joints lapped at least 2".
B. Securely fasten the insulation in place with 16 gauge soft annealed black or galvanized wire spaced approximately 12" on centers for straight runs and 3" on centers for elbows and fittings.
C. Take special care to avoid excessive stretching and compressing and to achieve securing at lapped sections where possible.

3.6 INSTRUCTIONS

A. Upon completion of this portion of the Work, and prior to its acceptance by the Owner, provide a qualified engineer and fully instruct the Owner's maintenance personnel in the proper operation and maintenance of items provided under this Section.
B. Demonstrate the contents of the approved operation and maintenance manual required under Article 1.2 above.

3.7 TESTING AND ADJUSTING

A. Test and adjust each piece of equipment and each system as required to assure proper balance and operation.
    1. Test and regulate ventilation and air conditioning systems to conform to the air volumes shown on the approved design drawings.
    2. Make tests and adjustments in apparatus and ducts for securing the proper volume and face distribution of air for each grille and ceiling outlet.
    3. Where required, provide pulleys for fans at no additional cost to the Owner and set to drive the fans at the speed needed to give the indicated volume.
    4. For each system, take the following data in tabulated form:
        a. Air volumes at all supply return and exhaust outlets;
        b. Total c.f.m. supplied;
        c. Total c.f.m. returned;
        d. Total static pressure at each fan and at each system;
        e. Motor speed, fan speed and input ampere rating for each fan.

B. Submit two sets of test and balance reports to the Architect for approval.

C. Eliminate noise and vibration, and assure proper function of all controls, maintenance of temperature and operation in accordance with the approved design.

D. Secure required approval from governmental agencies having jurisdiction.

END OF SECTION

SECTION 15700

THERMAL INSULATION FOR MECHANICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Work included:

1. The work covered by this section of the specifications consists of furnishing all labor, materials, equipment and accessories necessary for the insulation for piping and air duct system. Insulation on new system connected to or modified are included. All insulation work is to be in strict accordance with this specification, applicable drawings and subject to the terms and conditions of the contract. Finishes of new insulation on existing systems shall match the adjacent finish.
2. Domestic water piping.

1.2 RELATED DOCUMENT

A. Drawings and general provisions of contract, including general and special conditions, apply to work specified in this section.

1.3 SUBMITTAL DATA

A. Submittal data for insulating work shall contain a comprehensive summary or listing of all surfaces and systems to be insulated with each item defining type of surface covering vapor barriers, joining methods, fitting insulation, finishes, clips and pipe protection devices. Also included with submittal shall be manufacturers' complete engineering data on each item or material to be used with recommended installation method for each.

1.4 FIRE SAFETY STANDARDS

A. All insulation shall have composite (insulation, jacket or facing, and adhesive used to adhere the facing or jacket to the insulation) fire and smoke hazard ratings as tested by procedure ASTM E-84, NFPA 255 and UL 723 not exceeding:

1. Flame Spread 25
2. Smoke Developed 50

B. Accessories, such as adhesives, mastics, cements, tapes and cloths for fittings shall have the same component ratings as listed above. All products or their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed above requirements. Any treatment of jackets or facings to impart flame and smoke safety shall be permanent. The use of water-soluble treatment is prohibited. The insulation contractor shall certify that all products used have met the above criteria.

1.5 THERMAL CONDUCTIVITY

A. Indicated insulation thickness is based on an average thermal conductivity not to exceed .28 BTU per inch thickness per square foot, per degree F. per hour at a mean temperature of 75 degrees.

1.6 FITTINGS, VAPOR SEALS AND ACCESSORIES

A. Insulation on all cold surfaces where vapor barrier jackets are used shall be applied with a continuous unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation. Vapor barrier shall be sealed at ends of insulation and cutoff seals shall be provided at approximately 20 feet intervals in the piping.

B. At all hanger support locations in piping system, install pipe protection thermal hanger shields of waterproofed calcium silicate insulation, the same thickness as the adjacent pipe insulation, cased 360 degrees by galvanized steel. Shields shall be a standard product of the manufacturer and shall be as manufactured by Pipe Shield, Inc. or equal.

C. A general-purpose vapor barrier jacket shall be used on all piping. Jacket shall consist of glass fiber reinforced heavy Kraft paper laminated to aluminum foil.

D. All fittings shall be insulated with fiberglass and vinyl fitting covers. The insulation shall be to a thickness equal to the adjacent pipe insulation on exposed piping. Fitting insulation shall be vapor proofed on chilled piping.

E. Adhesives, mastics and coating shall be Benjamin Foster of products of equal quality and performance as made by Chicago Mastic Company.

PART 2 PRODUCTS

2.1 INSULATION

A. Domestic Water Piping (Hot and Cold)
1. Hot and cold domestic water piping shall be insulated with 1" thick (for hot water) and 1/2" thick (for cold water) fiberglass similar to Owner Corning type 25 SFG with vapor barrier jacket where exposed and in plenum.

2.2 ACCEPTABLE MANUFACTURERS

A. Insulation products meeting requirements described, as manufactured by Johns-Manville, Owens-Corning, CSG, Armstrong, BEH, Knauf or Pittsburgh will be acceptable.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pipe Application
1. All insulation shall be installed in a workmanlike manner by skilled workmen regularly engaged in this type of work. The insulation shall be applied over clean dry pipe with all joints butted firmly together.
2. All insulation shall be continuous through wall and ceiling openings and sleeves.
3. Insulation shall not be installed on any pipe surfaces until those surfaces have been inspected and released for insulation application.

END OF SECTION

SECTION 15887

CARBON MONOXIDE EXHAUST SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Provide carbon monoxide system where shown on the Drawings, as specified herein complete in place, tested and approved, including but not necessarily limited to:
   1. Exhaust fans
   2. Ductwork and duct fittings
   3. Inlet fittings
   4. Accessories

B. Related work:
   1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's "Notice to Proceed" submit:
   1. Materials list of items proposed to be provided under this section;
   2. Manufactures literature and data indicating rated capacities, dimensions weights and pocket loading, accessories, electrical requirements and wiring diagrams.
   3. Manufactures recommended installation procedures, when approved by the Architect/Owner, will become the basis for accepting or rejecting actual installation procedures used on the work
   4. Operation data: Include instructions for fan lubrication, motor and drive replacement, and spare parts list

1.3 Quality Assurance

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this section.

B. Performance Ratings: Conform to AMCA 300

1.4 Delivery, Storage and Handling

A. Comply with the pertinent provisions of the Section 01620

PART 2 PRODUCTS

A. Acceptable Manufactures:
   1. The design criteria is based on the use of products manufactured by Car-Mon Products Inc., 1225 Davis Rd., Eligin, Il. 60123-1317 or approved equal.

B. Except as otherwise approved by the Architect/Owner, provided a complete Carbon Monoxide Exhaust System having the following equipment and accessories.
   1. Exhaust fan;
      a. Shall be single inlet, single width, arrangement 10 shall have backward inclined fan wheel with single thickness flat blades.

b. The fan wheel shall be statically balanced before assembly any required balance weight shall be welded to the outside of the shroud or back plate, no weights are to be installed in the blade air stream.

c. The bearings shall be of the pillow block type with cast steel frame and be bolted to the structural angle supports that form part of the fan base.

d. The scroll and side sheets of the fan housing and the spun inlet cone shall be fabricated of cold rolled steel of 12 gauge and shall be joined through continuous welding. The inlet cone shall be bolted to the housing using a minimum of 8 studs welded to the housing.

e. The fan base and inlet support shall be fabricated of 12 gauge cold rolled steel. Bearing supports shall be fabricated of cold rolled steel angle, 3/16" thick, welded to the side of the lease. All seams shall be continuous welded. The motor base shall be 10 ga. cold-rolled steel, and have adjustable positions. Apply caulking to mating surfaces of the inlet cone and the fan housing, and the fan housing and fan lease.

f. The V-Belt drive shall be the adjustable type, the variable pitch sheave shall be factory set at the position to provide the specified capacity. All drives for the fans having 1 HP and larger motors shall have 2 V-Belts all fans shall be provided with a belt guard, with tachometer hole, enclosing sheave and belts.

g. All surfaces of centrifugal having diameters of 22 1/4" and less shall receive a Heresite air dry phenolic resinous coating. Fans having larger diameter shall be similarly coated except all exterior surfaces which shall receive an air dry machinery coating.

h. Fans shall be tested to measure "total frequency" vibration at each bearing. Fans having an average reading over 3 mils deflection will not be accepted Furnish reports indicating compliance.

2. Ceiling Suspension Platform

a. Fan platform shall be of heavy duty all welded construction, using 1 ½” x 1 ½” x 3/16” angle iron for the suspension platform. The suspension platform shall incorporate a 3" x 4.1 lb. base channel for vibration rails and 4 holes for suspension rods. Car-Mon Products Inc. CSP/VR

3. Inlet Taper and Discharge Flexible Connection

a. Fans shall be equipped with flexible connectors on the incoming and outgoing sides of the fans. Car-Mon Products Inc. Use Fan Model 14 when providing 2 to 3 reels. Use Fan Model 25 when providing 4 reels.

4. Back Draft Damper

a. Furnish an automatic back draft damper of all aluminum construction. The blades shall be linked together to provide simultaneous movement and shall have nylon bearings and felt blade edge seals.

5. Flexible Tubing

a. 25' x 6" Drop flexible tubing shall be abrasion resistant constructed of fire retardant fabric, cured to resist exhaust temperatures up to 665 degrees F. The tubing shall have as external steel-spring wire reinforced spiral. Provide RCT-6 adapters.

6. Retractable Hose Reel

a. Provide at each exhaust tubing drop automatic retractable hose reel assembly, as furnished by the manufacturer. Car-Mon Products Inc. Model # TSR-S32.

2.2 OTHER MATERIAL

A. Provide other materials not specifically described but required for a complete and proper installation.

PART 3 EXECUTION

A. SURFACE CONDITIONS
1. Examine the areas and conditions under which the work of this Section will be performed correct conditions detrimental to timely and proper completion of the work. Do not proceed until conditions are corrected.

B. INSTALLATION
1. Coordinate as required with the other trades to assure proper and adequate provisions in the work of these trades for interface with the work of the Section.
2. Install work in this Section in strict accordance with the Drawings, pertinent requirements of governmental agencies having jurisdiction and the manufacturer's recommended installation procedures as approved by the Architect/Owner.
3. Upon completion of the installation, make all required arrangements, conduct all required test and make all required changes or corrections as needed.

END OF SECTION

SECTION 16100
ELECTRICAL WORK

16101 GENERAL

A. Requirements of the conditions of the contract and Instruction to Bidders, and General Conditions, apply to all work of this Section.

B. Provide complete electrical service where shown on the drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
   1. Panelboards as needed.
   2. Branch circuit wiring, in conduit for lighting, receptacles, junction boxes and motors.
   3. Hangers, anchors, sleeves, chases, supports, for fixtures and other electrical material and equipment in association therewith.
   4. Lighting fixtures and lamps.
   5. Wiring system, in conduit, for equipment and control provided under other Sections of these specifications.
   6. Other items and services required to complete the system.

C. Related Work
   1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these specifications

16102 FIELD CONDITIONS AND MEASUREMENTS

A. The Electrical Contractor shall visit the site of the work and familiarize himself with all available information concerning the structural, excavations, the location condition bearing on transportation, handling, and storage of materials. The Electrical Contractor shall make his own estimate of the facilities needed, and difficulties of execution of the contract including local conditions, availability of labor, uncertainties of weather, transportation, and other contingencies. Failure of the contractor to acquaint himself with all available information concerning these conditions will not relieve him from responsibility for estimating the difficulties and costs or successfully performing the complete work.

16103 CLEANUP

A. The Electrical Contractor shall have electrical rubbish and debris removed from the premises as directed. On completion of the electrical contract all associated debris and rubbish shall be removed from the premises.

B. All electrical equipment and materials furnished by this contractor shall be thoroughly cleaned and ready for use upon completion of the work.

16104 GUARANTEE

A. Contractor guarantees by his acceptance of the contract, that all work installed shall be free from any defects in workmanship and/or materials and that all apparatus will develop capacities and characteristics specified and that if, during a period of one year or as therefore specified, from substantial completion of work, any such defects in workmanship, materials or performance appear, he will with no cost to owner remedy such defect.

16105 CODES

A. All electrical work shall be done in strict accordance with the National Electrical Code and all regulations, laws and ordinances that may be applicable.

16106 SUBMITTALS

A. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Manufacturer's recommended installation procedures which, when approved by the owner/architect, will become the basis for accepting or rejecting actual installation procedures used on the work.

B. Submittals shall include the following:
   1. Panelboards
   2. Lighting fixtures
   3. Wiring devices
   4. Electric cord reels

C. Samples
   1. When so requested by the owner/architect, promptly provide samples of items scheduled to be exposed in the final structure.
   2. When specifically so requested by the Contractor and approved by the Architect, approved samples will be returned to the Contractor for installation on the work.

D. Manuals: Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the owner/architect two copies of an operation and maintenance manual. Include with each manual.
   1. Copy of the approved record documents for this portion of work.
   2. Copies of all circuit directories.
   3. Copies of all warranties and guarantees.

16107 QUALITY ASSURANCE

A. Use adequate number of skilled workmen who are thoroughly trained and experienced in the crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

B. Without additional cost to the owner, provide such other labor and materials as are required to complete the work of this section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these contract documents.

16108 CONDUIT

A. All interior wiring above grade shall be installed in electrical metallic tubing with screw coupling fittings.

B. All interior wiring below slab shall be Galvanized Rigid Steel conduit. Schedule 40 PVC conduits to be used in carwash and wash equipment room. If PVC is used the last two feet to point of emergence shall be Galvanized Rigid Steel conduit with grounding bushing and a grounding conductor sized according to ART. 250-95 of the National Electrical Code shall be installed.

C. Wiring in office areas shall be concealed, wiring in shop and storage areas shall be installed on surface.

D. All exterior wiring shall be in galvanized Rigid Steel Conduit.

E. Type MC cable with grounding conductor or type AC cable may be used for fixture whips.

16109 WIRE AND CABLE

A. Building wire and cable with 600 volt insulation shall be 98% conductivity copper unless otherwise noted. The minimum size conductor for lighting and power shall be No. 12 AWG. The minimum size conductor for control shall be No. 14 AWG.

B. Conductors sized No. 10 and smaller shall be Type "THHN" solid or stranded as required unless otherwise noted, sizes No. 8 and larger shall be type "THHN" stranded unless otherwise noted.

C. Conductors shall be colored coded as required by governmental agencies having jurisdiction or as required by the National Electrical Code.

D. Contractor shall provide and install all telephone and data cable and equipment as required by the project and per specifications sections 16930.

E. Contractor shall provide and install all of the grounding and grounding field as required by this project and per specification section 16931.

F. Tele/ data cables installed above accessible ceilings may be installed without conduit. Tele/data cables installed above non-accessible ceilings and on surface shall be in conduit. Open cables installed in space used for environmental air shall be rated for plenum use.

16110 JUNCTION AND OUTLET BOXES

A. Outlet Boxes
   1. Provide standard one-piece units, galvanized or sherardized steel of shape and size best suited to that particular location, of sufficient size to contain enclosed wires according to ART. 370-16 of the National Electrical Code.
   2. Provide outlet boxes 2 1/8" deep for 1" conduits.
   3. For lighting outlets, provide standard 4" octagon or square units with 3/8" fixture stud and box hanger where required.
   4. For switches and receptacles, provide standard boxes with plaster or dry wall ring with stainless steel cover plate for concealed devices and pressed steel boxed with galvanized or cadmium plated steel cover plates for exposed devices.

B. Junction or Pull Boxes
   1. Interior junction boxes shall be galvanized code-gauge sheet steel units with screw-on covers, of size and shape required to accommodate wires without crowding, and to suit the location.
   2. Exterior boxes shall meet NEMA 3R or 4 standards.

16111 LIGHTING FIXTURES

A. Install lighting fixtures, complete with lamps, as shown on drawings and schedules. Manufacturers shown on schedules are for quality and type only, manufacturers of equal quality will be accepted if approved by owner.
   1. Recessed fixtures:
      a. Provide unit having an attached pull box and with UL label.
      b. Provide local label in addition if so required by governmental agencies having jurisdiction..

2. Fluorescent fixtures
    a. Provide ballasts thermally protected against overheating by built-in thermal protectors sensitive to ballast winding temperature and current.
    b. Provide protector preventing winding temperature from exceeding 120 degrees C, allowing winding temperatures to reach 105 degrees C under normal operating conditions at 40 degrees C ambient and, after opening, not reclosing above 80 degrees C.
    c. Exterior ballast shall be cold weather type.
    d. Where fixture substitutes are proposed, submit a sample fixture with materials list required to be submitted under Art. 16106 above.
    e. Light fixtures in work areas shall be located so as not to interfere with the operation of overhead doors.

16112 WIRING DEVICES

A. Toggle switches - Mount 48" above finished floor. (Also see Construction Documents)
    1. Single pole Leviton 5521-I
    2. 3-way Leviton 5523-I

B. Receptacles - Mount 18" above Finished Floor in office area 48" above Finished Floor in garage and storage areas and above splashboard over counters.
    1. Duplex receptacles Leviton 5800-I
    2. Weatherproof duplex receptacles Leviton 6599-I mounted in FS box and 6196-VFS cover.
    3. Ground Fault Interrupter duplex receptacles Leviton 6599-I
    4. Isolated ground receptacles Leviton 5262-IG

C. Telephone and Computer Outlets shall be 4" x 4" x 1 1/2" outlet box with plaster ring. Install 3/4" EMT from box to just above accessible ceiling as required.

D. Outlets in finished walls shall be 4' x 4" x x1 1/2" outlet box with plaster ring and a cover plate.

E. Outlets on surface shall be 4" x 4" x 1 1/2" outlet box and 4" x 4" raised cover plate.

F. Devices of the following manufacturers will be accepted as equal.
    1. Hubbel
    2. Arrow-Hart
    3. General Electric

16113 PANELBOARDS

A. Panelboards shall be Sq. 'D' Type with circuit breakers as shown on drawings and schedules, and shall be Service Entrance Rated.

16114 TRANSFORMERS

A. Service Entrance Transformer as/if required. See Site Plan.

16115 DISCONNECT SWITCHES

A. Disconnect switches shall be Sq. 'D' Class 3130 General Duty fusible or non-fusible as shown on drawings. Interior switches shall be NEMA 1 and Exterior switches shall be NEMA 3R.

16116 GROUNDING

A. Install a 5/8" x 10' copper-clad ground rod at service entrance with a #6 bare copper conductor between ground rod and grounding bus in Panel board.
B. All grounding shall comply with Article 250 of the National Electrical Code.

16117 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation as approved by the Architect.

16118 EXECUTION

A. Surface Conditions
   1. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

16119 PREPARATION

A. Coordinate
   1. Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this section.
   2. Coordinate the installation of electrical items with the schedule for work of other trades to prevent unnecessary delays in the total work.

B. Data indicated on the drawings and in these specifications are as exact as could be secured but there absolute accuracy is not warranted. The exact locations, distances, levels and other conditions will be governed by actual construction and the drawings and specifications should be used only for guidance in such regard.

C. Verify all measurements at the building. No extra compensation will be allowed because of differences between work shown on the drawings and actual measurements at the site of construction.

D. Branch circuit wiring and arrangement of home runs have been designed for maximum economy consistent with adequate sizing for voltage drops and other considerations. Install the wiring and circuits arranged exactly as shown on the Drawings, except as otherwise approved in advance by the architect.

E. The electrical drawings are diagrammatic, but are required to be followed as closely as actual construction and work of other trades will permit. Where deviations are required to conform actual construction and the work of other trades, make such deviations without additional cost to the owner.

16120 TRENCHING AND BACKFILLING

A. Perform trenching and backfilling associated with the work of this section in strict accordance with the provisions of the appropriate sections of these specifications.

16121 INSTALLATION OF RACEWAYS AND FITTINGS

A. Where conduit is installed concealed in the walls or above the ceiling, or exposed in work areas, provide rigid galvanized conduit or electrical metallic tubing with screw type fittings.

B. Use flexible metal conduit only for short motor connections or where subject to vibration.

C. Provide necessary sleeves and chases where conduits pass through floors and walls, and provide other necessary openings and spaces, arranging for in proper time to prevent unnecessary cutting in connection with the work. Perform cutting and patching in accordance with the provisions for the original work.

D. Where conduit is exposed, run parallel to or at right angle with lines of the building.

E. Securely and rigidly support conduits throughout the work. Conduits and wiring above a ceiling assembly shall not be supported to, or supported by, the ceiling assembly, including the ceiling support wires.

16122 INSTALLATION OF CONDUCTORS

A. Unless otherwise shown use #12 type THHN conductors for all branch circuits protected by 20 amp circuit breakers. Where so indicated on the drawings, use larger wires to limit voltage drops.

B. Use identified (white) neutrals and color-coded phase wires for all branch circuit wiring.
   1. Make splices electrically and mechanically with pressure-type connectors.
      a. For wire size #6 AWG and smaller, provide "Scotch-Lock" connectors.
   2. Insulate splices with a minimum of two half-lapped layers of Scotch Brand #33 vinyl-plastic electrical tape where insulation is required.

C. Tape all joints with rubber tape 1 1/2 times the thickness of the conductor insulation, than cover with vinyl-plastic electrical tape specified above.

D. The drawings do not indicate the home runs. Continue all home runs to the panel as though the routes were shown completely.

16123 INSTALLATION OF PANELS

A. Install panels as shown on drawings and specifications or as directed by the owner/architect.

B. Mount a typewritten directory behind glass or plastic on the inside of each panel door and, on the directory, show the number and complete description of all outlets on each circuit.

16124 TESTING AND INSPECTION

A. Make required tests in the presence of the owners representative and required approvals from the owner/architect and governmental agencies having jurisdiction.

B. Make written notice to the owner/architect adequately in advance of each of the following stages of construction.
   1. In the underground condition prior to placing concrete floor slab, when all associated electrical is in place.
   2. When all rough in is complete, but not covered.
   3. At completion of the work of this section.

C. When material and/or workmanship is found to not comply with the specified requirements, within three days after receipt of notice of such non-compliance remove the non-complying items from the job site and replace them with items complying with the specified requirements, all at no additional cost to the owner.

D. In the owner/architect's presence:
   1 Test all parts of the electrical systems for phase to phase and phase to ground short circuits and prove that all such items provided under this section function electrically in the required manner.
   2. Immediately submit to the architect a report of maximum and minimum voltages and a copy of the recording voltmeter chart.
   3. Also measure voltages between phase wires and neutral and report these voltages to the Architect.

16125 PROJECT COMPLETION

A. Upon completion of the work of this section, thoroughly clean all exposed portions of the electrical installation, removing all traces of soil, labels, grease, oil, and other foreign material and using only the type cleaner recommended by the manufacturer of the item being cleaned.
B. Thoroughly indoctrinate the owner's operation and maintenance personnel in the contents of the operations and maintenance manual required and submitted under article 16106 of this section of these specifications.

END OF SECTION

SECTION 16930

TELECOMMUNICATIONS
(SPECIFICATIONS AND REQUIREMENTS)

All MODOT building shall conform to EIA/TIA Building Telecommunications These Wiring standards are as follow TIA\EIA – 568A, 569, 570, 606, 607, TSB72 and TSB75.

All MODOT Building shall be wired using the T586B wiring scheme.

The contractor shall provide all necessary equipments, materials and level 5E certification as required to complete and tune up the network system Ethernet.

All cable runs and equipment shall be certified and a full set of reports and prints submitted to the MODOT before acceptance of the building cable and wiring system.

All cable runs (Home Run) shall be duplex run of four pair twisted cable, 24 gauge, plenum rated. Each run shall include two cables; one telephone run level 5E, or level 3 (verify) and one data run level 5E with compatible dual modular phone RJ/45 and data RJ/45jacks and face plates installed in electric boxes and ¾" rigid conduit where required. All raceways and J hooks shall be installed as set forth in EIA/TIA Standard and N.E.C.

All telephone and data cable above accessible ceiling may be installed without conduit. All telephone and data cable installed above non-accessible ceiling and on surface shall be in conduit. All telephone and data cable installed in sheet rock wall shell be in conduit terminated with a suitable electrical box. All telephone and data cable in modular furniture shall be installed furniture raceway and terminated in non-metallic surface mount boxes.

The following is some of the requirements required for the building of a Cabling System, but is not necessarily limited to the following:

Phone jacks RJ/45 shall be in ivory color, data jacks RJ/45 shall be in Orange color, face plates, blank face plates and non-metallic surface mount boxes shall be in ivory color.

Level 5E patch cord for all connections, and labeling for all cable, faceplates (D1 = Data, V1 = =Voice) and level 5E patch panels.

Relay rack, shall be 19" X 7'and clear aluminum, with vertical wire management 6" X 7' clear aluminum and relay rack installation kit.

Telephone blocks, (1) use 25 pair punch down block, type 66ml,for level 3 (2) use 100 pairs, 110 connecting block, for level 5E. All patch panels shall be level 5E, 48 ports as required per building.

Wall mount Relay Rack 7' x 19", with:
- Vertical Organizers.
- Horizontal Combination Organizers.
- 48 Port Patch Panel.

END OF SECTION

SECTION 16931

GROUNDING AND GROUND FIELD
(SPECIFICATIONS AND REQUIREMENTS)

Requirements for MoDOT Project Office shall follow the TIA/EIA - 607 Commercial Building Grounding Requirements for Telecommunications.

This building will require a separate telecommunications ground system. The requirements for this ground system is (15 ohms to ground or less), and shall be tested and certified at time of installations.

This system will consist of the following:

A. A (TMGB) Telecommunications Main Ground Busbar (Erico grounding bar kit p/n b544a017 or equivalent). This Grounding Busbar shall be located in the telecommunication room and serves as the dedicated extension of the building grounding electrode system for telecommunications only.

B. A Number four Green Insulated stranded copper cable run from the (TMGB) in the telecommunication room to the new grounding electrode system located outside the building.

C. The grounding electrode system shall consist of all specifications found in the IEEE Green and Emerald Books. Their shall be a minimum of (4) or (as many as needed) copper electrodes (5/8" x 8') spaced 8' apart, connected with number four bare copper cable as needed to achieve 15 ohms to ground or less.

D. All connectors and splices shall be of copper compression type and meet the specifications of the Standard IEEE 837 latest revision and the specifications of the NEC code, section 250-81 and 250-91.

E. There shall be no other grounding electrode system connected to this Telecommunication room grounding electrode system except by a number six stranded green copper cable connected to the Building (TMGB) Main Grounding Bar or system.

REV. on 12-22-03

END OF SECTION

New St. Clair Buildings "A" and "E" Door Hardware Schedules

Building "A" Maintenance																	
Door Number(s) Mandoors only	1	2	3	4	5	6	7	8	10	11	12	13	21	22	25	26	Totals
Hinges - Stanley - FBB179 - 41/2 X 4 1/2 US26D NRP	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	1.5	1.5	0.0	0.0	6.0
Hinges - Stanley - F179- 41/2 X 4 1/2 US26D	0.0	1.5	1.5	0.0	1.5	1.5	1.5	0.0	0.0	1.5	0.0	0.0	0.0	0.0	1.5	0.0	10.5
Hinges - Stanley - FBB179 - 41/2 X 4 1/2 US26D	0.0	0.0	0.0	1.5	0.0	0.0	0.0	1.5	1.5	0.0	0.0	1.5	0.0	0.0	0.0	1.5	7.5
Panic Device - Monarch #18R-LE-626 x Width	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panic Device - Von Duprin 99 x Width	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	3
Closure - Dorma - # 7601	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	1	4
Closure with positive stop - Dorma # 7601DS	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	5
Floor stop - Rockwood # 461	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2
Wall Stop - Rockwood # 409	0	1	1	1	1	0	0	1	1	1	0	0	0	0	0	1	8
Kick Down Stop - Glynn Johnson # 1153M	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	6
Kick Plate 8" x DW-2" - Rockwood	1	1	0	1	1	0	0	1	1	1	1	1	1	1	1	1	13
Weather striping - Pempko # 305CN x W x H	1	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	5
Sweep - Pempko # 18062 x width	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	4
Threshold - Pempko # 2005A x width (ADA w/ seal at base)	1	0	0	1	0	0	0	0	0	0	1	0	1	1	1	1	7
Coordinator - Rockwood # 1672 x 1601 AB or (576 & 570)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flush Bolts - Rockwood # 555 x 626	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Push Plate - Rockwood # 70C x US32D	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2
Pull Plate - Rockwood # 122 x 70C x 626	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2
Top Filler Plate (Exterior Doors)	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	3
Closure Door Reinforcements	1	0	0	0	0	0	0	1	1	0	1	0	1	0	0	0	5
Truss Head Architectural Bolts to reinforce door closure	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4
Fiderglass door	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
(Best Locks - No Substitution)																	
Store Room Function 93K	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	3
Office Function 93K	0	1	1	1	1	0	0	0	0	1	0	0	0	0	0	1	6
Dead Bolt T-series key/key	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Entry Rim Cylinder	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	3
Classroom Function 93K	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bathroom Function 93K	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2

Building "E" Cold Storage		
Door Number(s) Mandoors only	1	Totals
Hinges - Stanley - FBB179 - 41/2 X 4 1/2 US26D NRP	1.5	1.5
Hinges - Stanley - F179- 41/2 X 4 1/2 US26D	0.0	0.0
Hinges - Stanley - FBB179 - 41/2 X 4 1/2 US26D	0.0	0.0
Panic Device - Monarch #18R-LE-626 x Width	0	0
Panic Device - Von Duprin 99 x Width	1	1
Closure - Dorma - # 7601	0	0
Closure with positive stop - Dorma # 7601DS	0	0
Floor stop - Rockwood # 461	0	0
Wall Stop - Rockwood # 409	0	0
Kick Down Stop - Glynn Johnson # 1153M	0	0
Kick Plate 8" x DW-2" - Rockwood	1	1
Weather striping - Pempko # 305CN x W x H	1	1
Sweep - Pempko # 18062 x width	0	0
Threshold - Pempko # 2005A x width or as needed for seal	1	1
Coordinator - Rockwood # 1672 x 1601 AB or (576 & 570)	0	0
Flush Bolts - Rockwood # 555 x 626	0	0
Push Plate - Rockwood # 70C x US32D	0	0
Pull Plate - Rockwood # 122 x 70C x 626	0	0
Top Filler Plate (Exterior Doors)	1	1
Closure Door Reinforcements	1	1
(Best Locks - No Substitution)		
Store Room Function 93K	0	0
Office Function 93K	0	0
Dead Bolt T-series key/key	1	1
Entry Rim Cylinder	0	0
Classroom Function 93K	0	0
Bathroom Function 93K	0	0

LIMITING CONDITIONS FOR SUBSURFACE LOGS

Project: New St. Clair Maintenance Facility

Route:

Attachment for the Following Pages Numbered Consecutively 1 through 3.

The attached borings logs and other factual subsurface information obtained for the design of this project are made available to bidders so that all have access to identical subsurface information available to the Commission and are not intended as a substitute for personal investigation, interpretations, and judgment of the bidders.

This information was obtained by the Missouri Highway and Transportation Commission for its use only for design purposes and for estimation of quantities for the purpose of bid comparison, and *not* to determine actual subsurface conditions, the actual quantities of subsurface materials, or the appropriate construction methods. The Commission makes *no* representation as to the accuracy of the logs or other subsurface information, since the accuracy is limited by the equipment used and the personal judgment of the persons making the investigation, and the logs indicate conditions encountered only at the times and the specific locations shown. Ground water observations are *not* routinely recorded in all borings logs and the absence of such data does *not* mean that no ground water will be encountered. The furnishing of this information is *not* to be considered as a representation of actual conditions to be encountered during construction and does *not* relieve a bidder from the responsibility of making his own investigation of conditions to be encountered and basing his bid on information obtained from his own investigation. Any assumptions which a bidder may make from this data, the bidder makes at his own risk; none are intended by the Commission.

Certain types of documents relating to subsurface investigations are *not* included in this packet. These include correspondence and reports containing interpretations, opinions, and recommendations which may or may not be factual, accurate or consistent with design decisions. Individual test reports are not included where the results are otherwise summarized and made available in tabular form in one of the enclosed documents. However, any or all of that information not included in this packet, or any other subsurface information in the possession of the Commission, for this or any adjacent project, may be inspected upon specific request at the materials office in the district where the work is to be performed. Except, however, test reports for undisturbed foundation samples and certain other specialized tests are not routinely kept in the district; these may be available for inspection upon request only at the Commission's central laboratory in Jefferson City. The bidder is cautioned that any and all such interpretations, conclusions and recommendations are *not* represented or warranted to be accurate or reliable, and the Commission *cannot* be bound by them, whether or not it may appear to have "relied" on them. These subjective findings have *not* been confirmed or shown to be reliable, and the bidder assumes the sole risk of liability or loss if the bidder does rely on these documentary interpretations and conclusions to its detriment, delay or loss.

The bidder assumes all risks it may encounter in basing its order of work, equipment or personnel determinations, time of performance, cost of performance, working days needed, item bid prices, or any other element of the work, on the attached documents or any other documentation, not expressly warranted, which the bidder obtains from the commission.

For your guidance in understanding the limited subsurface data obtained by and documents prepared for the Commission, the attached sheet labeled "General Notes Regarding Subsurface Logs and Test Data" explains the procedures and test methods used by MODOT.

GENERAL NOTES REGARDING SUBSURFACE LOGS AND TEST DATA

Subsurface investigations by the Missouri Department of Transportation Department (MoDOT) are performed generally in accordance with procedures and test methods listed in AASHTO R13, "Conducting Geotechnical Subsurface Investigations." However, not all of the methods listed in R13 are used and, in addition to the sampling methods listed, MoDOT also utilizes the Giddings slotted-tube sampler for some preliminary geotechnical report samples and makes occasional use of a non-standard penetration test as described in (14) below. Test data reported in summary form in various reports may include the following which are performed in accordance with the indicated test methods with significant exceptions, additions, and abbreviations as noted:

(1) ASTM soil classification - ASTM D 2487
(2) AASHTO soil classification (group and index) - AASHTO M145 except that the index reported is computed by methods of AASHO M145-49
(3) Maximum Density (M.D.) and Optimum Moisture (O.M.) - AASHTO T99, Method C.
(4) Natural Moisture Content - (Wn) - AASHTO T265.
(5) Liquid Limit (LL) - AASHTO T89
(6) Plastic Index (PI) - AASHTO T90.
(7) Particle size analysis - AASHTO T88 except that percentages of clay or silt, if determined prior to 1972, may be based upon particle size definitions now obsolete.
(8) Unconfined compressive strength of soil (Qu) - AASHTO T208
Unconfined compressive strength of rock (Qu) - ASTM D2938
(9) Triaxial shear strength parameters (phi, angle of internal friction; and c, cohesion) - AASHTO T 236.
(10) Direct shear strength parameters (phi, angle of internal friction; and c, cohesion) - AASHTO T236
(11) One-dimensional consolidation characteristics - AASHTO T216. Data is reported using the following symbols:
(C_c) Compression index
(C_v) Coefficient of Consolidation
(P_1) In-situ pressure calculated to exist at the location, depth, and time sampled.
(e_1) Void ratio corresponding to P_1.
(P_2 & e_2) Pressure and void ratio calculated for an assumed loading condition.
(P_c & e_c) Estimated preconsolidation pressure and corresponding void ratio.
(12) Pocket Penetrometer (P.P.) and Torvane (Tv.) tests are non-standard tests made using small hand held devices marketed by Soiltest, Inc. or other suppliers.
(13) Standard penetration test - AASHTO T206.
(14) 100-blow penetration test - non-standard test using equipment of AASHTO T206. Inches penetration per 100 blows are reported. Estimated equivalent unconfined compressive strengths, if reported, are based upon correlations by MoDOT and others.

M-42
(Rev. 10/00)

MISSOURI DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND MATERIALS
Subsurface Log for Preliminary Geotechnical Report

County: Franklin Route: New St. Clair Maintenance Facility Job No.:

Logged by: R. Lauer Date Work Performed: 7/13-14/09

LOCATION	LOG OF MATERIALS	CLASSIFIED BY
A1-offset 4' SE of proposed corner El. 213.27	0-4.1' Light brown lean clay. 4.1-10.0' Red-brown fat clay w/scattered rock fragments. 10.0-10.6' Weathered sandstone and sandy dolomite, harder @ 10.4'	Mobile B-31 w/3" augers
A2 El. 211.07	0-2.6' Gray-brown lean clay w/scattered rock fragments. 2.6-6.8' Red-brown and gray fat clay w/scattered rock fragments. 6.8-7.2' Red clay and heavy cobbles. 7.2-9.5' Weathered sandstone and clay. 9.5-9.6' Sandy or cherty dolomite, cuts w/difficulty, possibly boulder.	"
A3 El. 213.19	0-2.5' Gravel and gray-brown clay. 2.5-3.9' Heavy chert gravel and red-brown clay. 3.9-10.3' Red-brown fat clay w/scattered rock fragments, stiff.	"
A4 El. 214.65	0-4.0' Gray-brown lean clay. 4.0-7.1' Brown fat cherty clay. 7.1-10.5' Red-brown and gray fat clay w/scattered rock fragments.	"
A5 (Middle) El. 213.69	0-2.5' Gray-brown lean clay. 2.5-10.6' Red-brown fat clay w/varying admixed rock fragments, stiff.	"
B2 El. 206.96	0-2.9' Tan-brown clay. 2.9-10.4' Red-brown fat clay w/varying admixed rock fragments.	"

M-42
(Rev. 10/00)

MISSOURI DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND MATERIALS
Subsurface Log for Preliminary Geotechnical Report

County: Franklin **Route:** New St. Clair Maintenance Facility **Job No.:**

Logged by: R. Lauer **Date Work Performed:** July 13-14, 09

LOCATION	LOG OF MATERIALS	CLASSIFIED BY
B Middle (3'south and 46'west of existing inside bldg. corner) El. 210.0	0-3.0' Brown-gray lean clay. 3.0-10.2' Red-brown fat clay w/varying admixed rock fragments.	Mobile B-31 w/3" augers
B3 El. 207.03	0-0.2' Loose asphalt. 0.2-4.9' Gray-brown lean clay. 4.9-10.2' Red-brown fat clay w/scattered rock fragments.	"
C1 El. 208.17	0-5.0' Gravel and red-brown clay, dry. 5.0-10.5' Yellow-brown, red-brown, and gray fat clay w/scattered rock fragments.	"
C2 El. 206.66	0-0.4' Gravel and soft deteriorated asphalt chunks. 0.4-3.6' Yellow-brown fat clay. 3.6-10.4' Red-brown clay w/varying admixed rock fragments.	"
C3 El. 210.69	0-5.0' Brown-gray lean clay. 5.0-10.4' Brown-gray clay w/scattered rock fragments, stiff.	"
C4 El. 211.76	0-5.2' Brown-gray lean clay, moist. 5.2-8.9' Red-brown and gray fat clay. 8.9-9.0' Dolomitic limestone, very hard, cuts w/difficulty.	"
C5 (Middle) El. 211.96	0-5.9' Brown, yellow-tan and gray lean clay. 5.9-10.4' Red and gray fat clay w/scattered rock fragments.	"

M-42
(Rev. 10/00)

MISSOURI DEPARTMENT OF TRANSPORTATION
CONSTRUCTION AND MATERIALS
Subsurface Log for Preliminary Geotechnical Report

County: Franklin **Route:** New St. Clair Maintenance Facility **Job No.:**

Logged by: R. Lauer **Date Work Performed:** 7/13-14/09

LOCATION	LOG OF MATERIALS	CLASSIFIED BY
E1 198.69	0-0.25' Asphalt pavement. 0.25-4.5' Yellow-brown and gray fat clay. 4.5-8.0' Weathered sandstone and clay, cuts easily. 8.0-8.7' Sandstone and sandy dolomite, cuts w/difficulty.	Mobile B-31 w/3" augers
E2 El. 198.74	0-0.2' Asphalt pavement. 0.2-0.8' Red-brown clay and scattered gravel. 0.8-2.4' Slag granular fill. 2.4-6.1' Gray-brown fat clay, stiff. 6.1-6.7' Red-brown and gray fat clay w/scattered rock fragments, v. stiff. 6.7-7.4' Sandstone, cuts w/difficulty.	Mobile B-31 w/4" augers
E3 El. 198.67	0-0.25' Asphalt pavement. 0.25-4.0' Red-brown fat clay w/scattered rock fragments. 4.0-7.8' Yellow-brown and gray fat gravelly clay, stiff. 7.8-8.0' Weathered sandstone and clay. 8.0-9.3' Sandstone, orange-brown, moderately hard, cuts w/difficulty.	Mobile B-31 w/4" augers
E4 El. 198.74	0-0.3' Asphalt pavement. 0.3-2.8' Gravelly sandy clay fill. 2.8-8.6' Red and yellow-brown fat clay w/scattered rock fragments. 8.6-10.0' Sandstone, tan-brown, cuts w/mod. difficulty.	Mobile B-31 w/3" augers

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

DATE	DESCRIPTION

DATE PREPARED	07/02/2009
ROUTE	STATE MO
DISTRICT	SHEET NO.
COUNTY	
JOB NO.	
CONTRACT ID.	
PROJECT NO.	
BRIDGE NO.	

"THIS MEDIA SHOULD NOT BE CONSIDERED A CERTIFIED DOCUMENT."

INSTALLATION
OPERATION
MAINTENANCE
MANUAL
DRAINBACK

YOUR DEALER:
G2Power Technologies, llc
105 Sunset Dr.
St. Louis, MO 63042-2109
sales@g2power.com
314.839.1609

INTRODUCTION

"Conservation for today... Energy for tomorrow..."

Alternate Energy Technologies, LLC., (AET) would like to extend our congratulations on your purchase of the Drainback System. Years of research and development, backed by critical engineering, has brought you the finest solar products you can buy. Please take time to read this booklet thoroughly. Each step is outlined completely and clarified by diagrams where necessary.

> "The solar energy system described in this manual, when properly installed and maintained, meets the minimum standards established by the SRCC. This certification does not imply endorsement or warranty of this product by SRCC."

The Drainback has been designed to be a complete solar appliance that incorporates ease of installation and maximum efficiency for years of trouble-free service. The Drainback system uses the sun's energy to heat your water, reducing your electricity consumption. The Drainback will pay for itself many times over the life of the system. All installations require a connection to your home water system. Only a qualified person or someone thoroughly familiar with standard plumbing and electrical practices should do the installation. If you have questions on the proper methods to make these connections, consult a qualified plumber or solar contractor for prescribed methods in your area. In most cases your installing solar contractor is familiar with the codes and their application. The codes are intended to protect the health, safety, and welfare of the public.

The system collects heat by circulating water between the reservoir, collectors and a heat exchanger wrapped around the base of the storage tank. Since only thermally efficient pure water is used, maximum safety and performance is assured. The Drainback system is ideally suited to cold regions with many freezing days each year or areas with aggressive water conditions. Freeze protection is provided by draining the collector loop liquid back into the drainback reservoir when the system is not operating. The simplicity of the drainback method provides reliable operation that makes this system an asset to any home located in the colder climes.

YOUR DRAINBACK SYSTEM

Your Drainback system consists of a collector array, a drainback reservoir, a storage tank with an integrated heat exchanger, circulation pump and a system controller, pre-engineered system.

COMPONENT	MODEL #
SYSTEM NUMBERS:	DB-80-40, DB-80-52, DB-80-64, DB-80-80, DB-120-64, DB-120-80, DB-120-96
COLLECTOR(S):	MSC or AE Series collectors
CONTROLLER:	Eagle 1 or GL30 (controllers include sensors)
PUMPS:	009F5 or UP15-100F (pumps include mounting flanges)
TANK:	Solar HE or EagleSun Contender (tanks include T&P relief valve)
DRAINBACK RESERVOIR:	DB-10SS, DB-15SS (reservoirs are sight glass equipped)
PRESSURE RELIEF VALVE:	P1000A
DRAIN VALVE:	BD Series
ANTI-SCALD VALVE:	AM101C or 34A-104-1
THERMOMETER(S):	T-120

Job site conditions will require the installation contractor to supply some, or all of the following:

- plumbing connections
- piping and insulation
- valves between your own water system and the Drainback solar system

INSTALLATION INSTRUCTIONS

PRE-INSTALLATION CHECKLIST

Unlike other types of solar collectors, the AET solar collectors do not add a significant amount of weight to the roof. However, if the collectors are placed at a steeper pitch than the roof itself, the additional exposed flat surfaces could present extreme wind loading forces during sustained high winds. Check local codes for roof load requirements. The mounting hardware supplied with your Drainback system has been designed for specific wind loads, but only if adequate support structure is present with sufficiently strong structural members (such as engineered trusses). Most building permit offices may be able to help you with recommended roofing practices for your area.

Obtain all applicable permits. Structural members penetrated by the solar system components must meet local codes. The installer is to run the piping in such a way that the performance of any fire rated assembly is not reduced. This applies to the collector mounting as well as the installation of any other system components.

Inspect the roof. If it is in poor condition, it is advisable to replace all or part of the roof where the system will be attached.

Locate a roof area facing as close to due south as possible for the placement of the solar collectors. The plumbing runs must be planned in advance so that the shortest possible route between the storage tank and collector is made. Make sure you have no low points in the sloped horizontal pipe runs. This could trap water and in freezing weather cause the pipe to rupture.

Make sure you have all the necessary plumbing materials, tools, and accessories before beginning work.

Wear gloves when handling the solar collectors! They get extremely hot when left exposed to the sun. The bright orange plastic caps should be removed prior to placing the collectors on the roof otherwise they may get so hot that they melt in place. Also, never try to lift the collectors by the pipe nipples. These bend when hot and would damage the collector. You should have a tarp handy to keep the collectors covered during the entire installation process. This will prevent the collectors becoming too hot to handle as you make your final adjustments and connections.

Use only lead-free solder. Use of 50/50 lead solder is expressly prohibited. Use of galvanized steel, CPVC, PVC, or any other type of plastic pipe is prohibited.

BASIC TOOLS AND MATERIALS

Electric Drill
Drill Index (w/ ½" and ¾" Wood Bits)
Hack Saw
Tubing Cutter
Tin Snips
16' Tape Measure
24" Level
Flashlight
Extension Cord
Slip Joint Pliers
Needle Nose Pliers
Pipe Wretches, 10" & 14"
Open End Wrenches, 9/16 & 7/16
Screw Driver 6" Flat Blade
Screw Driver 6" Philips
Wire Stripper or Knife
Wire Cutters
Adjustable Wrenches 8"& 10

Torch and Striker
Putty Knife
High Temperature Pipe Joint Compound
Wire Nuts or Connectors
Miscellaneous Copper Pipe & Fittings (3/4")
Solder Flux
Emory Paper
Silicon Caulk and Roof Tar
½" I.D. and ¾" I.D. Type M Copper Tubing
5/8" x ½" wall & 7/8" x ½" wall Armaflex or Rubatex Insulation
Angle Iron
Threaded Rod, Nuts, & Washers
Stainless Screw Clamps
Thermal Adhesive
Aluminum Flashing Sheet
Black Latex Outdoor Paint

INSTALLATION

The Drainback storage tank module is as easy to install as any normal electric hot water heater. Any experienced plumber or solar contractor may accomplish this installation. In addition to the normal cold water in, and hot water out connections, there are only two other connections required.

Dielectric nipples must be used on all connections to the tank. These are used wherever copper and galvanized lines are connected together. This is a requirement of the Uniform Plumbing Code. Typically, galvanized pipe nipples are used for all connections into the tank, which has ferrous female standard pipe thread, 3/4" nominal (3/4" inside diameter). One side of a dielectric union fits a standard galvanized pipe nipple, and the other side is brass or bronze for soldering to a copper pipe.

With solar tanks, the cold input from the pressurized supply line to the house (either city water or well water) must be fed into the tank inlet. This is marked "Cold Inlet" and is located on top of the tank. There is a long plastic tube attached internally to this connection so that incoming cold water is directed immediately to the bottom of the tank, and therefore does not mix and cool down the hot water. A cold-water shutoff valve must be installed above this connection so that water flow may be completely stopped in the event of a leak, repair, or maintenance.

The hot water output to the house from the tank should be connected to the port labeled "Hot Outlet" on the top of the tank. Again, a dielectric union must be used where a connection is made between galvanized and copper pipes. A mixing valve may be installed at this point to limit the temperature of water delivered to the home.

All hot water lines should be insulated with at least 1/2" thick heat resistant rubber tubing insulation such as Armstrong Armaflex.

In most instances, the solar collectors can be attached to the roof using the standard mounting hardware provided with the Drainback system. Certain types of roofing will require special attention for proper mounting. For example, a clay tile or cement tile roof. Complete roofing attachment methods of solar collectors for these various types of roofs are beyond the scope of this manual. The manual will describe and illustrate some of these approved mounting techniques. A competent contractor should be used to ensure that all roof penetrations and attachment points are not a source of rainwater leakage later on. Standard plumbing roof jacks or solar industry copper flashings may be used for plumbing penetrations in most cases.

The collectors should be canted toward the inlet side to ensure they drain completely when the pump is not running.

> CAUTION!
> Solar collectors become very hot when in direct sunlight with no fluid being circulated through them. Extreme caution should be taken when standing near, or handling solar collectors in this state. The circulating pump becomes very hot when running. Do not touch before allowing sufficient time to cool down.

COLLECTOR LOCATION

The collectors should be located on a south-facing roof, with the collector facing as close to south as possible. The collector should not be shaded from the sun, trees, or other obstructions. It is strongly recommended that the collector be mounted in the portrait orientation with its longest side traveling directly up the roof if possible.

The Collector should be mounted at an elevation angle above the horizontal equal to your latitude plus 10°. The procedures for determining this angle at your location are explained below.

Proper location and orientation of the solar collectors is important for maximum system efficiency. The collectors should be unshaded for the middle six hours of the day in each month of the year and should be located as close to the storage tank as possible to minimize heat loss in the piping runs. The best orientation is achieved when the collectors are facing due south and tilted at an angle from the horizontal of latitude + 10°. The figure below shows many alternatives for collector mounting. When roof mounting, place the collectors as close as possible to the peak of the roof. This will make installation easier due to increased attic access.

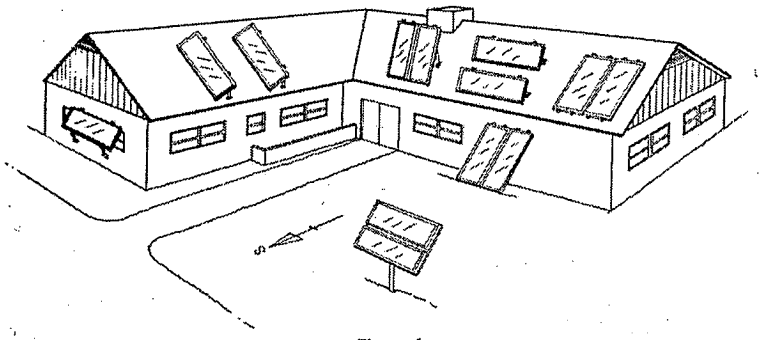


Figure 1

COLLECTOR ORIENTATION

Proper tilt angle for solar collectors is latitude plus 10°. This favors the winter sun because ambient temperatures are lower during the winter and collector efficiency suffers. This 10° additional tilt equalizes year round performance. Spacing can be determined from Table 1 below.

When collectors are mounted one behind the other, they are spaced apart so that in the morning and afternoon on December 21, when the sun is at its lowest altitude, the collectors will not shade each other and cause efficiency loss.

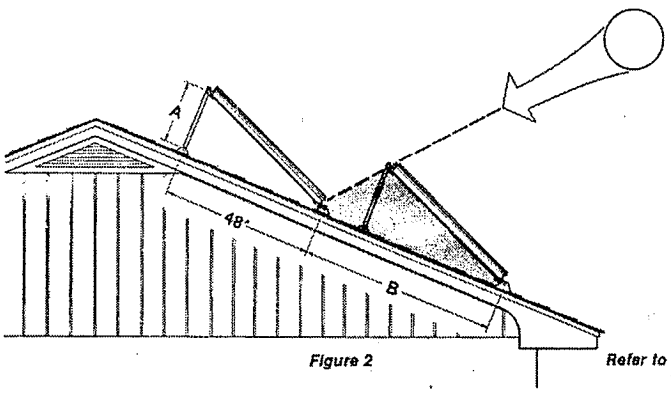


Figure 2 Refer to Table 1

LATITUDE		25° N		30° N		35° N		40° N		45° N		50° N	
COLLECTOR TILT		35°		40°		45°		50°		55°		60°	
		A	B	A	B	A	B	A	B	A	B	A	B
	FLAT	29	96	33	113	37	145	41	145	44	145	48	145
	5° 1/12	25	83	29	93	33	113	37	132	41	133	44	141
	9° 2/12	22	74	26	82	30	77	34	110	38	115	41	118
	14° 3/12	17	66	22	72	26	82	30	92	34	95	38	98
	18° 4/12	14	61	18	66	22	74	26	81	30	85	34	87
	23° 5/12	10	58	14	60	18	66	22	72	26	74	30	77
ROOF	27° 6/12	7	58	11	58	15	61	19	66	23	68	27	70
PITCH	30° 7/12	4	58	8	58	13	58	17	58	21	58	25	58
	34° 8/12	0	58	5	58	9	58	13	58	17	58	22	58
	37° 9/12	-2	58	3	58	7	58	11	58	15	58	19	58
	40° 10/12	-4	58	0	58	4	58	8	58	13	58	17	58
	43° 11/12	-7	58	-3	58	-2	58	6	58	10	58	14	58
	45° 12/12	-8	58	-4	58	0	58	4	58	8	58	13	58
	VERTICAL	-44		-41		-37		-33		-29		-25	

Table: All Lengths in inches

MOUNTING HARDWARE

The system package includes a specially designed mounting hardware, to speed collector installation. This hardware consists of four hinge sets, four roof brackets, two rear struts, and bolts.

a) After locating the mounting points from Table 1, the mounting bracket holes should be drilled.
b) A heavy coating of sealant should be applied to the bottom of the flashing plate, which should fit flat against the roof. It is necessary for the plate to slide under the above shingles to insure proper drainage of water.
c) The bottom of the roof bracket and the area around the threaded rod should also be thoroughly coated with tar sealant. When the bracket is set in place, alignment with the collector hinges is necessary before final tightening of the nuts. This should be completed before the sealant has time to set.
d) The threaded rod is fastened through a 2' x 6" wood or 2" x 2" x ¼" steel angle bracket under the roof as shown.

The rear struts should be cut and drilled to conform to Table 1. All bolts should be tightened securely. A stainless steel washer should be placed where the threaded rod passes through the aluminum bracket.
It is very important that the penetrations through the roof be well sealed. It should be carefully checked that all bolts are coated with tar and that no leaks are possible.

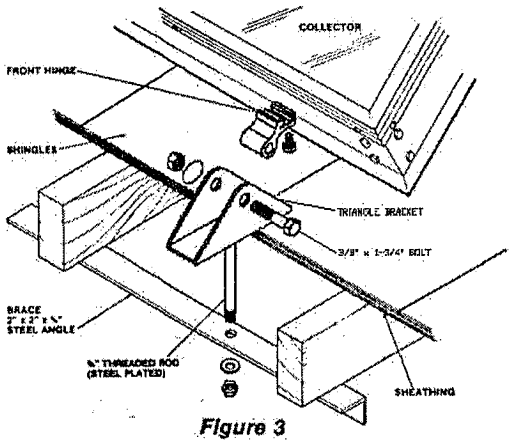


Figure 3

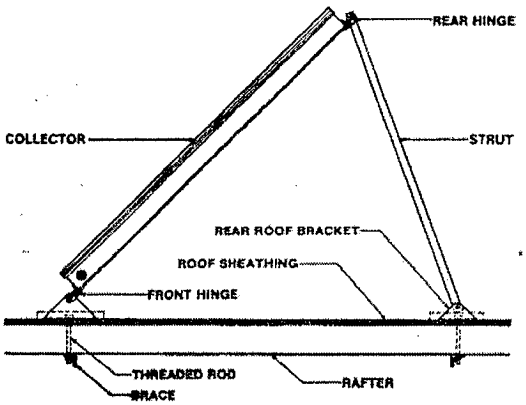
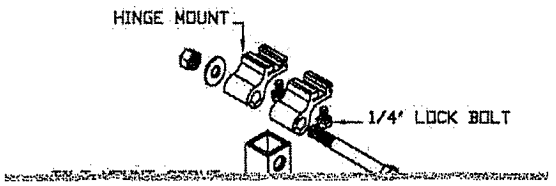


Figure 4



AE-Series			Center Line to Center Line (in.)		
Model	Size (ft)	Outside Box Dim. (in.)	AE-MH	AE-FM	AE-RM
AE-21	3 x 7	35.1875 x 85.1875	88.4375	88.9375	86.9375
AE-24	3 x 8	35.1875 x 97.1875	100.4375	100.9375	98.9375
AE-26	4 x 6.5	47.1875 x 77.1875	80.4375	80.9375	78.9375
AE-28	4 x 7	47.1875 x 85.1875	88.4375	88.9375	86.9375
AE-32	4 x 8	47.1875 x 97.1875	100.4375	100.9375	98.9375
AE-40	4 x 10	47.1875 x 121.1875	124.4375	124.9375	122.9375
MSC-Series			Center Line to Center Line (in.)		
Model	Size (ft)	Outside Box Dim. (in.)	MSC-MH	MSC-FRM	MSC-FM
MSC-21	3 x 7	35.8750 x 86.1250	90.5	87.375	37.125
MSC-24	3 x 8	35.8750 x 98.1250	102.5	99.375	37.125
MSC-26	4 x 6.5	47.8750 x 78.1250	82.5	79.375	49.125
MSC-28	4 x 7	47.8750 x 86.1250	90.5	87.375	49.125
MSC-32	4 x 8	47.8750 x 98.1250	102.5	99.375	49.125
MSC-40	4 x 10	47.8750 x 122.1250	126.5	123.375	49.125
ST-32	4 x 8	46.125 x 96.125	-	97.75	-

Table: Distance between centerlines of top and bottom mounts for all AE, MSC, ST series

MOUNTING THE COLLECTORS ON THE ROOF

For flush roof mount installation, AE-FM brackets are attached to the bottom of the collector and secured directly to the roof.

1. The 4 x AE-FM mounting brackets should be attached to the collector frame using the 1/4" lock-bolt on the bracket underside. Two brackets should be used at each end, at 6 to 12 inches from the corner of the collector. The 1/4" lock-bolt should be tightened snugly against the collector frame bottom.

2. The AE-FM are now attached directly to the roof with 3/8" SS mounting bolts (not supplied) extending all the way through the roof trusses or 3/8" lag bolts (not supplied) drilled directly into the roof trusses as shown. Thoroughly check the tightness of all bolts and screws.

STANDARD MOUNT (AE-MH)

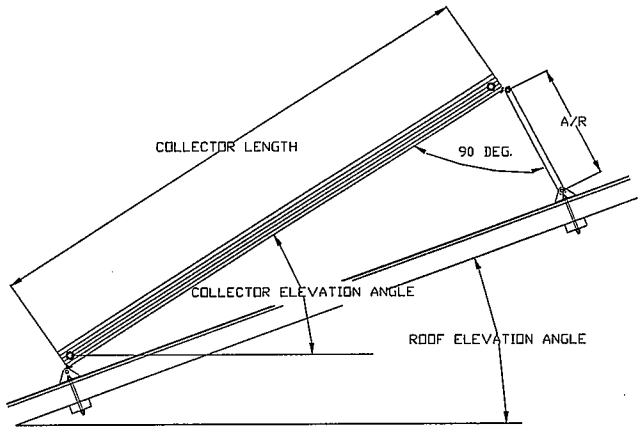
The AE-MH hardware kit allows the greatest flexibility in collector elevation angle when mounting the collectors on tilt or flat roofs.

1. The 4 x AE-Clips should be attached to the collector frame uses the 1/4" lock-bolt on the bracket underside. Two brackets should be used at each end, at 6 to 12 inches from the corner of the collector. The l/4" lock-bolt should be tightened snugly against the collector frame bottom.

2. The two front AE-Clips are attached to the two front Tilt Mount Triangle Roof Mounting Brackets, with two 3/8" x 1-3/4" SS bolts.

3. The two front Tilt Mount Triangle Roof Brackets are now attached to the roof with two 3/8" SS mounting bolts (not supplied) extending through the roof trusses, or two 3/8" lag bolts (not supplied) drilled directly into the roof trusses.

4. The two rear AE-Clips are attached to the rear Tilt Mount Triangle Roof Mounting Brackets via the Tilt Mounting Struts, using a 3/8" x 1-3/4" SS bolt at the bottom and a 3/8" x 4" SS bolt at the top of each strut.



Note: The Tilt mounting Struts should be cut to length to provide the required collector elevation angle as described in the following section.

COLLECTOR ELEVATION ANGLE

Ideally, the collector should be mounted at an elevation angle equal to the latitude of the collator location plus 10 degrees. Estimate your latitude based on your location in the United States.

If your roof elevation is within +/- 10° of the ideal elevation, then it is recommended that the collector be flush mounted with the roof. If not, then you will have to determine the length of the Tilt Mounting Struts required providing the ideal elevation for your roof and location as follows:

Calculating the Length of Strut Required:

a. Determine the correct latitude column for your location.
b. Now locate the correct row for your roof elevation angle.
c. At the intersection of the column and row will be two strut lengths, in inches.
d. Select the appropriate length based on the orientation of the collector on your roof. Use the long column if the collector is mounted portrait style. Use the short column if the collector is mounted landscape style.
e. Cut the struts to length and drill a 7/16" hole at 3/4" from each end of the strut.
f. Assemble the strut bottom to the triangle bracket with the 3/8" x 1-3/4" SS bolt supplied, and the strut top to the base of the collector using the two AE-Clips and the 3/8" x 4" SS bolt supplied. Secure the tilt mount triangle brackets directly to the roof using two 3/8" SS mounting bolts (not supplied) extending through the roof trusses, or two 3/8" SS lag bolts (not supplied) drilled directly into the roof trusses.
g. Thoroughly check the tightness of all bolts and screws.

DETERMINING THE STRUT LENGTH REQUIRED

Method:

1. Determine the latitude of your location to the nearest 5°.
2. Locate the correct latitude column in the table.
3. Locate the correct roof pitch / elevation angle row in the table.
4. At the intersection of the row and column locate the strut lengths in inches.
5. Use long figure if the long side of your collector runs up the roof.
6. Use the short figure if the short side of your collector runs up the roof.
7. Cut the strut to the appropriate length.
8. Drill a 7/16" hole 3/4" from each end of the strut.
9. N/A = Ideal Collector Elevation not possible at this roof angle.
10. If length is in red then heavier struts are required, see section 8 or contact AET.

Latitude		25°N		30°N		35°N		40°N		45°N		50°N	
Ideal Collector Tilt Angle		35		40		45		50		55		60	
Collector Orientation		Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short
Roof Pitch	Roof Angle												
Flat	0	59	25	70	30	84	36	100	43	120	51	145	62
1/12	5	48	21	59	25	70	30	84	36	100	43	120	51
2/12	9	41	18	50	22	61	26	73	31	87	37	104	44
3/12	14	32	14	41	18	50	22	61	26	73	31	87	37
4/12	18	26	11	34	15	43	18	52	22	63	27	76	32
5/12	23	18	8	26	11	34	15	43	18	52	22	63	27
6/12	27	12	5	19	8	27	12	36	15	45	19	55	23
7/12	30	7	3	15	6	23	10	31	13	39	17	48	21
8/12	34	1	1	9	4	16	7	24	10	32	14	41	18
9/12	37	N/A	N/A	4	2	12	5	19	8	27	12	36	15
10/12	40	N/A	N/A	0	0	7	3	15	6	23	10	31	13
11/12	43	N/A	N/A	N/A	N/A	3	1	10	4	18	8	26	11
12/12	45	N/A	N/A	N/A	N/A	0	0	7	3	15	6	23	10

Table: Determining the strut length required

There are three acceptable ways to secure the collector mounting brackets to the roof.

1. Spanner Mounting
2. Lag Bolt Mounting
3. J-Bolt Mounting

In spanner mounting after the brackets are positions on the chalk line, a 3/8" hole is drilled between the rafters. Aluminum flashing is positioned over the hole where the top of the flashing is extended up under the shingle above the3/8" hole and extends down over it. Caulk is applied between the flashing and the roof. The bracket is then positioned over the 3/8" hole using sealant between the bracket and the flashing. A piece of 3/8" all-thread is then inserted through the hole. A washer and nut secures the all-thread to the bracket (be sure the seal underneath the washer and on top of the nut). The all-thread rod should extend about 4" below the roof rafters. Drill a 3/8" hole in a 2 x 4 and insert the all-thread rod through it. The 2 x 4 should span 2 rafters. With a washer and double nut secure the all-thread to the 2 x 4. Tighten down until the bracket is tightly secured to the roof. Be careful not to over-tighten and bell out the roof underneath the bracket.

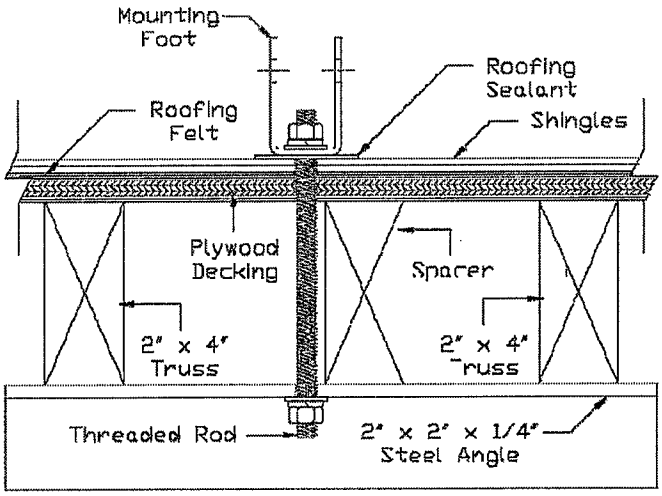


Figure: Spanner Mounting

In lag bolt mounting you must locate the center of the rafters along the top and bottom chalk lines. One method is to have one man on the roof and another in the attic. Using a hammer the man on the roof can tap the roof and determine where it is denser sounding. The roof man can drill a pilot hole while the attic man helps with distance corrections.

Then the attic man can call of the distance to the next rafter while the roof man drills corresponding pilot holes. Flashing the brackets is done as previously described. Secure the brackets to the roof using a ¼" x 3" stainless lag screw, a flat washer, and a lock washer.

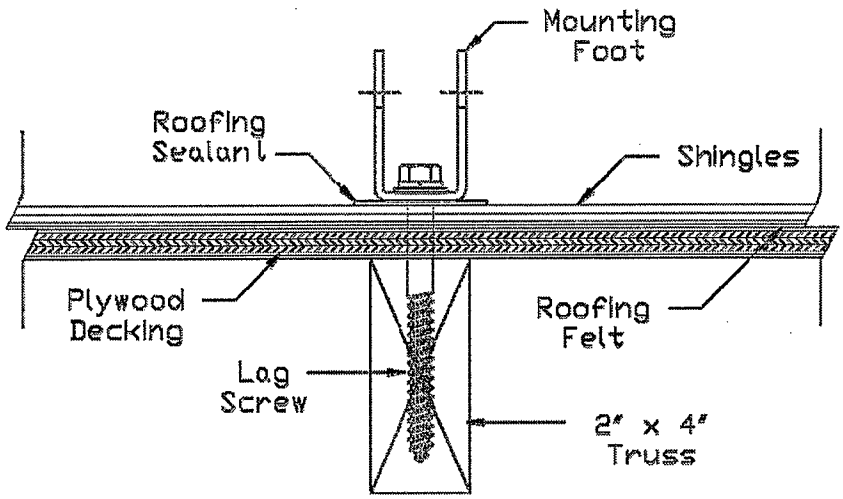


Figure: Lag Bolt Mounting

J-bolt mounting is done very similar to lag screw mounting except instead of drilling into the center of a rafter, a hole must be drilled directly beside a rafter. The size of the hole must be slightly larger than the bolt diameter. This is more easily accomplished if the attic man would drill a pilot hole through the roof along side the chosen rafter.

Fit the bolt through the mounting brackets and insert the bolt (J side first) through the hole in the roof. Work the J underneath the rafter. Pull the J-bolt snug against the rafter before tightening the nut. Use double nuts or lock-washers to securely fasten the mounting bracket to the J-bolt.

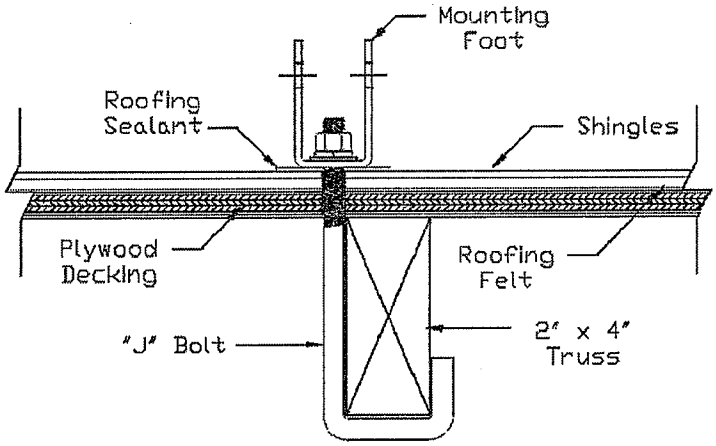


Figure: J-Bolt Mounting

PITCH PAN

The pitch pan is necessary any time standing water is encountered. The purpose is to provide an adequate seal around any penetration in the roof. Pitch pans are commonly used on flat roofs.

a) The pitch pan is placed in the proper position and flat on the roof.
b) Its flange is sealed with roofing felt and hot tar.
c) The holes are sealed on the inside with roofing tar to a sufficient level to insure a permanent seal.

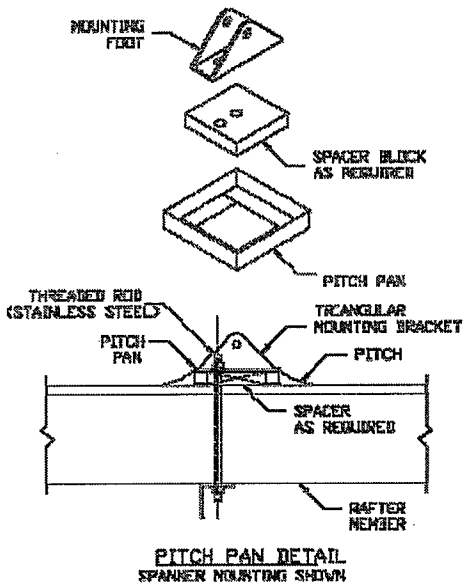


Figure: Pitch pan

ARRAY MOUNTING

Tile roofs are a little more difficult to mount solar collectors on but following this procedure will render a leak free installation.

The solar panels are mounted on two rails located at the top and bottom of the solar collectors. The collectors unistruts are secured to the rails using the AE rack mount hardware (AE-RM). The 1 5/8" Aluminum rails are anchored to the roof by using six or ten-inch stainless steel 3/8" hanger bolts. These bolts are lag screw on the bottom and 3/8 NPT thread on the top. A ten-foot length of unistrut should be anchored at three points, the middle and both ends.

Procedure:

a) Cut 12" x 12" square pieces of lead flashing.
b) Locate the roof rafters beneath the tile where the hanger bolts will be attached. Drill a 3/8" hole through the tile. Slide the 12" x 12" lead flashing under the tile located above the 3/8" hole, then drill through the lead flashing into the hole.
c) Screw lag portion of the 3/8" hanger bolt into the rafter.
d) Cut strips of the lead flashing about 1 ½" long and wide enough that when you fold it into a tube is slightly larger in diameter as the hanger bolt.
e) Using an acid core solder, weld the seam of the tube together.
f) Slip this tube over the top of the hanger bolt protruding from the roof, then solder it to the 12" x 12" lead flashing.
g) Thread down a stainless 3/8" nut to the bottom of the thread and seal the top of lead tube to the nut with a polybutylene caulk. Slip a 3/8" stainless washer on top o the nut.
h) Place the 1 5/8" aluminum unistrut rail on the hanger bolt and secure with another 3/8" stainless washer and net.

The rail is now secured, weather tight to the tile roof. Next, mount the AET solar collector to the rail using the AE rack mounts (AE-RM). See Figure below.

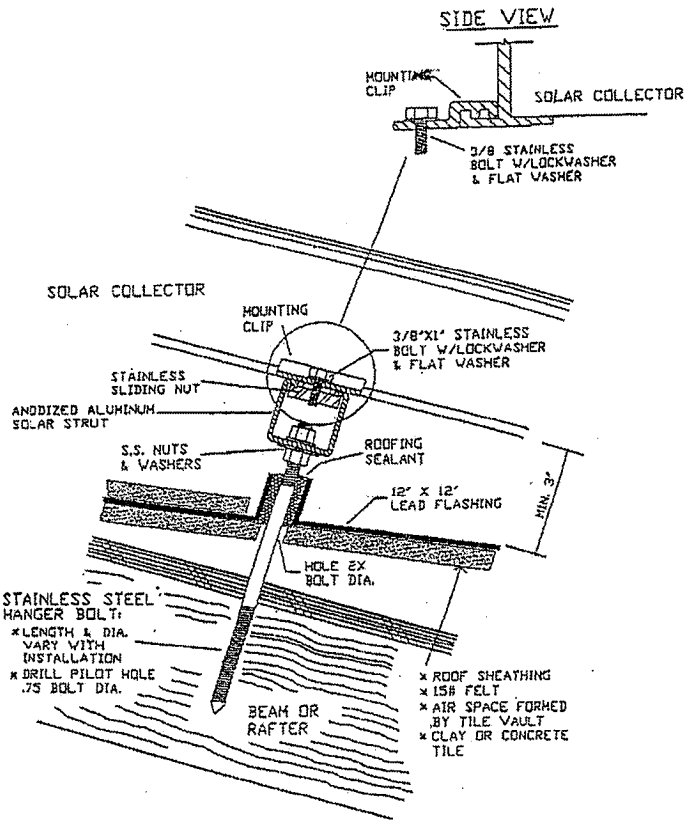


Figure: Rail mounting

COLLECTOR PIPING

All collectors and piping must be sloped a minimum of ¼" per foot for drainage. All piping must drain without any fluid "traps." Soldered connections should be made with 95/5 solder.

The piping of the system should be considered before a final decision is made on how the collectors are mounted. Piping should be made of not less than ¾" I.D. copper tube of the type meeting local codes, insulated with Armaflex or similar, and painted with exterior latex paint or wrapped with aluminum tape where exposed to

ultraviolet radiation. Piping is be supported using plumbers strap and should be installed in such a manner as to not crush the insulation.

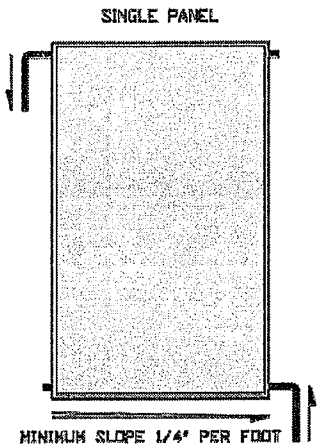


Figure: Single

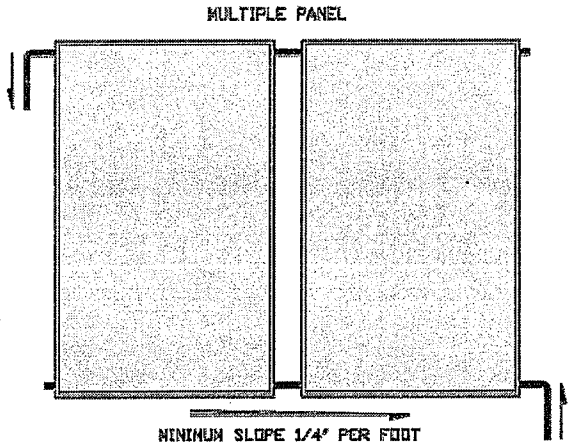


Figure: Multi

COLLECTOR PIPING DETAIL

The outlets of the collector are ¾" copper nipples. They should be piped as shown below.

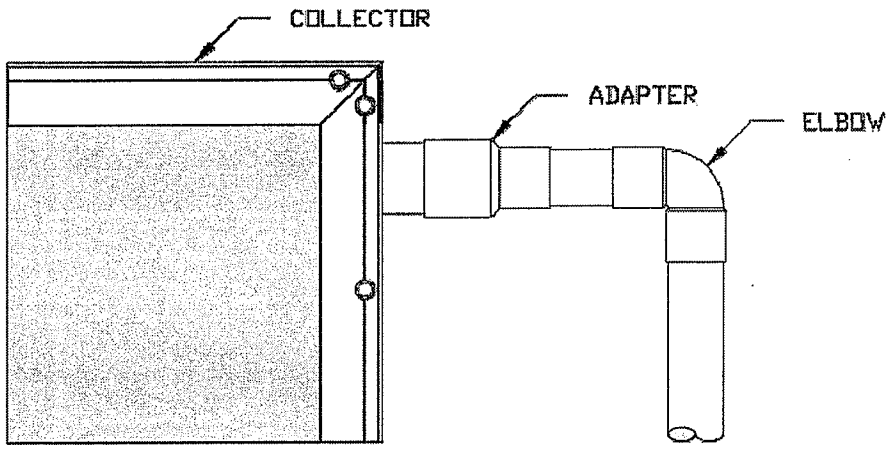


Figure: Copper nipples

PIPING THROUGH THE ROOF

Piping through the roof should be weatherproofed as shown in Figure below.

a) One inch holes are drilled through the roof on the same plane as the supply and return header nipples. Do not drill the hole above the supply header of the collector. This will prevent the collector from draining. Placing the hole below the supply header is acceptable, but it is more aesthetic if it is located on the same plane. A copper flashing is placed around the hole with its base cemented to the roof and its upper edges slid under the adjoining shingle. Placing the flashing under the shingle is preferred.
b) The copper tube supply and return line is then pushed up through the hole in the flashing.
c) A "coolie cap" is then slid over the copper tube till it meets the flashing. After piping to the collectors is completed, the "coolie cap" is soldered to the copper tube.
d) Polybutylene adhesive is placed on the top and bottom of the flashing, providing a weatherproof seal.
e) The sensor wire is run through the return flashing which is equipped with a special wire chase (tube). Once the wire is in place, fill the wire chase with clear silicone caulk to weatherproof.

NOTE: the sensor wire should not be in direct contact with the return plumbing. Secure the sensor wire to the outside of the return pipe insulation.

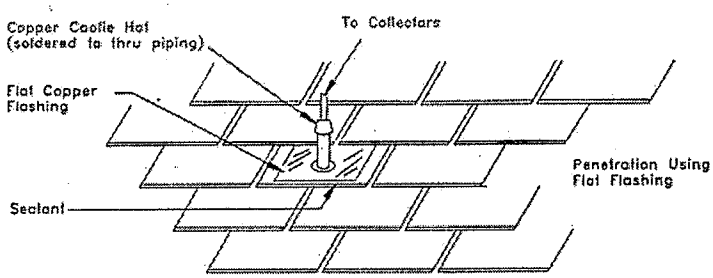


Figure: Piping through roof

STORAGE TANK PLACEMENT

To minimize expense and heat loss, the tank should be placed near the collectors and central to points of greatest water demand. It should be located in as warm a spot as possible, away from areas which would subject the drainback reservoir to freezing temperatures. It should be located with adequate ventilation, with a minimum of 6-8 inches of clearance and with ready access to controls and serviceable parts.

Provision should be made to prevent water damage in case of leakage. A catch pan with a minimum of ¾" drain line at least 2" in height may be installed and pitched for proper drainage. Electrical service of 115-120VAC should be available for the pumps and controller.

PLUMBING TO THE COLLECTORS

All pipe runs between the solar collectors must be solidly attached with proper clamping methods and properly insulated with 1/2" minimum Armstrong Armaflex, or equal rubber type insulation, pipe insulation (pipe insulation should be rated for 230°F). Insulate all hot water piping, as well as all of the exposed cold water piping at the entrance to the solar tank. Pipe insulation, exposed to the sun, should be painted with a latex based insulation paint to resist UV degradation.

A pressure and temperature relief valve must be installed on the storage tank.

A pressure relief valve must be installed on the drainback reservoir.

No air vent or vacuum beaker is necessary on the solar collector plumbing runs. The air gap at the top of the water in the drainback tank serves to break the siphoning action. This action is responsible for proper draining of the solar collectors when the solar circulation pump is shut off.

All plumbing runs between the tank and the solar collectors should be completely vertical when going up and down vertical wall surfaces. **All horizontal runs should be sloped at a pitch of l/4" inch per foot back down towards the direction of the tank.** Care must be exercised in planning the installation so that no low points are created where water may become trapped. For example, a flat roof with a parapet wall should be penetrated rather than running pipes parallel to the roof surface then go up over the parapet wall before going down again. This would create a rather long horizontal low point in the pipe run where water gets trapped, and it would be unable to properly drain back into the drainback tank when the pumps shut off.

All plumbing connections to the solar panels should be made with copper pipe only. CVPC may not be attached to the solar collectors, as very high temperatures may be reached on hot summer days.

Multiple collectors must always be connected in parallel as shown in the plumbing schematic.

Installation of an anti-scald valve is required. This is an automatic cold water mixer on the hot water side of the tank, which supplies hot water to the house. Refer to the system drawing and the illustrations on page 16, of this document, for the installation location of this valve. Only ASSE 1016 and 1017 certified valves are to be used with this system. See the system parts list, on page 26 of this document, for the valve recommended for this system.

SENSOR INSTALLATION

The storage tank sensor should be mounted at the bottom of the storage tank. The hot collector sensor should be mounted on the solar collector header pipe as described below.

1. The hot collector temperature sensor should be mounted directly on the output or return collector header using a stainless steel band clamp as shown in the figure below.

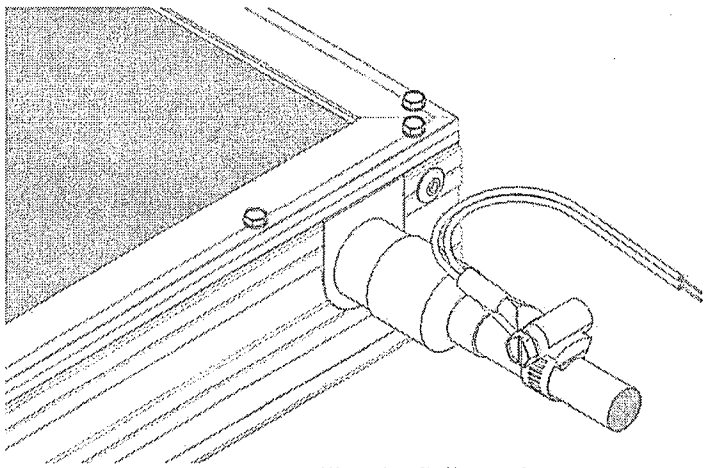


Figure: Installing the Collector Sensor

2. Run the sensor wire outside the pipe insulation to the collector.
3. Connect the collector sensor to the sensor wire using the Scotch lock connectors supplied.
4. Seal the connection using a silicon-based sealant.
5. All wire that is exposed to the sun should be protected from UV degradation using RBEF UV Finishing paint or equal. Also, properly secure the sensor wire runs.
6. Cover the sensor with pipe insulation to protect it from the elements.

SENSOR MOUNTING AT STORAGE TANK

On many of the solar tanks, the heat sensor is located behind the bottom front cover.

1. Remove the two screws that secure the bottom cover to the tank.
2. Remove the cover insulation until the shell of the tank is visible.
3. Locate the ¼" threaded stud and nut and the two sensor wires that were factory run from the top of the tank.
4. Remove the ¼" nut from the stud and place the sensor on the stud. Secure it with the nut.
5. Attach the wires on the sensor to the factory run wires. Note: it does not matter which wire is attached to the other.
6. Replace the insulation and bottom cover.

Note that some water heaters will not have factory installed sensors in the tank. In these cases installers will use standards industry practices in mounting the tank sensor.

ELECTRICAL INSTALLATION

All connections should be made in accordance with local electrical codes. A qualified electrician or contractor is required to install a 115-120VAC duplex receptacle adjacent to the solar storage tank. This receptacle is used to supply power to the differential controller which provides electrical service the pumps.

DRAINBACK DIFFERENTIAL TEMPERATURE CONTROLLER

See instructions provided with controller in box for proper installation.
Specifications for controller:

Operating Voltage	105 to 125 vac, 60 Hertz
Control Relay Contact Rating	One third HP inductive load.
Turn-On Differential	10°F (+1°F) for Storage Sensor at 135°F
Turn-Off Differential	5°F (+1°F) for Storage Sensor at 135°F
Sensor Matching Accuracy	1°F Or Less At 135°F
Maximum Sensor Temperature	300°F
High Limit Setting	Variable – see controller instructions

It is recommended that the controller high temperature limit be set at 140°F.

OPERATION INSTRUCTIONS

THEORY OF OPERATION

As the sun comes up in the morning, and starts to shine on the solar collectors, the collectors will begin to heat up. This system has a differential controller that senses temperature differences between water leaving the solar collector and the coldest water in the storage tank. When the water in the collector is about 12° F warmer than the water in the tank, the controller turns on the pumps. When the temperature difference drops to about 3-5° F, the pump is turned off. In this way, the water always gains heat from the collector when the pump operates. The solar installer manually sets the differential temperature of the controller at the time of the system installation. The pumps are very quiet, so you may not notice when they are on and when they are off.

The system collects heat by circulating the water in the collector loop through the collectors, the drainback reservoir and a heat exchanger on the storage tank. When the pumps turn on, the water in the collector loop is circulated through the solar collectors, where it is heated. The return water from the solar collectors passes through the drainback tank and to the heat exchanger. The heat exchanger gives up the collected heat to the water in the storage tank. The now cooler water is returned to the collectors to continue to collect heat. When there is no longer a marked difference between the temperature at the solar collector and at the solar storage tank (4° F) the controller automatically turns the pumps off – since there is no heat to be gained. This process is repeated continually throughout the day, so that by the end of the day, the water in the storage tank is hot. This is all done automatically and requires no interaction on the part of the system owner.

Drainback systems provide a fail-safe method of ensuring that collectors and collector loop piping never freeze by removing all water from the collectors and collector piping loop when the system is not collecting heat. Freeze protection is provided when the system is in the drain mode. Water in the collectors and exposed piping drains into the insulated drain-back reservoir tank each time the pump shuts off. A slight tilt of the collectors is required in order to allow complete drainage. A sight glass attached to the drain-back reservoir tank shows when the reservoir tank is full and the collectors have been drained. For this reason the Drainback system is protected from freeze damage at all temperatures.

> The collector and collector plumbing should be sloped back toward the drainback reservoir at 1/4" per foot minimum to allow the system to drain.

All solar systems will have a backup source of heating. A common backup source is gas or electric water heater. Backup sources are used because on some days, when it is very cloudy, the solar contribution will be very small. On days when there is plenty of sun, and the sun is doing the work of heating the water automatically, the resulting high water temperature in the tank will keep the internal hot water heater thermostat from turning on the gas or electric heat, thus saving fuel and money.

DRAINBACK SYSTEM COMPONENTS

This system is comprised to the following components:

- Solar Collector(s) – (AE or MSC Series Collectors)
- One differential controller and sensors
- One circulation pump with flange set
- One storage tank w/ T&P relief valve - (80 or 120 gal)
- One drainback reservoir - (10 or 15 gal)
- One pressure relief valve
- One fill/drain valve
- One mixing valve
- Two thermometers

THE SOLAR COLLECTORS

The collector array consists of solar collectors of sufficient size to meet the design criteria for your household needs and geographic area, plus a set of 4 mounting brackets for each solar collector. The collectors are the Alternate Energy Technologies, AE or MSC series, using Thermafin absorbers with Selective Crystal Clear Black coating. The Crystal Clear Black surface has been proven to withstand very high temperatures for long periods of time and will not flake or chip. It is a revolutionary coating, which is actually a crystalline structure that is "grown" on the surface of the copper plating material. Crystal Clear Black coating is a leading edge technology that allows the maximum amount of solar energy to be absorbed at the lowest light level and virtually eliminates the amount of energy reflected to the sky.

The absorber plate within the collector is made of Thermafin risers. Using a high frequency forge welded molecular bond between copper tube and copper fin to form the risers that make up the absorber plate. Thermafin is designed to conduct the maximum amount of heat absorbed to the fluid that passes through the tube and returns to the storage tank. Unlike other methods, that solder or braze the tube and fin, Thermafin has only copper to conduct the heat and is therefore the most efficient product available.

The glass on the solar collector is a low iron tempered glass of exceptional clarity. This means that sunlight coming into the collector loses very little energy and transforms almost all of the light into heat. The tempered glass is very strong and resists damage that ordinary window glass could never withstand. A high-density foam material is used to provide insulation and minimize heat loss in cold weather. All copper piping is externally sealed with high temperature silicone grommets. All of this ensures that the maximum heat energy is transferred to the water, which is stored for use as needed.

The aluminum frame of the collector consists of extruded aluminum, with an integral quick lock-mounting rail for ease of installation with our patented "Quick lock" mounting hardware. The mounting brackets come in a set of 4 per solar panel, and all hardware is included except for the actual bolt used to attach to the roof or mounting surface. All fasteners and bolts are made of high quality and long lasting stainless steel.

THE DIFFERENTIAL CONTROL

A differential controller (and its accompanying sensors) is used to activate the pumps. The controller will be set by the installation contractor to turn the pumps on and off at a specific temperature – usually on at 12°F difference between the sensor at the water heater and the sensor at the collector, and off at a 4°F difference.

THE CIRCULATION PUMP

The collector loop pump is selected for its head pumping characteristics. This pump is very quiet, efficient, and reliable. The collector loop pump is located below the drainback reservoir so that it has water pushing into the suction side of the pump from above, and therefore will never run dry. If this pump needs to be replaced all moving parts are contained inside a replaceable cartridge. The outer pump body may be removed by unbolting the pump flanges, and the inner cartridge may be replaced without having to disturb any of the plumbing.

THE STORAGE TANK

The water storage tank used in this system is similar in construction to that of a standard water heater and contains a heat exchanger for the solar interface. The water storage tank, stores the heat energy generated by the solar system. As the pumps circulate the fluids throughout the system, the fluids become hot and this heat energy is transferred to the water in the storage tank via the heat exchanger. This large volume of heated water used as the hot water source for the fixtures in the building/residence.

DRAINBACK RESEVOIR

The Drainback reservoir is a very high quality, well-insulated, hot water storage/transfer device. Potable water, in the storage tank, never comes in contact with the fluid in the collectors. The heated water, from the solar collectors, is directed through the heat exchanger encompassing or immersed in the storage tank. The heat exchanger transfers heat from the collector loop fluid to the potable water in the storage tank.

The backup water heating source is provided by a thermostatically controlled 4500 watt element in the storage tank. Refer to the water heater's installation manual for specific installation/electrical requirements.

SYSTEM VALVES

The Drainback system is equipped with several valves required for maintenance and protection of person and property. A temperature and pressure relief valve, on the storage tank, insures that excessive temperatures and system pressure is adequately relieved as needed. A pressure relief valve, on the collector loop, insures the collector loop does not exceed the design pressure of the system. A fill/drain valve is used when performing system maintenance or repair. An anti-scald valve is required to insure that the water delivered to the fixtures does not exceed scalding temperatures.

FREEZE PROTECTION

The homeowner is not required to perform any actions to prevent freeze damage to the collectors. The system is only circulating when the collectors are hotter than the storage. In freezing conditions this is not the case, therefore there is no circulation and the water has drained from the collectors into the reservoir.

This system has a freeze tolerance limit of -20°F (20° below zero F), ambient air temperature. When conditions such as these are present, during prime daylight hours, power to the controller should be disconnected by unplugging the power cord to the controller.

> "Freeze tolerance limits are based upon an assumed set of environmental conditions. Extended periods of cold weather, including ambient air temperatures above the specified limit, may cause freezing in exposed parts of the system. It is the owner's responsibility to protect the system in accordance with the Supplier's instructions if the air temperature is anticipated to approach the specified freeze tolerance limit."

OPERATING INDICATORS

Thermometers are installed on the feed/return lines, to/from the collectors to allow the system owner to easily identify the when the solar collectors are working properly. The return line from the collectors should be hotter than the feed line. A properly installed solar system should provide a temperature differential of 10-20°F.

The Drainback system also uses a sight glass, on the drainback reservoir, as an indicator that the system is working. As the pumps are energized, the fluid level across the sight glass falls, thus indicating that the fluid is being removed from the drainback reservoir. As the pumps are de-energized, the fluid level across the sight glass rises, thus indicating the fluid in the solar loop is returning (draining) back into the reservoir.

FILLING THE DRAINBACK RESERVOIR

1. Attach hose to fill valve "A"
2. Open fill valve "A" and the PR-45 relief valve (the pressure relief valve on the drainback reservoir)
3. Slowly fill the drainback reservoir to the top of the reservoir sight glass
4. Shut off fill valve "A" and close the PR-45
5. Remove fill hose

(Note: If replenishing water during periodic maintenance, make sure the controller is unplugged.)

START-UP PROCEDURE

1. Insure the system is filled, as directed above
2. Turn on pump and let run for 5 minutes
3. Check for leaks at collectors and in attic.
4. Switch controller to the automatic mode.

Once the complete system is in place, plumbed, and charged with heat transfer fluid, the final act to commission the Drainback system is to simply plug the controller line cord into a standard 115 VAC wall outlet. If the sun is shining and the tank is cool, the pump should turn on and the water should circulate.

SERVICE / MAINTENANCE PROCEDURES

SHUT DOWN PROCEDURE

To shut down the Drainback system, simply unplug the differential controller. The pump will stop and the water will drain out of the collectors and into the drainback reservoir.

> CAUTION!
> Never open the PR-45 while the system is in operation or hot water is present.
> Allow to cool prior to opening.

DRAINING THE DRAINBACK RESERVOIR

1. Unplug the controller and wait until all water returns into the reservoir
2. Attach hose to fill valve "A"
3. Open the PR-45 relief valve (see the caution statement above)
4. Open fill valve "A" (PR-45 MUST be open first)
5. Allow the system to drain completely
6. Close fill valve "A" and the PR-45 relief valve
7. Remove the drain hose

TROUBLESHOOTING GUIDE

The homeowner will know that the solar system is operating if both pumps are running and the water level in the sight glass is low. This indicates that the pump has pumped the water from the reservoir through the collectors.

Problems with systems usually fall under two categories: system leaks or lack of sufficient solar heated water.

LEAKS

If leaks exist, the system should be shut down for repair. Make sure the electrical circuit to the controller is unplugged. Close off the cold water inlet to isolate the solar system, until a suitable repair can be made.

There is a possibility that what may appear to be leaks may be condensation on the pipes. Also, water escaping from the T&P relief valve, on the water heater, may be an indication of proper function as they are designed to vent off excess temperature and pressure. Discharge from the T&P relief valve can happen, but it should be checked if it happens frequently.

INSUFFICIENT HOT WATER

If insufficient hot water is available, a system malfunction may not be indicated. A low amount of solar radiation or heavy water demand can be the cause. If no excessive demands are put on the system and ample solar radiation is available, the system should operate properly. The pump should run each sunny day until a full supply of hot water is stored. If the pump does not run, there is a problem on the electrical end of the system. Either, the pump, controller, or sensors may be malfunctioning. The controller can be bypassed by running a power cable directly to the pump and checking its function separate from the control system. Make sure that the problem is not a blown fuse or a tripped breaker. If the pump runs normally when powered externally, the control circuit is the problem area.

Differential controllers use thermistor sensors to determine modes of operation. A controller tester is available from AET for checking differential function. Check sensor wiring. If no faulty wiring can be discovered, replace sensors.

If the pump is running all the time, even when the collectors are cool, then the storage sensor or collector sensor may be open. It is also possible that the sensor wire itself is at fault. To check this, service personnel should test the continuity with an ohm meter. Be sure to disconnect the sensor when performing this test. Test the wire with both ends open, then retest after twisting the 2 sensor wires together at one end. The system can be set on a timer or switched on manually until the controller is properly functioning.

SYSTEM TROUBLESHOOTING AND OPERATIONAL CHECK

The system can be checked to determine that it is operating by noting the temperature difference between the collector feed and collector return lines. The return line should be hotter than the feed line. In addition, the owner should periodically check the drainback reservoir sight glass to make sure that there is sufficient water in the drainback reservoir.

The table below lists some of the possible problems, their cause, and their remedy. System owners are advised to contact the installer whenever a remedy requires some type of in-depth interaction with the solar system.

PROBLEM	POSSIBLE CAUSE	REMEDY
Insufficient Hot Water	Insufficient Solar Energy Back up source Excessive hot water consumption	Check system size, location & orientation Check / Replace Reduce consumption
Pump does not start	Controller switch in "Off" position Controller unplugged or blown fuse Defective sensor	Turn to "Auto" Return power to controller or replace fuse Replace sensor
Pump runs continuously	Controller in "On" position Defective sensor	Turn to "Auto" Replace sensor
Pump operates but no fluid Flows through the collectors	Flow tubes clogged Loss of fluid in drainback system	Flush collector tubing Cool system, locate air leak, refill properly
No water	Isolation Valve closed	Open valve
System leaks	Pipe burst due to freezing or defective joint Defective seals or piping	Repair or replace Check pipe insulation Repair or replace
System does not drain	Collector installed at incorrect angle Piping insufficiently sloped for draining	Change so draining can occur Check and ensure that piping slopes 1/4" per foot

OTHER PROBLEMS

A noisy pump is an indication of worn bearings, obstruction or loss of prime. As a rule of thumb, an 8-12° temperature gain should be expected across a collector, in bright sun, at the proper flow rate.

MAINTENANCE

DRAINBACK MAINTENANCE

Maintenance of a drainback system is minimal. The storage tank should be partially drained every 6 months to allow minerals to be removed preventing scale build up (this is recommended for all water heaters).

The collector glass should be kept clean for best system performance. Rain water will usually suffice, but a garden hose can be used during dry, dusty weather.

ROUTINE MAINTENANCE

In areas of infrequent rain the collector glazing should be visually inspected on a periodic basis (once a quarter) and cleaned with a hose if necessary.

The water level used as the heat transfer fluid in the drainback reservoir should be checked bi-annually. With the system off, make sure that the water level in the sight glass at the drainback reservoir is to the top of the sight glass. If not, follow the instructions in "Filling the Drainback Reservoir".

The storage tank should be flushed on an annual or bi-annual basis following the manufacturer's recommendations.

Exterior pipe insulation should be treated as required with an exterior UV inhibitor paint. Contact your authorized AET Dealer if you feel insulation needs re-coating or replacement.

NON-ROUTINE MAINTENANCE / TROUBLESHOOTING

In case of a leak in the collector system, first attempt to identify the source of the leak, then unplug the controller. Since the indirect Drainback system is already isolated from the solar storage tank via the heat exchanger, no valves need to be operated. If the leak is in the collector contact your installation contractor listed below or AET direct for instructions on how to repair or replace the absorber plate.

For leaks in the potable water system or the solar storage tank, close off the cold water inlet to isolate the solar system, until a suitable repair can be made.

VACATION PROCEDURES

If no hot water is to be used for some time, unplug the controller to allow the system to drain. To re-energize the system, simply plug the controller back into the power receptacle.

SYSTEM PARTS LISTING

COMPONENT	MANUFACTURER	MODEL
Solar Collector(s)	Alternate Energy Technologies, LLC	AE or MSC Series
Differential Control	IMC Instruments	Eagle 1
	Goldline Controls	GL-30 (LCO)
Circulation Pump	TACO, Inc.	009-F5
	Grundfos Pump	UP15-100F
Water Storage Tank	Richmond Water Heater	S80HE-1, S120HE-1
	Heat Transfer Products	SSC-80, SSC-120
Drainback Reservoir	Alternate Energy Technologies, LLC	DB-10SS, DB-15SS
Pressure Relief Valve	Wilkins	P1000A (45 psi)
Drain Valve	Watts Regulator	BD Series
Anti-Scald Valve	Honeywell – Sparcomix	AM-1-Series
Thermostat(s)	Honeywell	GT162

ESTIMATED COMPONENT LIFE

When installed and maintained as directed in this manual, one can expect many years of trouble-free service from this system. All components in this system are subject to the conditions of the installation. In locations where hard water is present, mineral deposits can prematurely foul-out the design life of these components. Periodic maintenance is required to insure that these components are well protected from such damage.

The solar collectors used in this system have a design life of 30+ years. Water storage tanks are designed for 12-20 years of use. The lesser components, such as pumps and valves are designed for 5+ years, however, are more likely to foul, as described above, if not maintained properly.

WARRANTIES AND DISCLAIMERS

Please note that we specifically exclude any warranty for, or liability from, acts of nature, including freeze damage and shading of the collectors by future growth.

Warranty periods for all the major components are given below:

Item	Part#	Period
Collector(s)	AE or MSC Series	10years
Differential Control	Eagle 1 or GL30	1 year
Circulation Pump	009-F5 or UP15-100F	1 year
Storage Tank	S80HE-1, S120HE-1, SSC-80, SSC119	6years
Drainback Tank	DB-10SS, DB-15SS	1 year
Valves	various	1 year

All parts are available from your authorized agent or from AET direct.

FLUID QUALITY

This system uses water as a heat transfer fluid media in the solar loop.

> "No other fluid shall be used that would change the original classification of this system. Unauthorized alterations to this system could result in a hazardous health condition."

HAZARDS

Solar collectors become very hot when in direct sun with no fluid being circulated through them. Extreme caution should be taken when standing near, or handling solar collectors in this state.

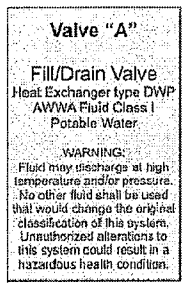
The circulating pumps become very hot when running. Always allow at least 30 minutes for the pump to cool down before touching the pump.

Relief valves may discharge fluids at high temperature and/or pressure.

FLUID SAFETY LABELING:

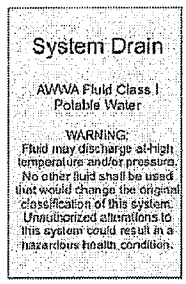
Valve "A" – this label is affixed to the system fill/drain valve at the lowest point in the solar plumbing loop.

The heat transfer fluid is introduced here. When properly charged, the fluid level should be approximately ¼" from the top of the sight glass, on the drainback reservoir.



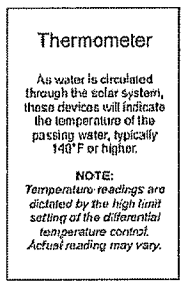
System Drain – this label is affixed to the tank drain valve at the base of the water storage tank.

This valve is to be used only as directed in the water storage tank owner's manual or as directed in this manual. Power should be disconnected, at the circuit breaker, prior to service.



Valve "B" – this label is affixed to the temperature and pressure relief valve on top of the water storage tank.

The valve is preset to open and discharge if either a high pressure or high temperature situation occur in the water storage tank.

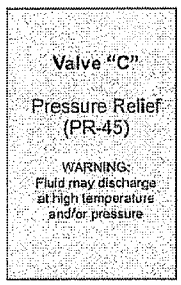


Thermometer – this label is affixed to the temperature gauges on the collector feed/return lines.

The gauge will display the temperature of the HTF to/from the collector. During system operation, the collector return line temp should read approximately 8° or more above the outside ambient air temperature.

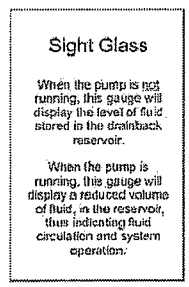
Valve "C" – this label is affixed to the PR-45, pressure relief valve on the drainback reservoir.

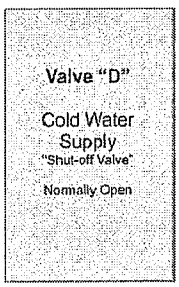
This valve is normally closed and may open and discharge if high pressure occurs in the collector plumbing loop.



Sight Glass – this label is affixed to the base of the sight glass on the drainback tank.

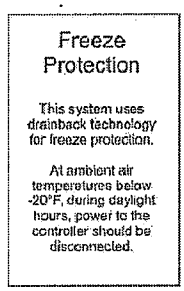
The sight glass is used in conjunction with the temperature gauge as a means by which an observer can easily identify that the system is operating properly.





Valve "D" - this label is affixed to the cold water supply, "shut-off" valve.

This valve is normally open and should **only** be closed when maintenance is performed on the system. Power should be disconnected, at the circuit breaker, prior to service.

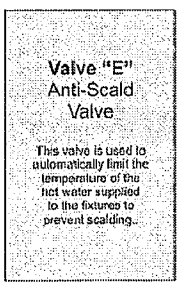


Freeze Protection – this label is affixed to the collector return line at the base of the drainback tank.

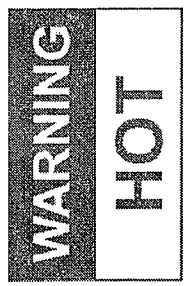
Manual intervention is required as a secondary precaution to protect components from freeze damage, when air temperatures fall below -20° F (-28.9°C).

Valve "E" – the label is affixed to the anti-scald valve.

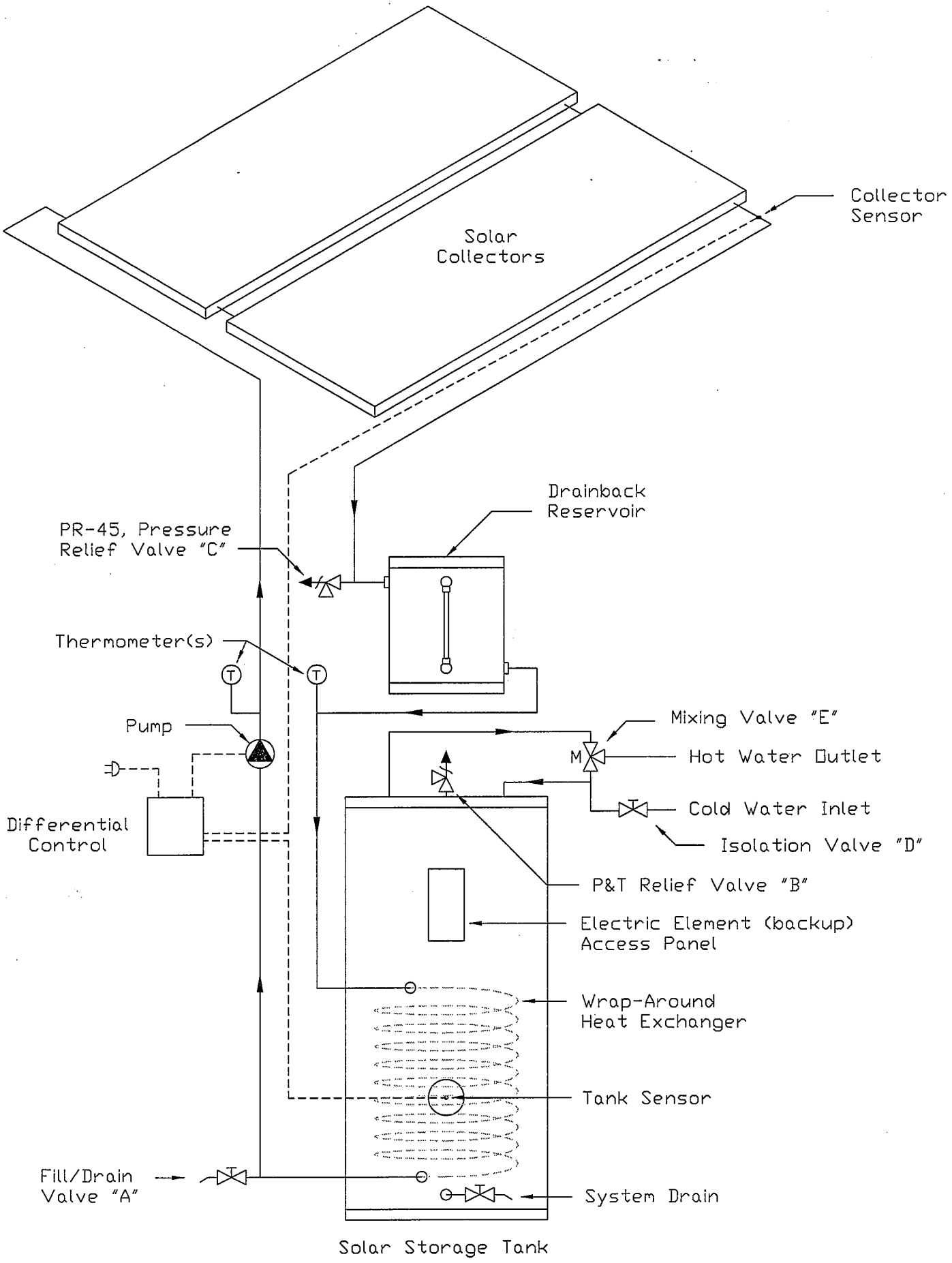
This valve is used to limit the temperature of the water to the fixtures in the dwelling to prevent scalding.



WARNING / HOT – labels are affixed to the collector return line at the drainback tank, the hot water supply line from the water storage tank and on all system components that could present a safety hazard due to high temperatures.



NOTE: The fluid safety labeling, as described above, is intended as a means of identification for the homeowner and/or service personnel. Removal of these labels could result in personal injury.


Collector Sensor
Solar Collectors
Drainback Reservoir
PR-45, Pressure Relief Valve "C"
Thermometer(s)
Pump
Mixing Valve "E"
M
Hot Water Outlet
Cold Water Inlet
Isolation Valve "D"
Differential Control
P&T Relief Valve "B"
Electric Element (backup) Access Panel
Wrap-Around Heat Exchanger
Tank Sensor
Fill/Drain Valve "A"
System Drain
Solar Storage Tank

DELHI INDUSTRIES SUBMITTAL

Date: **July 29, 2009**

Project No:	G2	Submitted by:	Your Solar Home Inc.
Project Name:	Warehouse		299 Applewood Cres. Units 4&5
Location:	St. Louis		Vaughan
Engineer:			ON Canada L4K 4E7
Architect:			Bob Waddell
Reference:			(905) 669-2212 (___) ___-____

Equipment Tag

Contractor:

Model Information

Series 400: EXHAUSTER, SWSI, FC, CENTRIFUGAL

Model:	410	Part Number:	9040103		
CFM:	750	Shaft Diameter:	.75 in.	Unit Weight:	26 lbs.
SP:	2	Wheel Diameter:	11.1 in	Ship Weight:	28 lbs.
RPM:	1388	Tip Speed:	4043 FPM		
BHP:	0.47	Static Efficiency:	50.0 %	Elevation:	0 ft
		Outlet Velocity:	1033 FPM	Temperature:	70 F

Sound Data

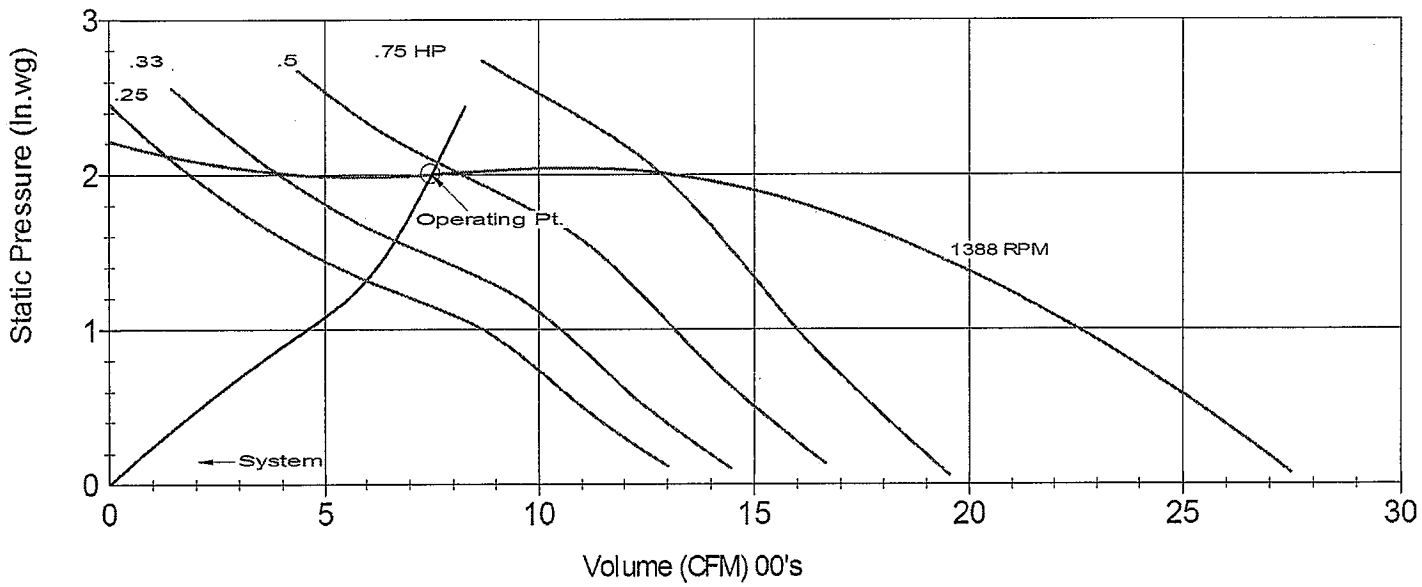
Frequency, re: 10^-12 Watts	63	125	250	500	1000	2000	4000	8000		
Sound Power Level @	87	89	85	79	75	72	68	65	(Hz)	LwA: 82
									(dB)	SONES: 21

Ducted inlet or ducted outlet dBA @5 ft. **71** Ducted inlet and ducted outlet dBA @5 ft. **51**

Performance Curve

DELHI Model 410

CFM=750 SP=2 BHP=0.47 S. Eff=50.0% RPM=1388



Drive Information

Motor Pulley	Turns Open	Blower Pulley	Bushing	Belt
1VL34 x 5/8" \ 8500059	2.5	BKH40 \ 8500000	H x 3/4 \ 8500062	4L360 \ 8200006

Motor Data

HP	Motor Type	Volts/Phase	Frame	Motor RPM	Position
.50	ODP	115/1	56 (56H) Fr	1725	1

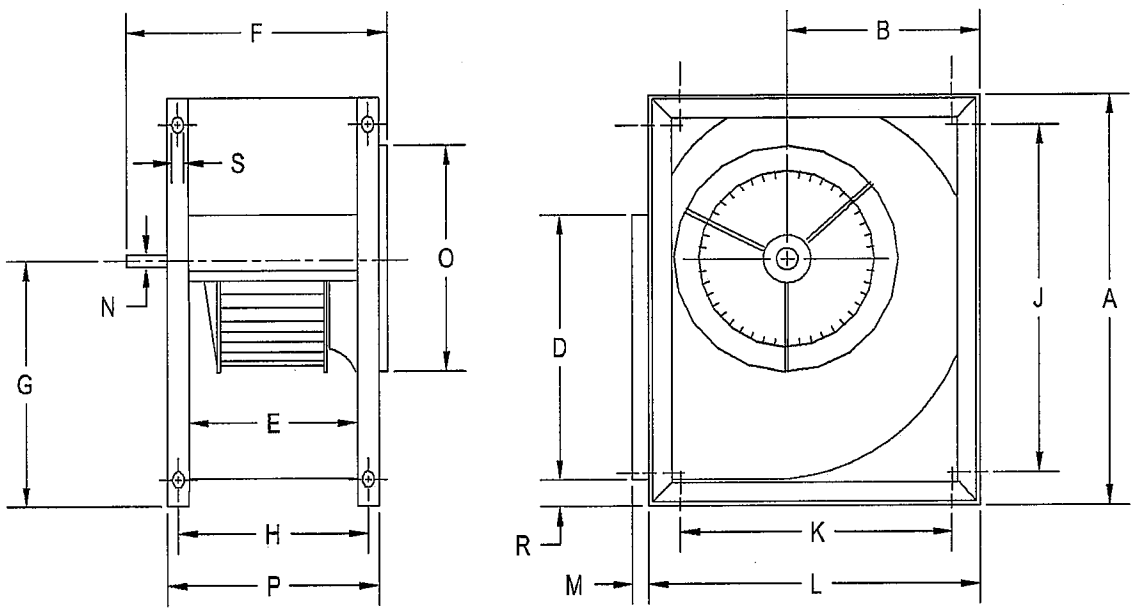
Options/Notes

Vibration Isolators Hanger

Dimensions

Model: 410

(Inches)



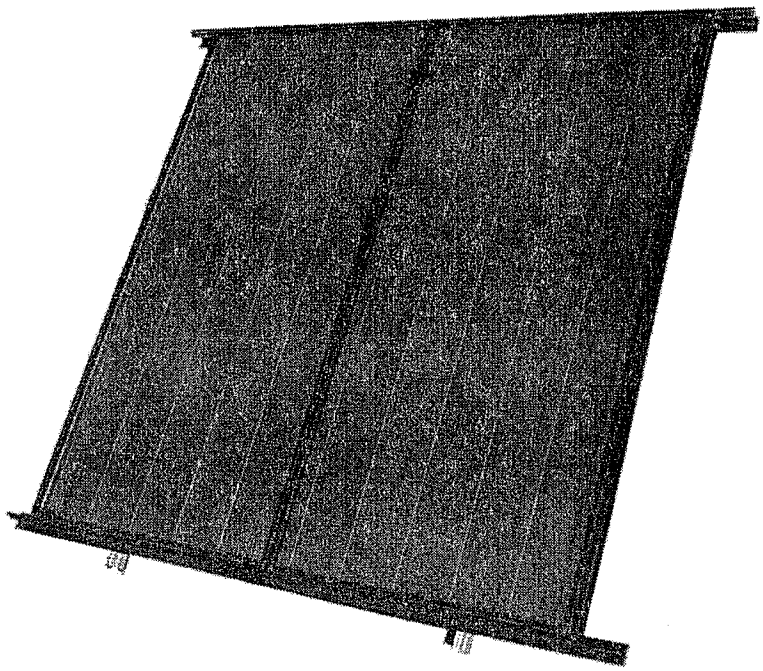
A	B	D	E	F	G	H	J	K	L
19.125	9.	11.375	9.1875	13.9375	11.25	10.3125	16.25	13.5	16.25

M	N	O	P	R	S
.75	.75	12.	11.3125	1.5	.4375

Standard Features

400 Series FC Exhauster

- Forward curved wheel provides quiet, low rpm operation.
- Galvanized wheel and housing with green enamel finish frame.
- Universal frame allows choice of discharge position.
- Heavy duty, self aligning, grease lubricated ball bearings.
- Steel construction.



SOLARSHEAT
1000G/1500G/1500GS
Roof Stand
Installation Manual

By
Your Solar Home, Inc.

Version 1.0
May 29, 2009

All building, plumbing, electrical and safety codes supersede the instructions in this manual. Your Solar Home will not warranty any roof installations that are not performed by authorized SolarSheat dealers and that do not follow or use the proper roof hardware, stands, flashing and weatherization. The manufacturer assumes no liability for improper installation. Use this manual at your own risk.

1.0 Introduction

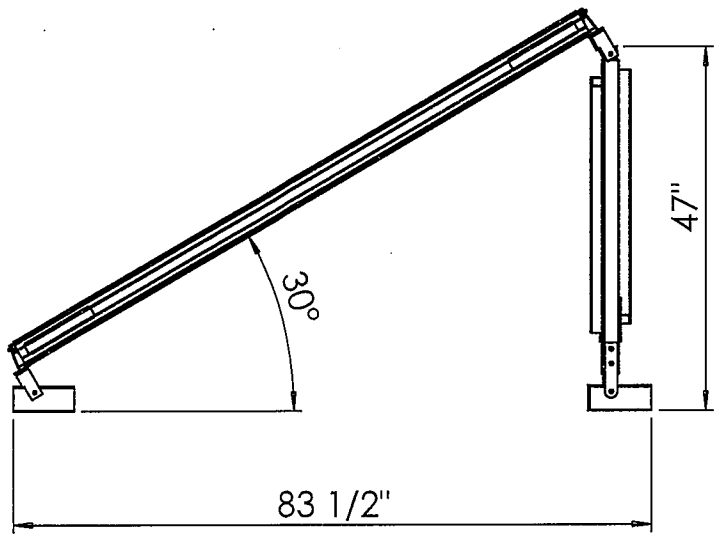
The SolarSheat 1000G, 1500G and 1500GS are modular solar collectors designed for supplemental room heating. Interior air is drawn though the SolarSheat, heated up and pushed back into the adjoining room. The 1000G & 1500G systems are self-powered and do not require any external electrical power, whereas the 1500GS collectors are designed to work with either the 1500G (two-pak) or an A/C powered fan system.

This manual covers the roof stand installation of the 1000G, 1500G and 1500GS solar collector models.

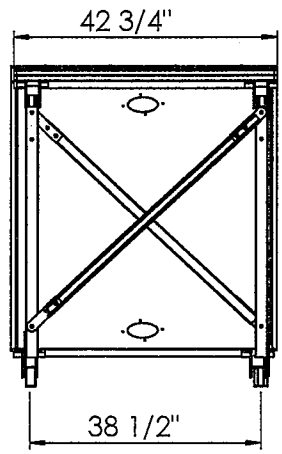
2.0 General installation

The successful operation of the SolarSheat solar collector depends entirely on the proper installation and maintenance as outlined in this manual. Prior to installation please read the installation instructions completely. The installation of the SolarSheat roof stand should comply with all local building codes, permits and OSHA requirements. The SolarSheat can be installed into new construction projects or retrofitted to existing buildings.

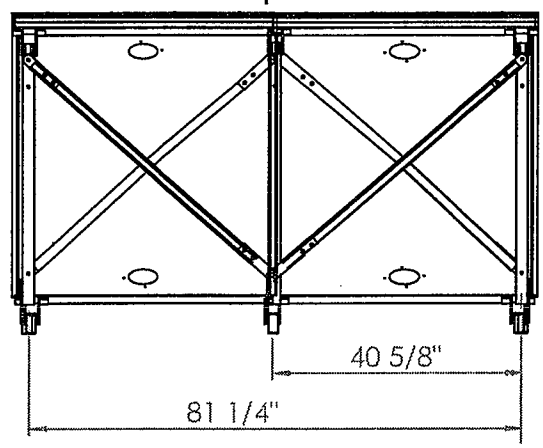
2.1 SolarSheat roof stand kit dimensions - 30 degree angle shown



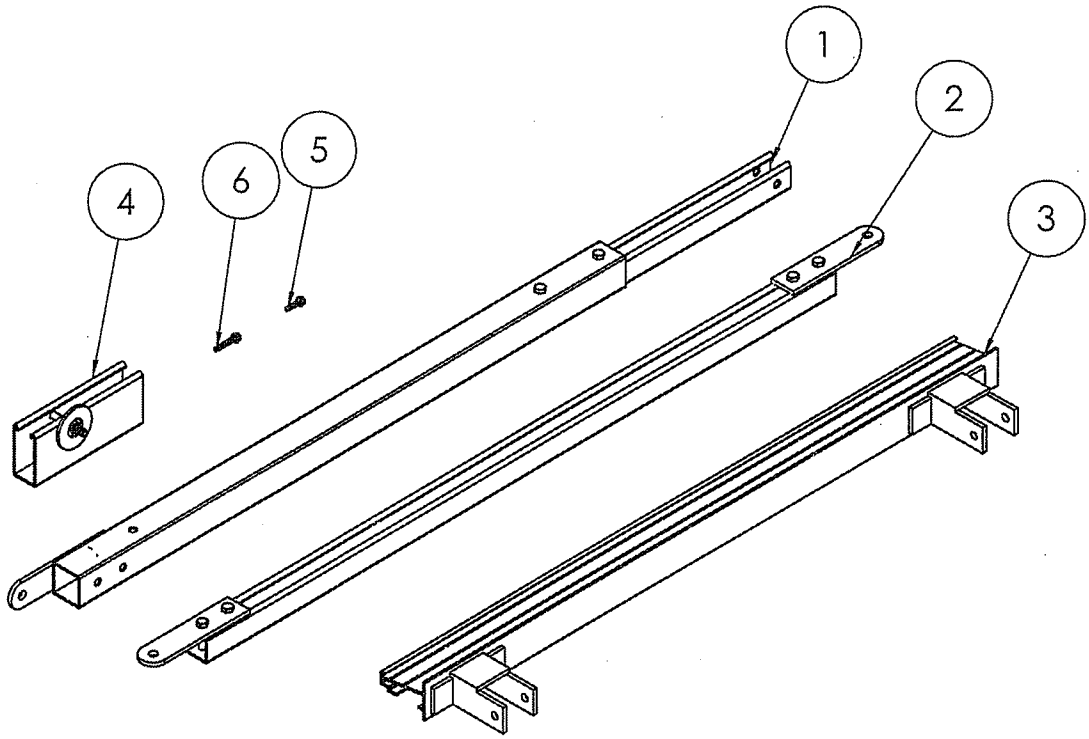
APPROXIMATE DIMENSIONS



SolarSheat 2-pak dimensions

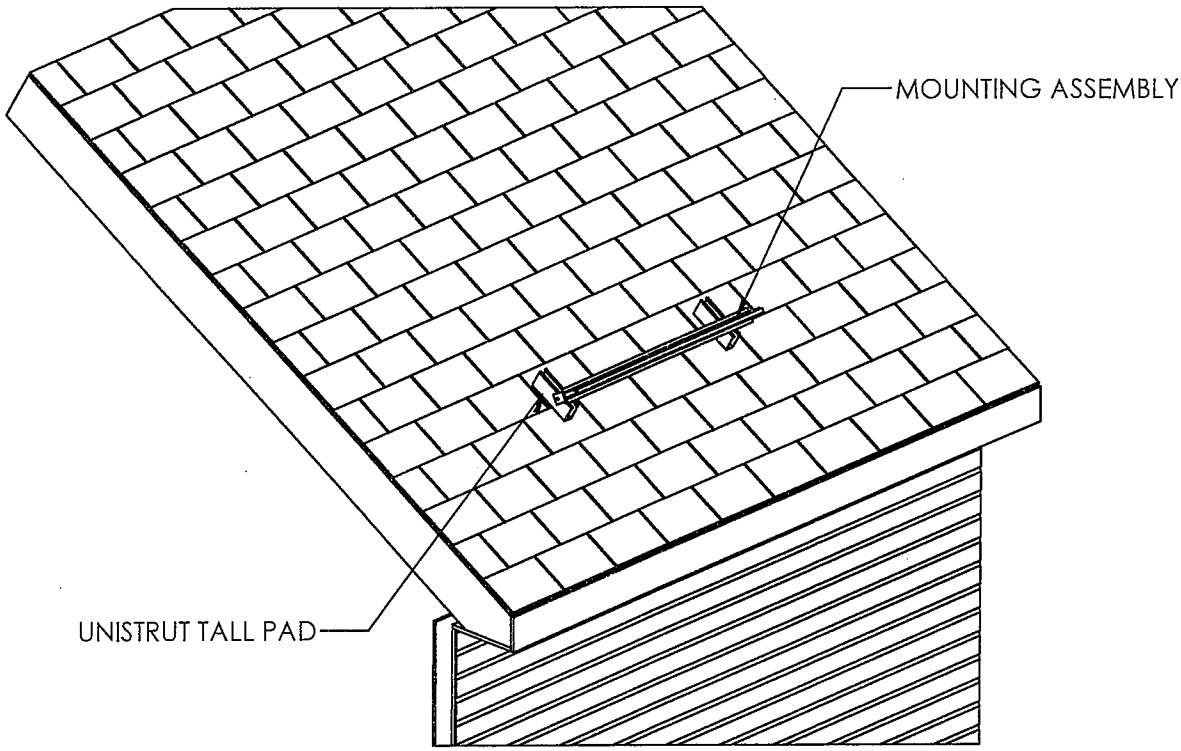


2.2 SolarSheat roof stand kit packing list

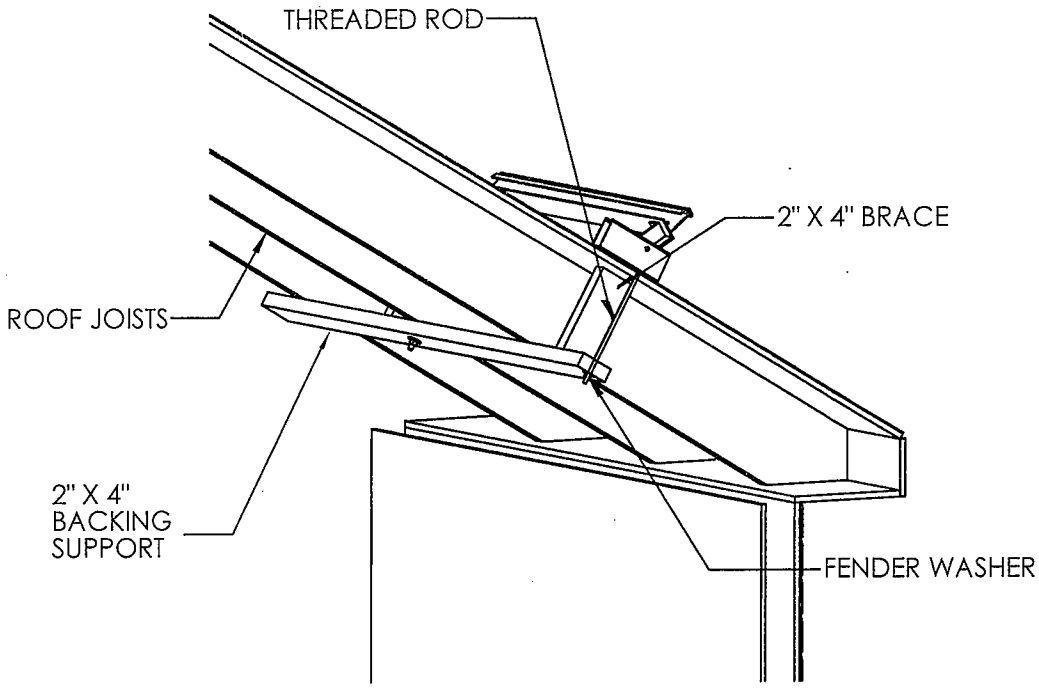


ITEM NO.	PART NUMBER	DESCRIPTION	QTY-Single	QTY-2 pack
1	h013	Tele-Strut Channel	2	3
2	h015	Cross piece mount	2	
3	y007	Collector mount assy with brackets	2	
4	h010	Unistrut tall pads	4	6
5	f004	black TEK screw - 1"	8	16
6	f011	black TEK screw-1-1/2"	8	16

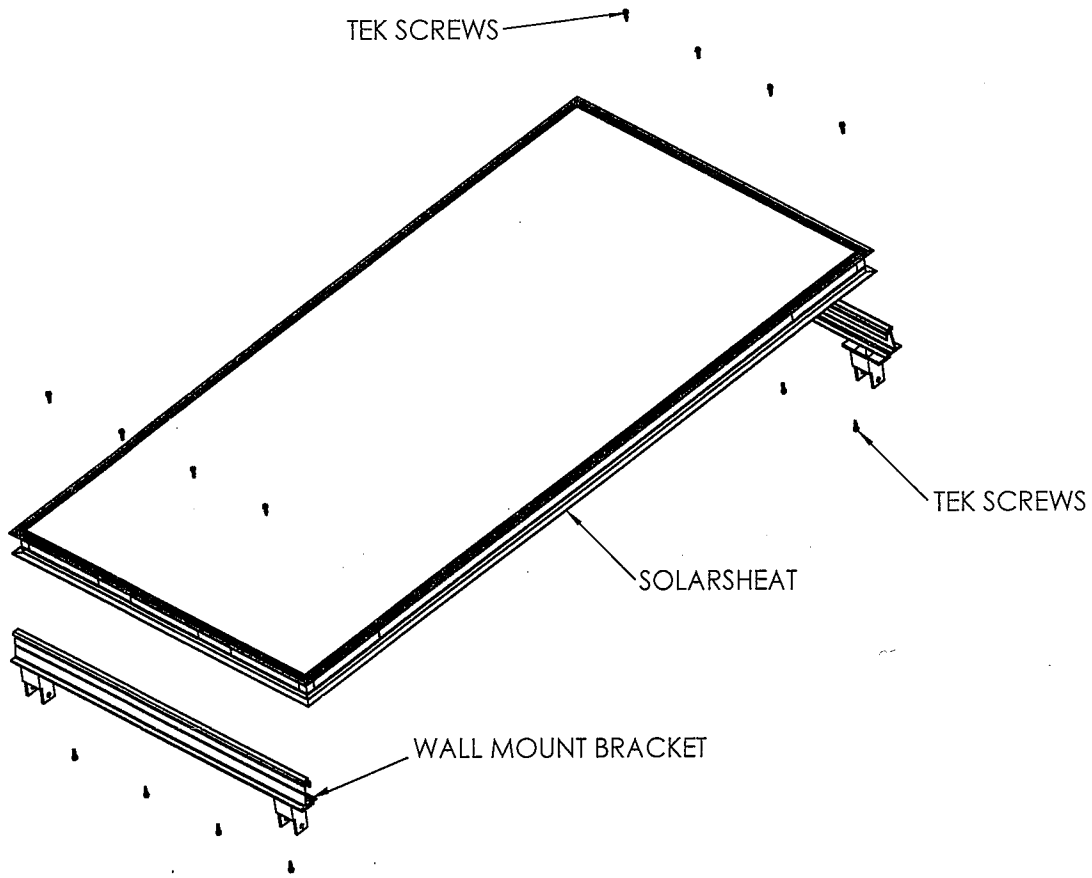
2.3 SolarSheat roof stand installation & mounting procedures

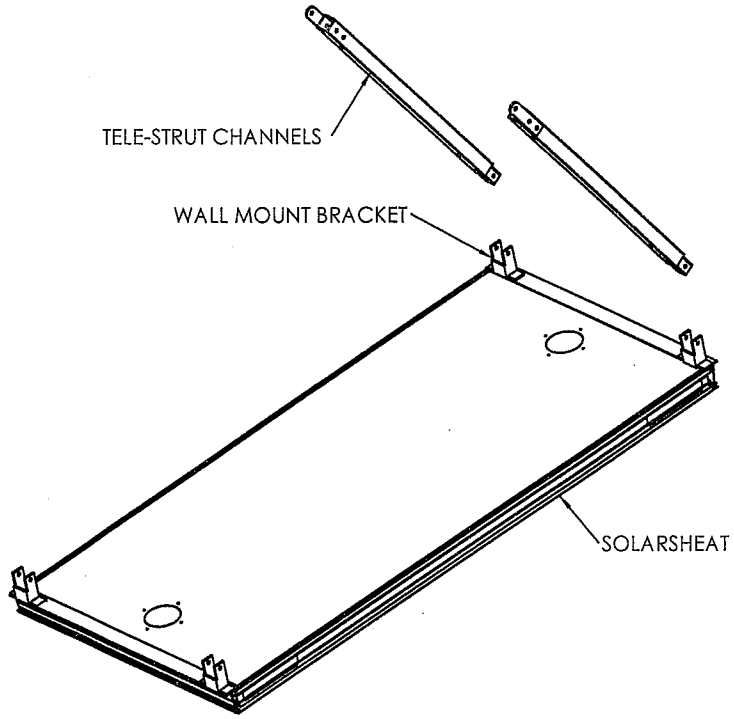


1. Mount lower Unistrut tall pads to roof. Use mounting assembly as a guide for determining the spacing of the tall pads on the roof surface.
2. Locate the pads so that they do not interfere with the roof joists.

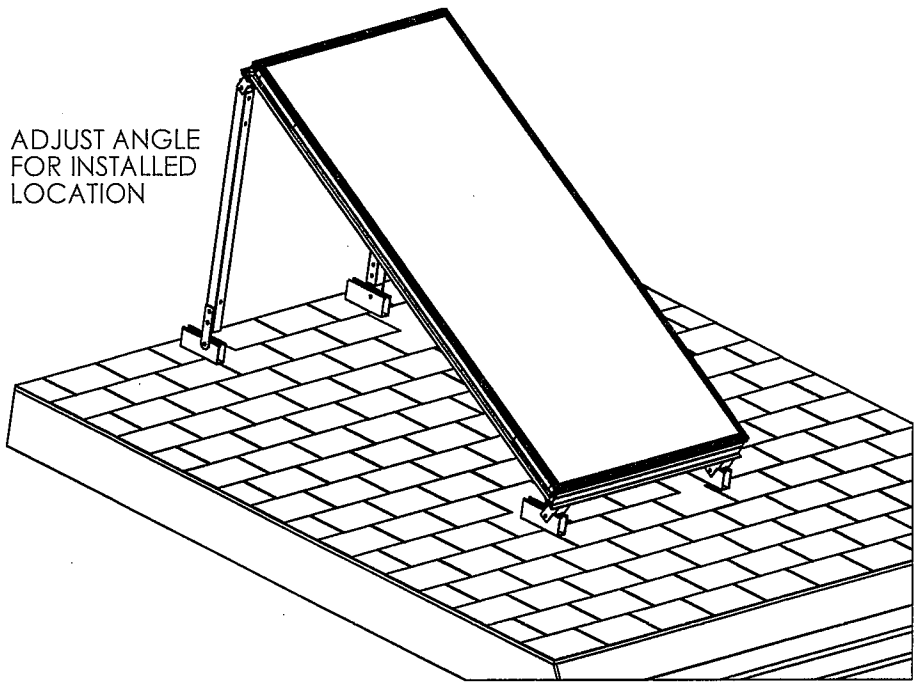


3. Drill Unistrut tall pads prior to installation. Use 1/2" galvanized threaded rod to mount to roof surface and seal well with caulking. Attach 2" X 4" backing support to spread the load between the threaded rods/pads.
4. Cut 2" X 4" brace to the depth of the roof rafters to prevent bending the roof sheeting.
5. Tighten threaded rod using appropriate nuts and washers.
6. Mount upper & lower collector mounting assembly with brackets to SolarSheat collector using 4- 1" TEK screws on the front side and 4- 11/2" TEK screws on the back side.

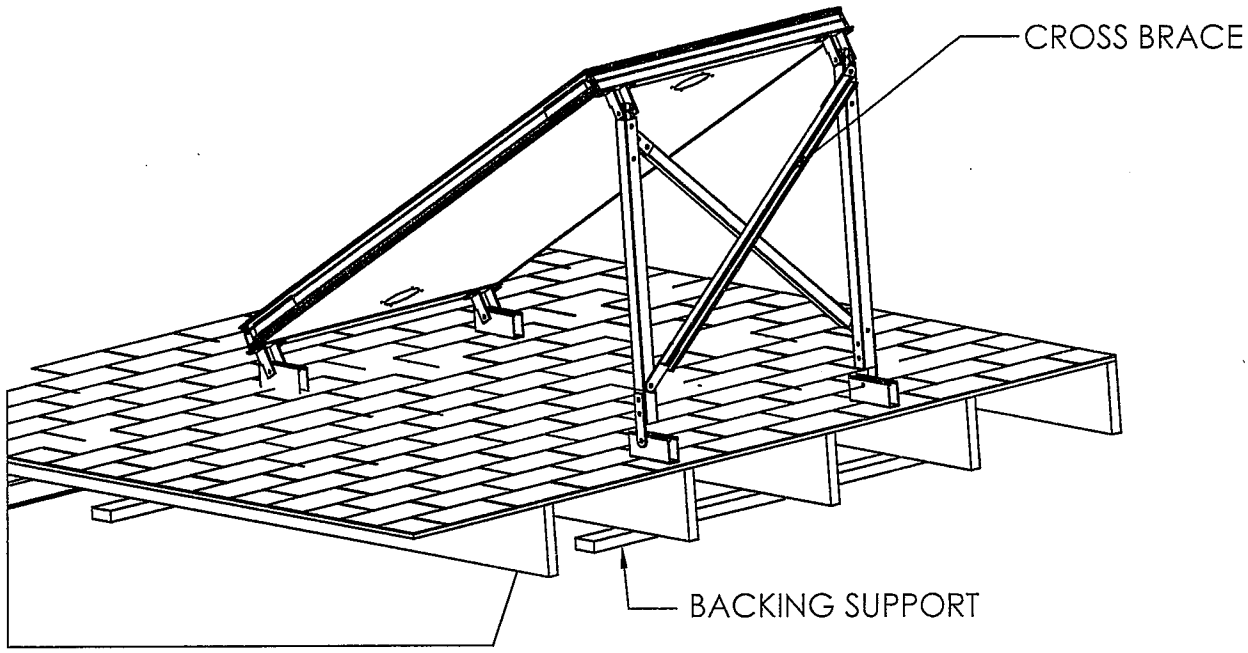


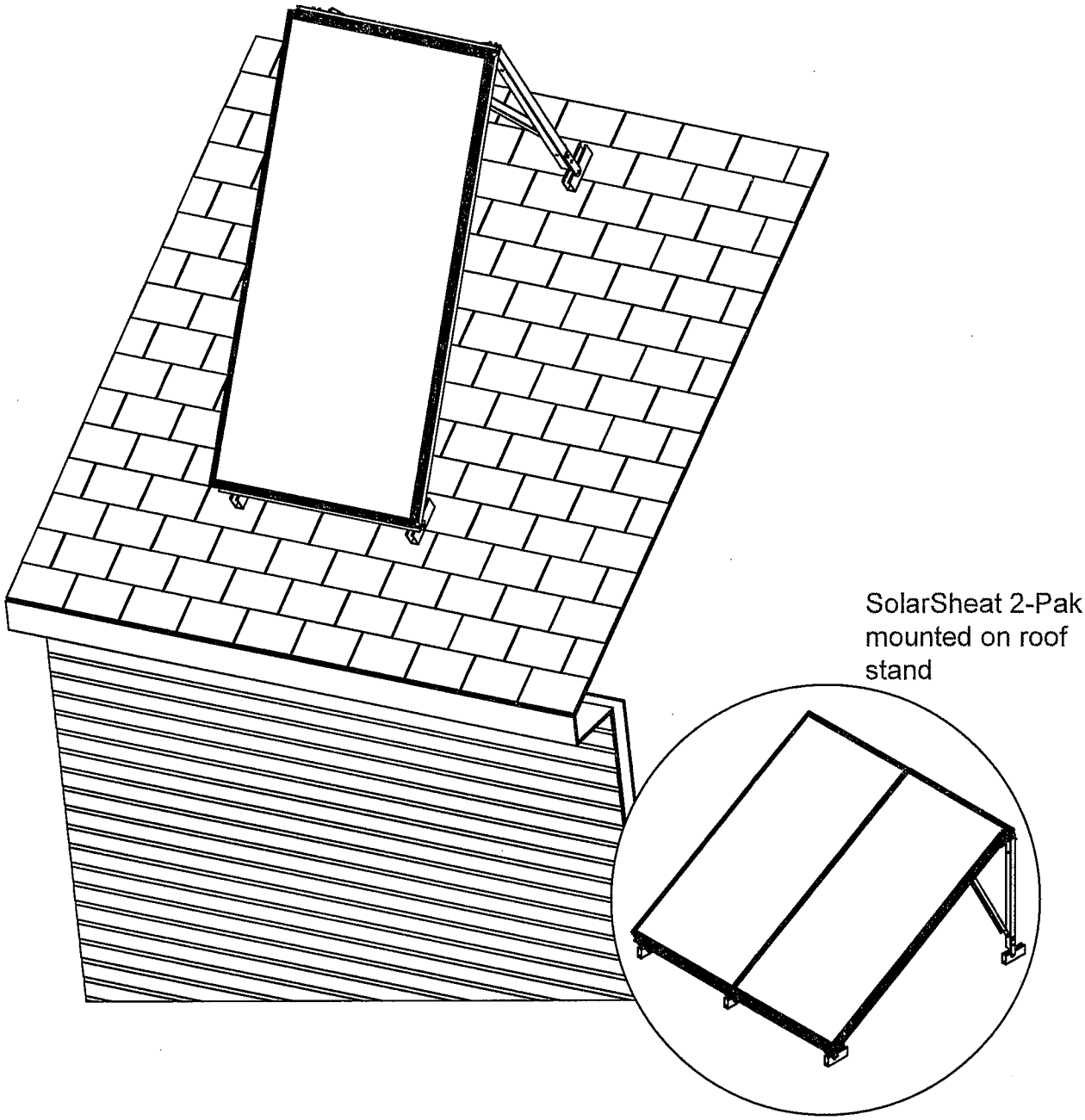


7. Mount tele-strut channels to upper collector mounting assembly using supplied hardware.
8. Temporarily attach upper tall pads to the tele-strut channels and (with some assistance) lift the collector(s) up into position.
9. Adjust angle of the collectors by adjusting the length of the tele-strut channel.
10. Locate the placement of the upper tall pads by ensuring that the struts are perpendicular to the roof surface. Mount pads to roof repeating steps 3-5.



10. Add cross braces to tele-strut channels
11. Check all fasteners to ensure they are properly secured and tight and that all roof penetrations are well sealed
12. Connect duct work and wiring as indicated in the SolarSheat Flush Roof Mount Installation Manual.





SolarSheat 2-Pak mounted on roof stand

yoursolarhome.com

299 APPLEWOOD CRESCENT , UNIT 4
VAUGHAN, ONTARIO L4K 4E7 CANADA
OFFICE: **905.669.2212**
1.866.556.5504
FAX: **905.669.2204**
E-MAIL: info@yoursolarhome.com

Congratulations! You have completed the roof stand mount installation of the SolarSheat 1000G/1500G/1500GS. We hope you enjoy many years of maintenance free solar powered heat.

WATER GAUGE & GAUGE GLASS INSTALLATION INSTRUCTIONS

INSTALLATION

Only properly trained personnel should install and maintain water gauge glass and connections. Remember to wear safety gloves and glasses during installation. Before installing, make sure all parts are free of chips and debris.

1. Apply Teflon tape or pipe dope to pipe threads. Install top gauge fitting (fitting without a drain valve) into the uppermost tapping. Wrench tighten the fitting until it is snug and the glass outlet is pointing at five o'clock (about 1/8 turn from its final downward vertical position).

2. Install the bottom gauge fitting (the fitting with a drain valve) until it is snug and the glass outlet is pointing directly upward. Verify top and bottom fittings are threaded into the tappings the same number of turns (distance A = distance B).

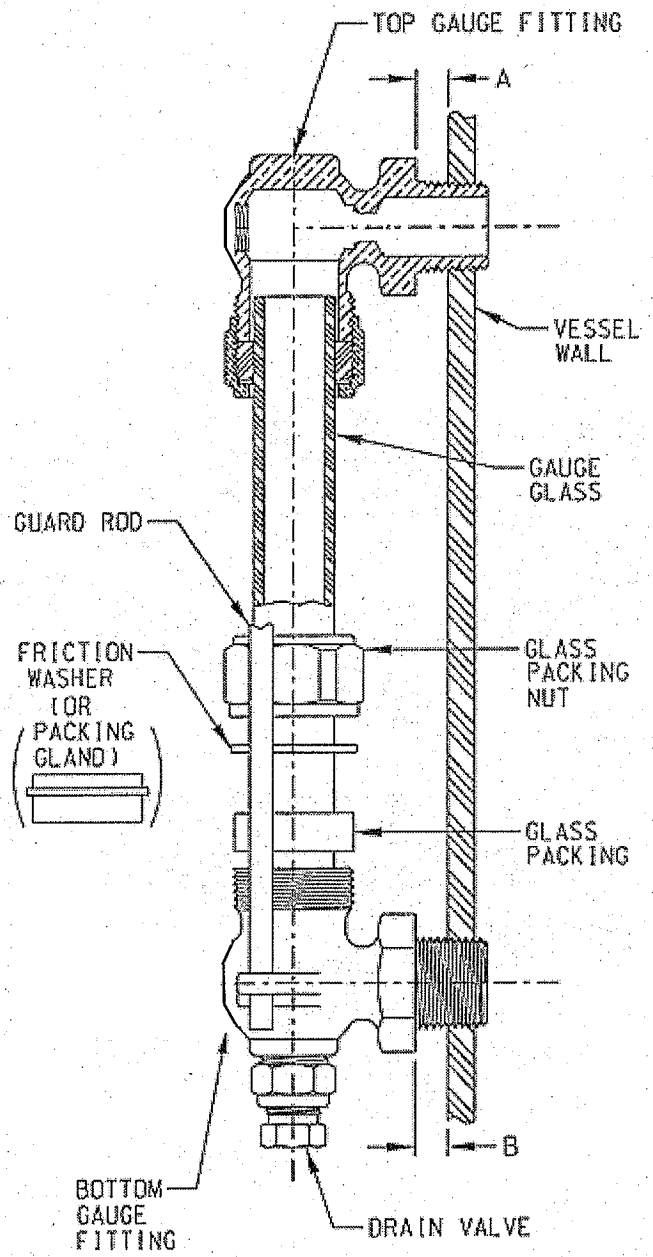
3. Remove glass packing nut, friction washer (or packing gland, depending upon the model), and glass packing from the fittings, and place them, in same order, on to both ends of the gauge glass. Push both packings about an inch up the gauge glass.

4. Gently insert one end of the glass into the top gauge fitting. Keeping the glass inside the top fitting, gently rotate the top gauge fitting clockwise until vertically aligned with the bottom gauge fitting, then insert glass into bottom fitting until glass bottoms out on the shoulder inside the bottom fitting.

5. Carefully raise glass about 1/16" and slide lower glass packing down until the glass packing contacts the lower gauge fitting. DO NOT allow the glass to remain in contact with any metal!

6. Carefully slide upper glass packing up as far as possible.

7. Hand tighten both glass packing nuts, then tighten 1/2 turn more by wrench. Tighten only enough to prevent leakage. DO NOT OVER TIGHTEN! If any leakage should occur, tighten slightly, a quarter turn at a time, checking for leakage after each turn.



WARNING: California law requires that this warning be given to the consumer. This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

WATER GAUGE GLASS

NOTICE: READ ALL WARNINGS AND INSTRUCTIONS BEFORE PERFORMING INSTALLATION OR MAINTENANCE.

WARNING!

SAFETY GLASSES AND GLOVES SHOULD BE WORN AT ALL TIMES WHEN WORKING WITH OR EXAMINING WATER GAUGE GLASS AND CONNECTIONS.

IMPROPER INSTALLATION OR MAINTENANCE OF GAUGE GLASS AND CONNECTIONS CAN CAUSE IMMEDIATE OR DELAYED BREAKAGE RESULTING IN BODILY INJURY AND/OR PROPERTY DAMAGE.

USE AND CARE

DO NOT's

DO NOT use the glass if it contains any scratches, chips, or any other visible signs of damage.

DO NOT reuse any tubular glass or glass packings.

DO NOT subject gauge glass to bending or torsional stresses.

DO NOT over tighten glass packing nuts.

DO NOT allow glass to touch any metal parts.

DO NOT exceed the recommended pressure of the gauge or gauge glass.

DO NOT clean the gauge or gauge glass while pressurized or in operation.

CONBRACO

CONBRACO INDUSTRIES, INC.
P.O. BOX 247
MATTHEWS, NORTH CAROLINA 28106
MADE IN U.S.A.

WATER GAUGE GLASS

DO's

DO verify proper gauge has been supplied.

DO examine gauge glass and packings carefully for damage before installation.

DO install protective guards and utilize automatic ball checks where necessary to help prevent injury in case of glass breakage.

DO inspect the gauge glass daily, keep maintenance records, and conduct routine replacements.

DO protect glass from sudden changes in temperatures such as drafts, water spray, etc.

MAINTENANCE

Examine the gauge glass regularly for any signs of clouding, scratching, erosion, or corrosion. The glass should be inspected daily until the need for replacement becomes apparent. This will help establish the routine inspection and routine replacement schedules.

CLEANING

Use commercial non-abrasive glass cleaners to keep the glass clean. Use diluted acids such as Hydrochloric (muriatic) acid when regular cleaners do not seem to work. Do not use wire brushes or any other abrasive materials which could scratch the glass.

INSPECTION

Examine the surface of the glass for scratches, corrosion, chips, cracks, surface flaws, or nicks. To do this, shine a very bright concentrated light at an angle of about 45 degrees. A defective glass will glisten as the light strikes imperfections. Glass which appears cloudy or roughened, and will not respond to cleaning, should be replaced.

STORING

Keep gauge glass in original packaging until ready to install.

SOLAR WARM AIR SYSTEM(S)
BUILDING "E"

PART 1 GENERAL

1.1 SUMMARY

A. Provide Solar Warm Air System(s) to provide supplementary warm air in the wintertime for Building E in St. Clair, MO, where shown on the drawings, as herein specified and as needed for complete and proper installation.

B. Related work:

1. Documents affection work of this section include, but are not necessarily limited to, General conditions, Supplementary conditions, Plumbing and Electrical sections of these specifications and manufacturer's specifications and recommended installation procedures.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work in their section.

1.3 SUBMITTALS

A. Within 30 calendar days after the contractor has received the owners "Notice to Proceed" submit:

1. Materials list of the items proposed to be provided under this section
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Shop drawings showing fabrication and installation.
4. Manufacturer's recommended installation procedures, which when approved, will become the basis for accepting or rejecting actual installation procedure.

PART 2 PRODUCTS

2.1 SOLAR WARM AIR SYSTEMS FOR BUILDING "E"

A. Where shown on the drawings, provide the following equipment or equals, approved in advance by the Architect/Owner.

1. Eight (8) – Solar Warm Air Panels (four pairs with accompany parts list)
2. Four (4) - roof mount kit (double adjustable) -- adjustable roof mount , 1 pair flashing
3. Two (2) - Delhi Blower Model 410

B. Acceptable Products:

1. G2Power Technologies, llc 105 Sunset Dr. St. Louis, MO 63042
   Ph: 1-314-839-1609 Email: sales@g2power.com

2.2 OTHER MATERIALS

1. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the contractor, subject to the approval of the Architect/Owner.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine all areas and conditions that work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades to interface with work in this section.

B. Install this work in accordance with the manufacturer's installation recommendations, these specifications and with pertinent requirements of government agencies having jurisdiction.

C. Upon completion of installation and hookup, put each operating components through at least five complete operating cycles, adjust as needed to secure optimum operation level.

PART 4 SPECIAL NOTES

4.1 COLLECTOR MOUNTING

A. To ensure proper wind loading it is suggested that the ends and middle of the Uni-Strut mounting rails are fastened directly through to the bar joists using all-thread and the penetrations properly sealed to prevent leakage. The balance of the rail can be attached using S-5 clips as appropriate. Maximum lengths of Uni-Strut should be selected to form the most continuous rail possible. Individual sections should be connected together using mechanical fasteners or welded to form one continuos rail section.

4.2 AIR FLOW

A. Systems should be ducted and fans installed according to manufacturer's installation instructions for the Delhi Model 410 fan. Ducting and blower mounting are the same as for Building A warehouse.

4.3 ROOF PENETRATIONS

Roof penetrations to connect ductwork to Solar Collector Array should be done in accordance with roofing contractor and roofing manufacturer's instructions to insure proper sealing of the penetrations have been achieved.

END OF SECTION

SOLAR HOT WATER SYSTEM
FOR DOMESTIC HOT WATER SUPPLY

PART 1 GENERAL

1.1 SUMMARY

A. Provide Solar Hot Water System to provide hot water for self-service wash bay equipment, where shown on the drawings, as herein specified and as needed for complete and proper installation.

B. Related work:

1. Documents affection work of this section include, but are not necessarily limited to, General conditions, Supplementary conditions, Plumbing and Electrical sections of these specifications and manufacturer's specifications and recommended installation procedures.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work in their section.

1.3 SUBMITTALS

A. Within 30 calendar days after the contractor has received the owners "Notice to Proceed" submit:

1. Materials list of the items proposed to be provided under this section
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Shop drawings showing fabrication and installation.
4. Manufacturer's recommended installation procedures, which when approved, will become the basis for accepting or rejecting actual installation procedure.

PART 2 PRODUCTS

2.1 SOLAR HOT WATER SYSTEM FOR SELF SERVICE WASH BAY EQUIPMENT

A. Where shown on the drawings, provide the following equipment or equals, approved in advance by the Architect/Owner.

1. One (1) - 80 gallon Storage tank with internal wrap around heat exchanger and 4500 watt electric heating element - Rheem Model # 81V80HE-1 or similar
2. One (1) - 10 Gallon drain back reservoir tank with sight glass and pressure relief valve.
3. One (1) - Eagle 2 Sun Controller, Differential Temperature Controller - IMC Instruments Inc. Product # SOLR-2EHW-20 With Conduit Holes for Hard Wiring or Product # SOLR-2ELC-10, -15 With Line Cord &Receptacle or similar. With line cord & receptacle - 10 Amp SOLR-2ELC-10 15 Amp SOLR-2ELC-15 With conduit holes for permanent wiring - 20 Amp SOLR-2EHW-20 30 Amp SOLR-2EHW-30
3. Two (2) - THERMISTOR TEMPERATURE SENSORS RATED TO 400 degrees F - Bolt-on style: SOLR-TS02
4. One (1) Taco 009 circulation pump or similar
5. Four (4) – 4 foot by 8 foot flat plate solar collectors AE-32 or similar. Working pressure 165 psi, Flow rate 0.5 to 1.8 GPM (recommended) including rack mount and stilt kit, mounting hardware for mounting solar collectors to roof.

B. Acceptable Products:

1. G2Power Technologies, llc 105 Sunset Dr. St. Louis, MO 63042
Ph: 1-314-839-1609 Email: sales@g2power.com

2.2 OTHER MATERIALS

1. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the contractor, subject to the approval of the Architect/Owner. See Plumbing Plans.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine all areas and conditions that work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades to interface with work in this section.
B. Install this work in accordance with the manufacturer's installation recommendations, these specifications and with pertinent requirements of government agencies having jurisdiction.
C. Upon completion of installation and hookup, put each operating components through at least five complete operating cycles, adjust as needed to secure optimum operation level.

3.3 ROOF PENETRATIONS

Roof penetrations to connect ductwork to Solar Collector Array should be done in accordance with roofing contractor and roofing manufacturer's instructions to insure proper sealing of the penetrations have been achieved.

END OF SECTION

SOLAR HOT WATER SYSTEM
FOR SELF-SERVE WASH BAY EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Provide Solar Hot Water System to provide hot water for self-service wash bay equipment, where shown on the drawings, as herein specified and as needed for complete and proper installation.

B. Related work:

1. Documents affection work of this section include, but are not necessarily limited to, General conditions, Supplementary conditions, Plumbing and Electrical sections of these specifications and manufacturer's specifications and recommended installation procedures.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work in their section.

1.3 SUBMITTALS

A. Within 30 calendar days after the contractor has received the owners "Notice to Proceed" submit:

1. Materials list of the items proposed to be provided under this section
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Shop drawings showing fabrication and installation.
4. Manufacturer's recommended installation procedures, which when approved, will become the basis for accepting or rejecting actual installation procedure.

PART 2 PRODUCTS

2.1 SOLAR HOT WATER SYSTEM FOR SELF SERVICE WASH BAY EQUIPMENT

A. Where shown on the drawings, provide the following equipment or equals, approved in advance by the Architect/Owner.

1. One (1) - 120 gallon Storage tank with internal wrap around heat exchanger and 4500 watt electric heating element - Rheem Model # 82V120HE-1 or similar
2. One (1) - 10 Gallon drain back reservoir tank with sight glass and pressure relief valve.
3. One (1) - Eagle 2 Sun Controller, Differential Temperature Controller - IMC Instruments Inc. Product # SOLR-2EHW-20 With Conduit Holes for Hard Wiring or Product # SOLR-2ELC-10, -15 With Line Cord &Receptacle or similar. With line cord & receptacle - 10 Amp SOLR-2ELC-10 15 Amp SOLR-2ELC-15 With conduit holes for permanent wiring - 20 Amp SOLR-2EHW-20 30 Amp SOLR-2EHW-30
3. Two (2) - THERMISTOR TEMPERATURE SENSORS RATED TO 400 degrees F - Bolt-on style: SOLR-TS02
4. One (1) Taco 009 circulation pump or similar
5. Four (4) – 4 foot by 8 foot flat plate solar collectors AE-32 or similar. Working pressure 165 psi, Flow rate 0.5 to 1.8 GPM (recommended) including rack mount and stilt kit, mounting hardware for mounting solar collectors to roof.

B. Acceptable Products:

1. G2Power Technologies, llc 105 Sunset Dr. St. Louis, MO 63042
Ph: 1-314-839-1609 Email: sales@g2power.com

2.2 OTHER MATERIALS

1. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the contractor, subject to the approval of the Architect/Owner. See Plumbing Plans.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine all areas and conditions that work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades to interface with work in this section.
B. Install this work in accordance with the manufacturer's installation recommendations, these specifications and with pertinent requirements of government agencies having jurisdiction.
C. Upon completion of installation and hookup, put each operating components through at least five complete operating cycles, adjust as needed to secure optimum operation level.

3.3 ROOF PENETRATIONS

Roof penetrations to connect ductwork to Solar Collector Array should be done in accordance with roofing contractor and roofing manufacturer's instructions to insure proper sealing of the penetrations have been achieved.

END OF SECTION

SOLAR WARM AIR SYSTEM(S)
BUILDING "A" – WAREHOUSE & OFFICE SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Provide Solar Warm Air System(s) to provide supplementary warm air in the wintertime for warehouse and offices in Building A in St. Clair, MO, where shown on the drawings, as herein specified and as needed for complete and proper installation.

B. Related work:

1. Documents affection work of this section include, but are not necessarily limited to, General conditions, Supplementary conditions, Plumbing and Electrical sections of these specifications and manufacturer's specifications and recommended installation procedures.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work in their section.

1.3 SUBMITTALS

A. Within 30 calendar days after the contractor has received the owners "Notice to Proceed" submit:

1. Materials list of the items proposed to be provided under this section
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Shop drawings showing fabrication and installation.
4. Manufacturer's recommended installation procedures, which when approved, will become the basis for accepting or rejecting actual installation procedure.

PART 2 PRODUCTS

2.1 SOLAR WARM AIR SYSTEMS FOR BUILDING "A" WAREHOUSE & OFICES

A. Where shown on the drawings, provide the following equipment or equals, approved in advance by the Architect/Owner.

1. Forty (40) – Solar Warm Air Panels
2. Eighty (80) - Collar 5" black plastic
3. Twenty (20) - roof mount kit (double adjustable) -- adjustable roof mount , 1 pair flashing
4. Six (6) - White Rogers Thermostat
5. Six (6) – SP Control System, includes SPDT fan control, sensor, wire, reostat
6. Six (6) - sensor (heat) c-106-158+/-020H
7. Seven (7) - Delhi Blower Model 410
8. Twenty (2) - Backdraft damper 6" round

B. Acceptable Products:

1. G2Power Technologies, llc 105 Sunset Dr. St. Louis, MO 63042
   Ph: 1-314-839-1609 Email: sales@g2power.com

2.2 OTHER MATERIALS

1. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the contractor, subject to the approval of the Architect/Owner.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine all areas and conditions that work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades to interface with work in this section.
B. Install this work in accordance with the manufacturer's installation recommendations, these specifications and with pertinent requirements of government agencies having jurisdiction.
C. Upon completion of installation and hookup, put each operating components through at least five complete operating cycles, adjust as needed to secure optimum operation level.

PART 4 SPECIAL NOTES

4.1 COLLECTOR MOUNTING

A. To ensure proper wind loading it is suggested that the ends and middle of the Uni-Strut mounting rails are fastened directly through to the bar joists using all-thread and the penetrations properly sealed to prevent leakage. The balance of the rail can be attached using S-5 clips as appropriate. Maximum lengths of Uni-Strut should be selected to form the most continuous rail possible. Individual sections should be connected together using mechanical fasteners or welded to form one continuos rail section.

4.2 AIR FLOW

A. Normal operation for Solar Warm Air collectors is to push the air through them. However, in such a large array it will be necessary to suck or draw the air through them to maintain the pressure for directing the heat towards the floor of the structure and for the office space ducting. The Delhi fan should be attached to the exhaust outlet of the sub-arrays and the air pulled or drawn through the collectors. The return ducting for each sub-array should be drawn from the ceiling area, in the warehouse, through filtration in order to prevent dust from entering the system.
B. The office space return air will be drawn from the ceiling area plenum using a separate blower from the blower used to direct heated exhaust air in to the ducting and as such does not require the same filtration system be added. The warehouse filtration system will necessitate an onsite design to be created, to accommodate this feature. The Delhi fan should then be used to pull the air through the collectors. In the warehouse arrays, the exhaust ducting should be left open and pointed directly towards to floor in order to obtain the greatest diffusion of heated air in to the space.

4.3 ROOF PENETRATIONS

Roof penetrations to connect ductwork to Solar Collector Array should be done in accordance with roofing contractor and roofing manufacturer's instructions to insure proper sealing of the penetrations have been achieved.

END OF SECTION

SOLAR HOT WATER SYSTEM
FOR SELF-SERVE WASH BAY EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Provide Solar Hot Water System to provide hot water for self-service wash bay equipment, where shown on the drawings, as herein specified and as needed for complete and proper installation.

B. Related work:

1. Documents affection work of this section include, but are not necessarily limited to, General conditions, Supplementary conditions, Plumbing and Electrical sections of these specifications and manufacturer's specifications and recommended installation procedures.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work in their section.

1.3 SUBMITTALS

A. Within 30 calendar days after the contractor has received the owners "Notice to Proceed" submit:

1. Materials list of the items proposed to be provided under this section
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Shop drawings showing fabrication and installation.
4. Manufacturer's recommended installation procedures, which when approved, will become the basis for accepting or rejecting actual installation procedure.

PART 2 PRODUCTS

2.1 SOLAR HOT WATER SYSTEM FOR SELF SERVICE WASH BAY EQUIPMENT

A. Where shown on the drawings, provide the following equipment or equals, approved in advance by the Architect/Owner.

1. One (1) - 120 gallon Storage tank with internal wrap around heat exchanger and 4500 watt electric heating element - Rheem Model # 82V120HE-1 or similar
2. One (1) - 10 Gallon drain back reservoir tank with sight glass and pressure relief valve.
3. One (1) - Eagle 2 Sun Controller, Differential Temperature Controller - IMC Instruments Inc. Product # SOLR-2EHW-20 With Conduit Holes for Hard Wiring or Product # SOLR-2ELC-10, -15 With Line Cord &Receptacle or similar. With line cord & receptacle - 10 Amp SOLR-2ELC-10 15 Amp SOLR-2ELC-15 With conduit holes for permanent wiring - 20 Amp SOLR-2EHW-20 30 Amp SOLR-2EHW-30
3. Two (2) - THERMISTOR TEMPERATURE SENSORS RATED TO 400 degrees F - Bolt-on style: SOLR-TS02
4. One (1) Taco 009 circulation pump or similar
5. Four (4) – 4 foot by 8 foot flat plate solar collectors AE-32 or similar. Working pressure 165 psi, Flow rate 0.5 to 1.8 GPM (recommended) including rack mount and stilt kit, mounting hardware for mounting solar collectors to roof.

B. Acceptable Products:

1. G2Power Technologies, llc 105 Sunset Dr. St. Louis, MO 63042
Ph: 1-314-839-1609 Email: sales@g2power.com

2.2 OTHER MATERIALS

1. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the contractor, subject to the approval of the Architect/Owner. See Plumbing Plans.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine all areas and conditions that work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

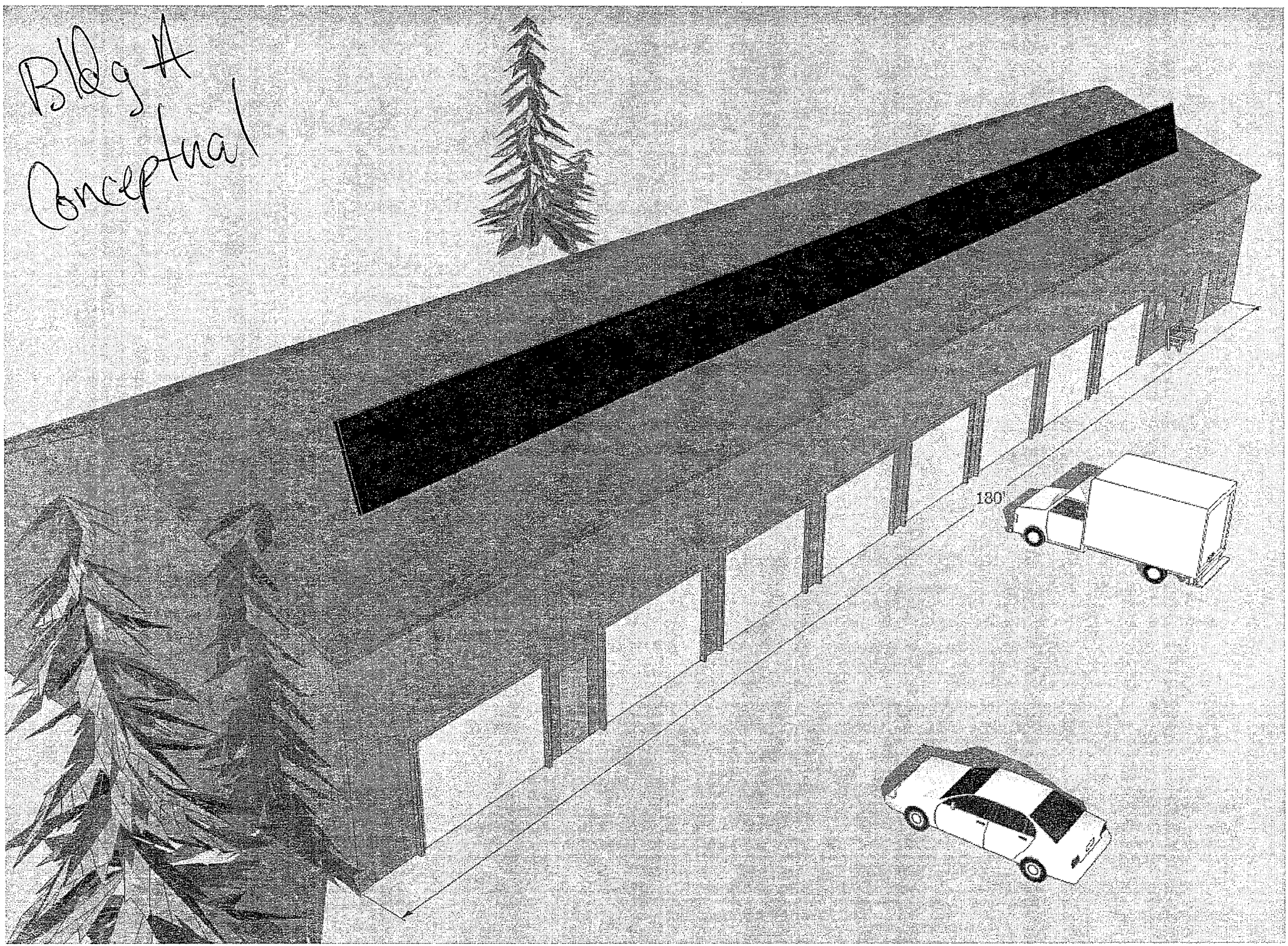
3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades to interface with work in this section.
B. Install this work in accordance with the manufacturer's installation recommendations, these specifications and with pertinent requirements of government agencies having jurisdiction.
C. Upon completion of installation and hookup, put each operating components through at least five complete operating cycles, adjust as needed to secure optimum operation level.

3.3 ROOF PENETRATIONS

Roof penetrations to connect ductwork to Solar Collector Array should be done in accordance with roofing contractor and roofing manufacturer's instructions to insure proper sealing of the penetrations have been achieved.

END OF SECTION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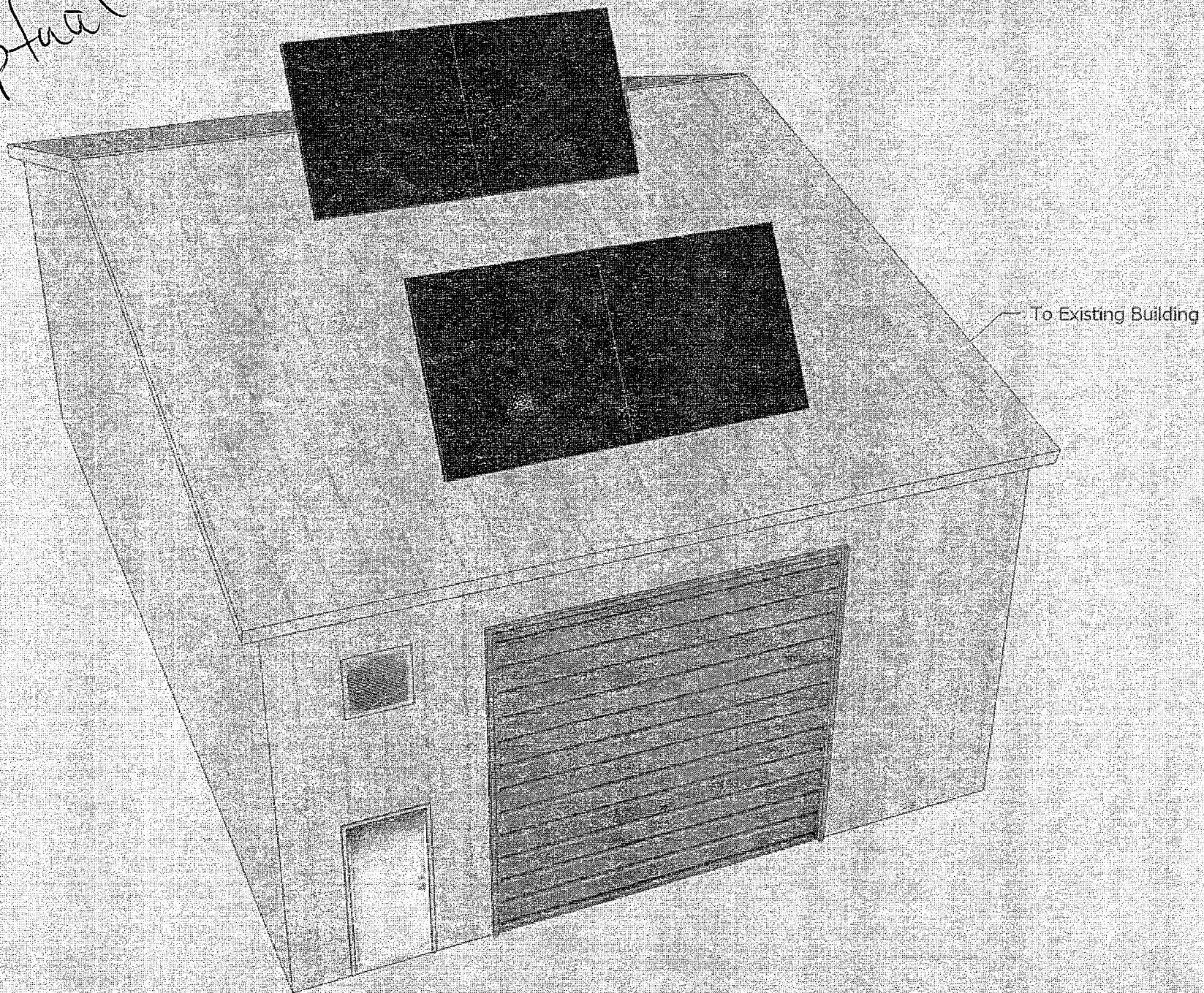

Missouri
Division of Labor Standards

WAGE AND HOUR SECTION

JEREMIAH W. (JAY) NIXON, Governor

Annual Wage Order No. 16

Section 036

FRANKLIN COUNTY

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

Original Signed by
Carla Buschjost Director
Division of Labor Standards

This Is A True And Accurate Copy Which Was Filed With The Secretary of State: **March 10, 2009**

Last Date Objections May Be Filed: **April 9, 2009**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Effective Date of Increase	*	Basic Hourly Rates	Over-Time Schedule	Holiday Schedule	Total Fringe Benefits
Asbestos Worker			$32.91	55	60	$15.46
Boilermaker			$32.30	57	7	$19.80
Bricklayers-Stone Mason	6/09		$29.75	72	5	$17.11
Carpenter	5/09	d	$32.48	77	41	$11.65
Cement Mason	5/09		$28.58	80	6	$13.51
Electrician (Inside Wireman)	6/09		$33.60	82	71	$7.96 + 42.5%
Communication Technician			$29.00	44	47	$6.78 + 29.25%
Elevator Constructor		a	$39.715	26	54	$19.715
Operating Engineer						
Group I			$28.17	3	66	$17.29
Group II			$28.17	3	66	$17.29
Group III			$22.81	3	66	$17.29
Group III-A			$28.17	3	66	$17.29
Group IV			$22.81	3	66	$17.29
Group V			$22.81	3	66	$17.29
Pipe Fitter			$33.00	91	69	$19.68
Glazier			$30.81	87	31	$18.13 + 13.2%
Laborer (Building):						
General		c	$24.56	113	3	$8.59
First Semi-Skilled		b	$24.76	113	3	$8.59
Second Semi-Skilled		b	$24.76	113	3	$8.59
Lather			USE CARPENTER RATE			
Linoleum Layer & Cutter	5/09		$28.43	92	26	$11.40
Marble Mason	5/09		$29.29	76	51	$11.56
Millwright	5/09		$32.48	77	41	$11.65
Iron Worker			$29.98	11	8	$16.875
Painter			$29.58	104	12	$10.51
Plasterer			$27.36	67	3	$12.60
Plumber			$33.00	91	69	$19.68
Pile Driver			USE CARPENTER RATE			
Roofer			$28.00	15	73	$13.75
Sheet Metal Worker			$33.77	32	25	$19.22
Sprinkler Fitter			$30.59	33	19	$14.30
Terrazzo Worker	4/09		$29.25	116	5	$10.13
Tile Setter	5/09		$29.29	76	51	$11.56
Truck Driver-Teamster						
Group I	5/09	***e	$28.625	35	36	$8.65
Group II	5/09	***e	$28.735	35	36	$8.65
Group III	5/09	***e	$28.775	35	36	$8.65
Group IV	5/09	***e	$28.845	35	36	$8.65
Traffic Control Service Driver	5/09		$28.775	22	55	$9.045
Welders-Acetylene & Electric		*				

Fringe Benefit Percentage is of the Basic Hourly Rate

Attention Workers: If you are not being paid the appropriate wage rate and fringe benefits contact the Division of Labor Standards at (573) 751-3403.

**Annual Incremental Increase

*** Due to a clerical error, the Footnote "e" for Truck Driver - Teamster was inadvertently left out of the Footnote column.

OCCUPATIONAL TITLE	*Effective Date of Increase	Basic Hourly Rates	Over-Time Schedule	Holiday Schedule	Total Fringe Benefits

* Welders receive rate prescribed for the occupational title performing operation to which welding is incidental.

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

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

a - Vacation: Employees over 5 years - 8%; Employees under 5 years - 6%
b - Projects over $500,000 - $24.56; Projects under $500,000 - $23.06
c - Projects over $500,000 - $24.76; Projects under $500,000 - $23.26
**d - Projects over $1 Million - $32.48; Projects under $1 Million - $27.39
**e - Group I:
Projects over $3 3/4 Million - $28.625
Projects under $3 3/4 Million - $25.125
Group II:
Projects over $3 3/4 Million - $28.735
Projects under $3 3/4 Million - $25.235
Group III:
Projects over $3 3/4 Million - $28.775
Projects under $3 3/4 Million - $25.275
Group IV:
Projects over $3 3/4 Million - $28.845
Projects under $3 3/4 Million - $25.345

REPLACEMENT PAGE
FRANKLIN COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION

FED: Minimum requirement per Fair Labor Standards Act means time and one-half (1 ½) shall be paid for all work in excess of forty (40) hours per work week.

NO. 3: Means the regular workday shall consist of eight (8) consecutive hours, exclusive of a thirty (30) minute lunch period, with pay at the straight time rate. The regular workday shall begin between the hours of 6:00 a.m. and 9:00 a.m. The Employer may have the option to schedule the work week from Monday through Thursday at ten (10) hours per day at the straight time rate of pay with all hours in excess of ten (10) hours in any one day to be paid at the applicable overtime rate. If the Employer elects to work from Monday through Thursday and is stopped due to inclement weather, holiday or other conditions beyond the control of the Employer, they shall have the option to work Friday at the straight time rate of pay to complete the forty (40) hours for the workweek. All overtime work performed on Monday through Saturday shall be paid at time and one-half (1½) the hourly rate plus an amount equal to one-half (½) of the hourly Total Indicated Fringe Benefits. All work performed on Sundays and recognized holidays shall be paid at double (2) the hourly rate plus an amount equal to the hourly Total Indicated Fringe Benefits. Shifts may be established when considered necessary by the Employer. Shift hours and rates will be as follows. If shifts are established, work on the First Shift will begin between 6:00 a.m. and 9:00 a.m. and consist of eight (8) hours of work plus one-half hour unpaid lunch. Hours worked during the first shift will be paid at the straight time rate of pay. The second shift shall start eight hours after the start of the first shift and consist of eight (8) hours of work plus one-half hour unpaid lunch. Work on the second shift will begin between 2:00 p.m. and 5:00 p.m. and be paid the straight time rate plus $2.50 per hour. The third shift shall start eight hours after the start of the second shift and consist of eight (8) hours plus one-half hour unpaid lunch. Work on the third shift will begin between 10:00 p.m. and 1:00 a.m. and be paid the straight time rate plus $3.50 per hour. The additional amounts that are to be paid are only applicable when working shifts. Shifts that begin on Saturday morning through those shifts which end on Sunday morning will be paid at time and one-half these rates. Shifts that begin on Sunday morning through those shifts which end on Monday morning will be paid at double time these rates.

NO. 11: Means eight (8) hours shall constitute a day's work, with the starting time to be established between 6:00 a.m. and 8:00 a.m. from Monday to Friday. Time and one-half (1½) shall be paid for first two (2) hours of overtime Monday through Friday and the first eight (8) hours on Saturday. All other overtime hours Monday through Saturday shall be paid at double (2) time rate. Double (2) time shall be paid for all time on Sunday and recognized holidays or the days observed in lieu of these holidays.

NO. 15: Means the regular working day shall be scheduled to consist of at least eight (8) hours, but no more than ten (10) consecutive hours, exclusive of the lunch period. The regular working day may be scheduled to commence at any time between the hours of 5:00 a.m. and 10:00 a.m. All work performed in excess of forty (40) hours in one work week, or in excess of ten (10) hours in one work day shall be paid at the rate of one and one-half (1½) times the regular hourly wage scale. Any work performed on a Saturday shall be paid for at the rate of one and one-half (1½) times the regular hourly wage scale unless such Saturday work falls under the category of Saturday Make-Up Day. Any work performed by Employees anywhere on Sunday or recognized holidays, shall be paid for at the rate of double (2) time the regular wage scale. If, during the course of a work week, an Employee is unable to work for any reason, and, as a result, that Employee has not accumulated forty (40) hours of compensable time at the straight time rate, the Employer, at his option may offer the Employee the opportunity to work on Saturday at straight time; provided, however, if during the period worked by said Employee on Saturday, the Employee's compensable time at the straight time rate exceeds forty (40) hours, all time worked in excess of the forty (40) hours will be paid at the rate of one and one-half (1½) times the regular hourly wage scale.

NO. 22: Means a regular work week of forty (40) hours will start on Monday and end on Friday. The regular work day shall be either eight (8) or ten (10) hours. If a crew is prevented from working forty (40) hours Monday through Friday, or any part thereof by reason of inclement weather, Saturday or any part thereof may be worked as a make-up day at the straight time rate. Employees who are part of a regular crew on a make-up day, notwithstanding the fact that they may not have been employed the entire week, shall work Saturday at the straight time rate. A workday is to begin between 6:00 a.m. and 9:00 a.m. However, the project starting time may be advanced or delayed if mutually agreed to by the interest parties. For all time worked on recognized holidays, or days observed as such, double (2) time shall be paid.

REPLACEMENT PAGE
FRANKLIN COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION

NO. 26: Means that the regular working day shall consist of eight (8) hours worked between 6:00 a.m., and 5:00 p.m., five (5) days per week, Monday to Friday, inclusive. Hours of work at each jobsite shall be those established by the general contractor and worked by the majority of trades. (The above working hours may be changed by mutual agreement). Work performed on Construction Work on Saturdays, Sundays and before and after the regular working day on Monday to Friday, inclusive, shall be classified as overtime, and paid for at double (2) the rate of single time. The employer may establish hours worked on a jobsite for a four (4) ten (10) hour day work week at straight time pay for construction work; the regular working day shall consist of ten (10) hours worked consecutively, between 6:00 a.m. and 6:00 p.m., four (4) days per week, Monday to Thursday, inclusive. Any work performed on Friday, Saturday, Sunday and holidays, and before and after the regular working day on Monday to Thursday where a four (4) ten (10) hour day workweek has been established, will be paid at two times (2) the single time rate of pay. The rate of pay for all work performed on holidays shall be at two times (2) the single time rate of pay.

NO. 32: The regular working day shall consist of seven and one-half (7½) hours of labor on the job between eight (8) a.m. and four (4) p.m. and the regular working week shall consist of five (5) consecutive seven and one-half (7½) hour day's of labor on the job beginning with Monday and ending with Friday of each week. The normal work week is 37½ hours. All full-time or part-time labor performed during such hours shall be recognized as regular working hours and paid for at the regular hourly rate. **All work performed during regular work hours on Saturdays shall be paid at time and one-half (1-1/2).** All work performed outside of regular working hours and performed during the regular work week, shall be at double (2) times the regular rate, except that the first two (2) hours following the regular work day shall be paid at one and one-half (1½) times the regular rate. And, a flexible starting time as early as 7:00 a.m. may be implemented when mutually agreed upon by the interested parties. An early starting time of 6:00 a.m. may be used during summer months to avoid excessive afternoon temperatures. This early starting time to be used when mutually agreed upon by the interested parties. All work performed on recognized holidays and Sundays shall be paid double (2) time. Appropriate overtime rates to be based on fifteen minute increments.

NO. 33: Means the standard work day and week shall be eight (8) consecutive hours of work between the hours of 6:00 a.m. and 6:00 p.m., excluding the lunch period Monday through Friday, or shall conform to the practice on the job site. Four (4) days at ten (10) hours a day may be worked at straight time, Monday through Friday and need not be consecutive. All overtime, except for Sundays and holidays shall be at the rate of time and one-half (1½). Overtime worked on Sundays and holidays shall be at double (2) time.

NO. 35: Means a regular work week of forty (40) hours, will start on Monday and end on Friday. The regular work day shall be either eight (8) or ten (10) hours. If a crew is prevented from working forty (40) hours Monday through Friday, or any part thereof by reason of inclement weather, Saturday or any part thereof maybe worked as a make-up day at the straight time rate. Employees who are part of a regular crew on a make-up day, notwithstanding the fact that they may not have been employed the entire week, shall work Saturday at the straight time rate. A work day is to begin between 6:00 a.m. and 9:00 a.m. However, the project starting time maybe advanced or delayed if mutually agreed to by the interested parties. For all time worked on recognized holidays, or days observed as such, double (2) time shall be paid.

NO. 44: Means forty (40) hours shall constitute a work week, Monday through Friday. Eight (8) hours shall constitute a work day. Hours of work shall be between the hours of 7:00 a.m. and 4:30 p.m. All work performed before 7:00 a.m. and after 4:30 p.m. and all work performed in excess of eight (8) hours in any one work day, over forty (40) hours in any work week and the first eight (8) hours of work on Saturday, shall be paid at the rate of one & one-half (1½) times the regular rate of pay. All hours worked in excess of eight (8) hours on Saturday, all hours worked on Sunday and on holidays, or days that may be celebrated as such, and as designated by the federal government, shall be paid at two (2) times the regular rate of pay. All shifts for work performed between the hours of 4:30 p.m. and 12:30 a.m. shall receive eight (8) hours pay at the regular hourly rate of pay plus ten percent (10%) additional for seven and one-half (7½) hours work. The ten percent (10%) differential shall apply to the basic pay rate and the percentage fringe benefit rates. All work performed between the hours of 12:30 a.m. and 8:00 a.m. on a third shift shall receive eight (8) hours pay for seven (7) hours work at the regular hourly rate plus fifteen percent (15%) differential shall apply for the basic pay rate and the percentage fringe benefit rates. All overtime work required after the completion of a regular shift shall be paid at one and one-half times (1½ x) the "shift" hourly rate.

REPLACEMENT PAGE
FRANKLIN COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION

NO. 55: Means the regular work day shall be eight (8) hours between 6:00 a.m. and 4:30 p.m. The first two (2) hours of work performed in excess of the eight (8) hour work day, Monday through Friday, and the first ten (10) hours of work on Saturday, shall be paid at one & one-half (1½) times the straight time rate. All work performed on Sunday, observed holidays and in excess of ten (10) hours a day, Monday through Saturday, shall be paid at double (2) the straight time rate.

NO. 57: Means eight (8) hours per day shall constitute a day's work and forty (40) hours per week, Monday through Friday, shall constitute a week's work. The regular starting time shall be 8:00 a.m. The above may be changed by mutual consent of authorized personnel. When circumstances warrant, the Employer may change the regular workweek to four (4) ten-hour days at the regular time rate of pay. It being understood that all other pertinent information must be adjusted accordingly. All time worked before and after the established workday of eight (8) hours, Monday through Friday, all time worked on Saturday, shall be paid at the rate of time and one-half (1½) except in cases where work is part of an employee's regular Friday shift. All time worked on Sunday and recognized holidays shall be paid at the double (2) time rate of pay.

NO. 67: Means eight (8) hours shall constitute a day's work, with a flexible starting time to begin between 6:00 a.m. to 8:00 a.m., five (5) days a week, Monday through Friday. Any work over eight (8) hours in any one day shall be at the overtime rate, which is time & one-half (1½). Any work on Saturday shall be at time & one-half (1½), unless a Make-Up Day due to inclement weather is in effect. Any work on Sundays or holidays shall be at double (2) time. Four (4) days, ten (10) hours each day to be worked during Monday through Friday, shall be paid at straight time. A Make-Up Day Due To Inclement Weather Only - Employee(s) will be permitted to work an eight (8) hour make-up day on Saturday only, and the employee will receive the regular straight time wage rate. To be eligible for this eight (8) hour make-up day, the employee cannot have worked over thirty-two (32) hours for that particular workweek Monday through Friday. Any hours less than eight (8) hours may not be made up under this provision.

NO. 72: Means that except as is otherwise provided herein, the work week shall be determined to begin at 8:00 a.m. Wednesday and end at 4:30 p.m. on the following Tuesday. Except as herein provided, working hours are from 8:00 a.m. to 11:55 a.m. and 12:30 p.m. to 4:25 p.m. and no more than the regular hours shall be worked during the forenoon or afternoon at the regular rate. In the case of days of inclement weather starting time and quitting time may be adjusted so long as the hours worked on such days do not exceed eight (8) and do not extend beyond 4:30 p.m. In circumstances where the Employee or Employees have regularly been working overtime on a particular day or days, no adjustment in the starting time shall operate to deprive Employees of overtime pay, which they would have otherwise received but for the change in the starting time. The parties understand that the application of the provisions of the preceding sentence will result in Employees receiving overtime pay even where they have not worked more than with (8) hours on a particular day. Regardless of the staring time, the forenoon working hours shall end at 11:55 a.m. and the afternoon working hours shall begin at 12:30 p.m. and end 8 hours and 25 minutes after the staring time fixed by the Employer for forenoon hours. Work performed by an employee on a non-holiday Saturday, except as hereinafter provided, or at night or before or after regular working hours on a non-holiday weekday, shall be considered overtime work, for which Employees working during such time shall be paid at the rate of one and one-half (1½) times their regular hourly wage rate for each hour or fraction thereof, worked during such time. Work performed on a Sunday or the recognized holidays shall be considered overtime work for which the Employee shall be paid twice the amount of his or her regular hourly wage rate for each hour or fraction thereof worked on any such day.

NO. 76: Means the standard workday shall consist of eight (8) hours of work between the hours of 8:00 a.m. and 4:30 p.m. with a thirty (30) minute unpaid lunch hour occurring in the middle of the shift. The standard workweek shall consist of five standard workdays commencing on Monday and ending on Friday. The normal starting and quitting times may be changed by mutual consent of interested parties. All time worked before and after the established eight (8) hour workday, Monday through Friday, and all time worked on Saturday, shall be paid for at the rate of time & one-half (1½) the hourly base wage rate in effect. All time worked on Sunday and holidays shall be paid at the rate of double (2) the hourly wage in effect. All work done on Saturday will be done at time & one-half (1½), unless Saturday shall be used as a make-up day. If an employee should lose one or more days in a work week and use Saturday as a make-up day the pay shall be at the regular hourly base wage rate and benefits.

REPLACEMENT PAGE
FRANKLIN COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION

NO. 77: Means the regular workday shall consist of eight (8) consecutive hours, exclusive of a thirty (30) minute lunch period, with pay at the regular straight time hourly rate. The regular workday shall begin on the job site between the hours of 6:00 a.m. and 8:00 a.m. with the starting time to be determined by the Employer, unless project owner requires different starting time. This adjustable starting time can, at the Employer's option, be staggered to permit starting portions of the work force at various times within the prescribed hours. The Employer may establish a four (4) ten (10) hour shift exclusive of the thirty (30) minute lunch period at the straight time wage rate. Forty (40) hours per week shall constitute a week's work Monday through Thursday. In the event a job is down due to weather conditions, safety or other conditions beyond the control of the Employer, then Friday may, at the option of the employer, be worked as a make-up day at the straight time wage rate. Straight time is not to exceed ten (10) hours a day or forty (40) hours per week. Time and one-half (1 ½) shall be paid for all overtime hours worked during the week, Monday through Friday and for all work performed on Saturday. Double (2) time shall be paid for all time worked on Sunday and recognized holidays.

NO. 80: Means eight (8) hours shall constitute the regular work day and forty (40) hours a work week, Monday through Friday. The Employer shall establish the starting time between 6:30 a.m. through 9:00 a.m. An Employer may further adjust the starting time up to 9:30 a.m. throughout the year. Time and one-half (1½) shall be paid after eight (8) consecutive hours worked after the established starting time and for hours worked before the established starting time. Time and one-half (1½) shall be paid for work performed on Saturdays. Work performed on Sundays and Holidays shall be paid at the double (2) time rate of pay. The Employer when working on Highway and Road Work may have the option to schedule the work week for his paving crew only from Monday through Thursday at ten (10) hours per day at the straight time rate of pay with all hours in excess of ten (10) hours in any one day to be at the applicable overtime rate of time and one-half (1½). If the Employer elects to work from Monday through Thursday and is stopped due to inclement weather (rain, snow, sleet falling), the Employer shall have the option to work Friday at the straight time rate of pay to complete the forty (40) hours.

NO. 82: Means the workday shall consist of eight (8) hours worked between 7:00 a.m. and 4:30 p.m. Forty (40) hours will constitute the workweek from Monday through Friday inclusive. Up to four (4) hours of overtime work per day performed before or after the assigned normal workday, (twelve (12) continuous hours, starting no earlier than 6:00 a.m.), Monday through Friday, shall be paid at a rate of one and one-half times (1.5x) that employee's hourly rate. Any additional overtime, Monday through Friday, shall be paid at a rate of double (2x) that employee's hourly rate. For hours worked on Saturday, Sunday and recognized legal holidays, or days that may be celebrated as such, and as designated by the federal government, double (2) time shall be paid. All shifts for work performed between the hours of 4:30 p.m. and 12:30 a.m. shall receive eight (8) hours pay at the regular hourly rate of pay plus ten percent (10%) additional for seven and one-half (7½) hours work. The ten percent (10%) differential shall apply to the basic pay rate and the percentage fringe rates. All work performed between the hours of 12:30 a.m. and 8:00 a.m. on a third shift shall receive eight (8) hours pay for seven (7) hours work at the regular hourly rate plus fifteen percent (15%) differential shall apply for the basic pay rate and percentage fringe benefit rates. When a shift continues past the latest time at which a shift may operate, then the appropriate percentage overtime is paid.

NO. 87: Means eight (8) hours starting between 6:00 a.m. and 8:00 a.m. and ending between 2:30 p.m. and 4:30 p.m. at the Employers discretion shall constitute a day's work. Any work prior to 6:00 a.m. or after eight (8) hours shall be paid at the overtime rate. Five (5) days from Monday through Friday inclusive shall constitute a regular work week. All hours before and after these regular hours shall be considered overtime and shall be paid for at the rate of double (2) time. All work on Saturday and Sunday shall be paid at double (2) the prevailing scale of wages.

NO. 91: Means eight (8) hours shall constitute a day's work commencing at 8:00 a.m. and ending at 4:30 p.m., allowing one-half (½) hour for lunch. The option exists for the Employer to use a flexible starting time between the hours of 6:00 a.m. and 9:00 a.m. The regular workweek shall consist of forty (40) hours of five (5) workdays, Monday through Friday. The workweek may consist of four (4) ten (10) hour days from Monday through Thursday, with Friday as a make-up day. If the make-up day is a holiday, the employee shall be paid at the double (2) time rate. The employees shall be paid time and one-half (1½) for work performed **on Saturdays,** before the regular starting time or after the regular quitting time or over eight (8) hours per work day (unless working a 10-hour work day, then time and one-half (1½) is paid for work performed over ten (10) hours a day) or over forty (40) hours per work week. Work performed on Sundays and recognized holidays shall be paid at the double (2) time rate of pay.

REPLACEMENT PAGE
FRANKLIN COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION

NO. 92: Means all work performed from 8:00 a.m. to 4:30 p.m., Monday through Friday, will be at straight time pay up to forty (40) hours per week. All work performed Monday through Friday before 8:00 a.m. and after 4:30 p.m. will be done at time and one-half (1½). All work done on Saturday will be done at time and one-half (1½), unless the employer and employee agree that Saturday shall be used as a make-up day. The Employer may use a flexible starting time of 7:00 a.m. to 8:00 a.m., and quitting time of 3:30 p.m. to 4:30 p.m., and any such different work starting time shall determine whether wages are payable at the straight rate or the premium rate. All work performed on Saturday shall be paid for at time and one-half (1½), unless the Saturday has been used as a make-up day. All work performed on Sunday and holidays shall be paid for at the rate of double (2) time.

NO. 104: Means eight (8) hours per day shall constitute a standard work day between the hours of 7:00 a.m. and 5:00 p.m. The standard work week shall be forty (40) hours between 7:00 a.m. on Monday and ending 5:00 p.m. on Friday. An overtime rate of time and one-half (1½) the base hourly rate shall be paid on all hours in excess of eight (8) hours in a day Monday through Friday. Saturdays shall be considered overtime and work done on Saturday shall be paid at time and one-half (1½) the prevailing scale. Sundays and holidays shall be considered overtime and work done on these days shall be paid at double (2) the prevailing scale.

NO. 110: Means eight (8) hours between the hours of 8:00 a.m. and 4:30 p.m. shall constitute a work day. The starting time may be advanced one (1) or two (2) hours. Employees shall have a lunch period of thirty (30) minutes. The Employer may provide a lunch period of one (1) hour, and in that event, the workday shall commence at 8:00 a.m. and end at 5:00 p.m. The workweek shall commence at 8:00 a.m. on Monday and shall end at 4:30 p.m. on Friday (or 5:00 p.m. on Friday if the Employer grants a lunch period of one (1) hour), or as adjusted by starting time change as stated above. All work performed before 8:00 a.m. and after 4:30 p.m. (or 5:00 p.m. where one (1) hour lunch is granted for lunch) or as adjusted by starting time change as stated above or on Saturday, except as herein provided, shall be compensated at one and one-half (1½) times the regular hourly rate of pay for the work performed. All work performed on Sunday and on recognized holidays shall be compensated at double (2) the regular hourly rate of pay for the work performed. If an Employer is prevented from working forty (40) hours, Monday through Friday, or any part thereof by reason of inclement weather (rain and mud), Saturday or any part thereof may be worked as a make-up day at the straight time rate. The Employer shall have the option of working five eight (8) hour days or four ten (10) hour days Monday through Friday. If an Employer elects to work five (5) eight (8) hour days during any work week, hours worked more than eight (8) per day or forty (40) hours per week shall be paid at time and one-half (1½) the hourly rate Monday through Friday. If an Employer elects to work four (4) ten (10) hour days in any week, work performed more than ten (10) hours per day or forty (40) hours per week shall be paid at time and one-half (1½) the hourly rate Monday through Friday. If an Employer is working ten (10) hour days and loses a day due to inclement weather, they may work ten (10) hours Friday at straight time. Friday must be scheduled for at least eight (8) hours and no more than ten (10) hours at the straight time rate, but all hours worked over the forty (40) hours Monday through Friday will be paid at time and one-half (1½) overtime rate.

NO. 113: Means the regular workday shall consist of eight (8) consecutive hours, exclusive of a thirty (30) minute lunch period, with pay at the regular straight time hourly rate. The regular workday shall begin on the job site between 6:00 a.m. and 9:00 a.m. The Employer shall have the option of working five (5) eight (8) hour days or four (4) ten (10) hour days, Monday through Friday. If an Employer elects to work five (5) eight (8) hour days during any work week, hours worked more than eight (8) per day or forty (40) per week shall be paid at time and one-half (1½) the hourly rate Monday through Friday. If a crew is prevented from working forty (40) hours Monday through Friday, or any part thereof, by reason of inclement weather, Saturday or any part thereof may be worked as a make-up day at the straight time rate. The Employer may establish a four (4) ten (10) hour shift exclusive of the thirty (30) minute unpaid lunch period at the straight time wage rate. Forty (40) hours per week shall constitute a week's work, Monday through Thursday. In the event a job is down due to weather conditions, holiday, or other conditions beyond the control of the Employer, then Friday may, at the option of the Employer, be worked as a make-up day at the straight time wage rate. Straight time is not to exceed ten (10) hours a day or forty (40) hours per week. If an Employer elects to work eight (8) hour days and loses a day due to inclement weather, he may work ten (10) hour days the remainder of the week at straight time. Straight time shall be paid for hours worked on all days except Saturday, Sunday and Holidays. Time and one-half (1&1/2) will be paid for hours worked after eight (8) hours in a five eight (8) hour day work week or ten (10) hours in a four (4) ten (10) hour day workweek, and on Saturday, except when Saturday is used as a make-up day. Sundays and recognized Holidays or days observed as such, shall be paid at the double (2) time rate.

REPLACEMENT PAGE
FRANKLIN COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION

NO. 116: Means the standard work day shall consist of eight (8) hours of work between the hours of 8:00 a.m. and 4:30 p.m. The standard work week shall consist of five standard work days commencing on Monday and ending on Friday inclusive. All time worked before and after the established eight (8) hour work day, Monday through Friday, and all time worked on Saturdays, shall be paid for at the rate of time & one-half (1½) the hourly base wage rate in effect. All time worked on Sundays and recognized holidays shall be paid for at the rate of double (2) the hourly base wage rate in effect.

FRANKLIN COUNTY
HOLIDAY SCHEDULE – BUILDING CONSTRUCTION

NO. 3: All work done on New Year's Day, Decoration Day, July 4th, Labor Day, Veteran's Day, Thanksgiving Day and Christmas Day shall be paid at the double time rate of pay. Whenever any such holidays fall on a Sunday, the following Monday shall be observed as a holiday.

NO. 5: All work that shall be done on New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day, and Christmas Day shall be paid at the double (2) time rate of pay.

NO. 6: All work done on New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day, Christmas Day, and any additional holidays which may be mutually agreed upon shall be paid at the double time rate of pay. Whenever any such holiday falls on a Sunday, the following Monday shall be recognized and observed as the holiday. No work shall be performed on Labor Day.

NO. 7: All work done on New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, and Christmas Day shall be paid at the double time rate of pay. If a holiday falls on a Sunday, it shall be observed on the following Monday. If a holiday falls on a Saturday, it shall be observed on the preceding Friday.

NO. 8: All work performed on New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, and Christmas Day, or the days observed in lieu of these holidays, shall be paid at the double time rate of pay.

NO. 12: All work done on New Year's Day, Decoration Day, Independence Day, Veteran's Day, Thanksgiving Day and Christmas Day shall be paid at the double time rate of pay. Should any of these days fall on Sunday, then the following day shall be observed as the holiday. Under no circumstances shall employees be permitted to work on Labor Day.

NO. 19: All work done on New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day, and Christmas Day shall be paid at the double time rate of pay. The employee may take off Friday following Thanksgiving Day. However, the employee shall notify his or her Foreman, General Foreman or Superintendent on the Wednesday preceding Thanksgiving Day. When one of the above holidays falls on Sunday, the following Monday shall be considered a holiday and all work performed on either day shall be at the double (2) time rate. When one of the holidays falls on Saturday, the preceding Friday shall be considered a holiday and all work performed on either day shall be at the double (2) time rate.

NO. 25: All work done on New Year's Day, Martin Luther King Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the day after Thanksgiving, Christmas Day, Presidential Election Day, or days locally observed as such, and Saturday and Sunday shall be recognized as holidays and shall be paid at the double (2) time rate of pay. If a named holiday falls on a Saturday, the holiday will be observed on the preceding Friday. When a named holiday falls on Sunday, the Monday after will be observed as the holiday. Appropriate overtime rates to be based on fifteen minute increments.

NO. 26: All work done on New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day and Christmas Day shall be paid at the double time rate of pay. When a Holiday occurs on Saturday it shall not be observed on either the previous Friday or the following Monday. Such days shall be regular work days. If such a holiday occurs on Sunday it shall be observed on the following Monday.

NO. 31: All work done on New Year's Day, Presidents Day, Good Friday, Memorial Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day, Friday after Thanksgiving Day, Christmas Day, and Employee's Birthday shall be paid at the double time rate of pay. If a holiday falls on Sunday, the following Monday will be observed as the recognized holiday. If a holiday falls on Saturday, the preceding Friday will be observed as the recognized holiday.

FRANKLIN COUNTY
HOLIDAY SCHEDULE – BUILDING CONSTRUCTION

NO. 36: The following days are recognized as holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on a Sunday, it shall be observed on the following Monday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid the workman unless worked. An Employer working a four (4) day, ten (10) hour schedule may use Friday as a make-up day when an observed holiday occurs during the work week. Employees have the option to work that make-up day. If workmen are required to work the above enumerated holidays, or days observed as such, they shall receive double (2) the regular rate of pay for such work.

NO. 41: The following days shall be observed as legal holidays: New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day and Christmas Day. No work shall be performed on the Fourth of July, Labor Day or Christmas Day. Any work performed on the above holidays shall be paid for at two (2) times the regular straight time rate of pay. When any of the above holidays fall on Sunday, the following Monday shall be observed as such holiday. If a holiday falls on Saturday, it shall not be considered to be observed on the previous Friday or following Monday. Such days shall be regular workdays.

NO. 47: The following holidays are recognized: New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day and Christmas Day. When a holiday listed above falls on Saturday, it shall be celebrated on the Friday preceding the holiday. When a holiday falls on Sunday, the following Monday shall be observed. Holidays referred to above shall be paid for at the double (2) time rate of pay when worked.

NO. 51: All time worked on Sundays and recognized holidays shall be paid for at the rate of double (2) the hourly base wage rate in effect. The Employer agrees to recognize the following holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day and Christmas Day. If the holiday falls on Sunday, it shall be recognized on the following Monday. If the holiday falls on a Saturday, it shall be recognized as a Saturday only holiday.

NO. 54: All work performed on New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day shall be paid at the double (2) time rate of pay. When a holiday falls on Saturday, it shall be observed on Friday. When a holiday falls on Sunday, it shall be observed on Monday.

NO. 55: The following days are recognized as holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on a Sunday, it shall be observed on the following Monday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid the workmen unless worked. An Employer working a four (4) day, ten (10) hour schedule may use Friday as a make up day when an observed holiday occurs during the work week. Employees have the option to work that make up day. If workmen are required to work the above enumerated holidays, or days observed as such, they shall receive double (2) the regular rate of pay for such work.

NO. 60: All work performed on New Year's Day, Armistice Day (Veteran's Day), Decoration Day (Memorial Day), Independence Day (Fourth of July), Thanksgiving Day and Christmas Day shall be paid at the double time rate of pay. No work shall be performed on Labor Day except when triple (3) time is paid. When a holiday falls on Saturday, Friday will be observed as the holiday. When a holiday falls on Sunday, the following Monday shall be observed as the holiday.

NO. 66: All work performed on Sundays and the following recognized holidays, or the days observed as such, of New Year's Day, Decoration Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day and Christmas Day, shall be paid at double (2) the hourly rate plus an amount equal to the hourly Total Indicated Fringe Benefits. Whenever any such holidays fall on a Sunday, the following Monday shall be observed as a holiday.

FRANKLIN COUNTY
HOLIDAY SCHEDULE – BUILDING CONSTRUCTION

NO. 69: All work performed on New Year's Day, Decoration Day, July Fourth, Labor Day, Veteran's Day, Thanksgiving Day or Christmas Day shall be compensated at double (2) their straight-time hourly rate of pay. Friday after Thanksgiving and the day before Christmas will also be holidays, but if the employer chooses to work these days, the employee will be paid at straight -time rate of pay. If a holiday falls on a Sunday in a particular year, the holiday will be observed on the following Monday.

NO. 71: All work performed on the following recognized holidays, or days that may be celebrated as such, shall be paid at the double (2) time rate of pay: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Day after Thanksgiving and Christmas Day. If a holiday falls on Sunday, it shall be celebrated on Monday. If a holiday falls on Saturday, it shall be celebrated on the Friday preceding such Saturday.

NO. 73: The following days are recognized as holidays: New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day (or mutually agreed date of the Friday after Thanksgiving Day may be substituted for Veteran's Day), Thanksgiving Day and Christmas Day, or in the event that any of said Holidays falls on Sunday, then the day or days generally recognized as such. Any work performed anywhere on any of the aforesaid Holidays, or on the day or days recognized and observed as such, shall be paid for at double (2) time the regular hourly rate.

OCCUPATIONAL TITLE	*Effective Date of Increase	Basic Hourly Rates	Over-Time Schedule	Holiday Schedule	Total Fringe Benefits
CARPENTER					
Journeymen	5/09	$29.98	23	16	$11.50
Millwright	5/09	$29.98	23	16	$11.50
Pile Driver Worker	5/09	$29.98	23	16	$11.50
OPERATING ENGINEER					
Group I	5/09	$28.82	10	9	$18.31
Group II	5/09	$28.82	10	9	$18.31
Group III	5/09	$27.52	10	9	$18.31
Group IV	5/09	$24.06	10	9	$18.31
Oiler-Driver	5/09	$24.52	10	9	$18.31
LABORER					
General Laborer	5/09	$26.01	2	4	$9.29
Skilled Laborer	5/09	$26.61	2	4	$9.29
TRUCK DRIVER-TEAMSTER					
Group I	5/09	$28.625	25	21	$8.65
Group II	5/09	$28.735	25	21	$8.65
Group III	5/09	$28.775	25	21	$8.65
Group IV	5/09	$28.845	25	21	$8.65

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

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

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

FRANKLIN COUNTY
OVERTIME SCHEDULE – HEAVY CONSTRUCTION

FED: Minimum requirement per Fair Labor Standards Act means time and one-half (1 ½) shall be paid for all work in excess of forty (40) hours per work week.

NO. 2: Means a regular workweek shall be forty (40) hours and will start on Monday and end on Friday. The regular work day shall be either eight (8) or ten (10) hours. If a crew is prevented from working forty (40) hours Monday through Friday, or any part thereof, by reason of inclement weather, Saturday or any part thereof may be worked as a make-up day at the straight time rate. Employees who are part of a regular crew on a make-up day, notwithstanding the fact that they may not have been employed the entire week, shall work Saturday at the straight time rate. A workday shift is to begin at the option of the Employer, between 6:00 a.m. and not later than 9:00 a.m. However, the project starting time may be advanced or delayed if required. If workmen are required to work the enumerated holidays or days observed as such or Sundays, they shall receive double (2) the regular rate of pay for such work.

NO. 10: Means the regular workday for which employees shall be compensated at straight time hourly rate of pay shall, unless otherwise provided for, begin at 8:00 a.m. and end at 4:30 p.m. The regular workweek shall consist of five (5) days, Monday through Friday, beginning at 8:00 a.m. and ending at 4:30 p.m. except as may be modified. The starting time may be either advanced or delayed one hour or two hours at the discretion of the Employer. The Employer may have the option to schedule his work week from Monday through Thursday at ten (10) hours per day at the straight time rate of pay with all hours in excess of ten (10) hours in any one day to be at the applicable overtime rate. If the Employer elects to work Monday through Thursday and is stopped due to inclement weather, holidays or other conditions beyond the control of the Employer, he shall have the option to work Friday at the straight time rate of pay to complete the forty (40) hour workweek. All necessary overtime and work performed on Saturday, shall be paid at time and one-half (1½) the hourly rate, plus an amount equal to one-half (½) of the hourly Total Indicated Fringe Benefits. All work performed on Sundays and recognized holidays shall be paid at double (2) the hourly rate, plus an amount equal to the hourly Total Indicated Fringe Benefits. Shifts may be established when considered necessary by the Employer. Shift hours and rates will be as follows. If shifts are established, work on the First Shift will begin between 6:00 a.m. and 9:00 a.m. and consist of eight (8) hours of work plus one-half hour unpaid lunch. Hours worked during the first shift will be paid at the straight time rate of pay. The second shift shall start eight hours after the start of the first shift and consist of eight (8) hours of work plus one-half hour unpaid lunch. Work on the second shift will begin between 2:00 p.m. and 5:00 p.m. and be paid the straight time rate plus $2.50 per hour. The third shift shall start eight hours after the start of the second shift and consist of eight (8) hours plus one-half hour unpaid lunch. Work on the third shift will begin between 10:00 p.m. and 1:00 a.m. and be paid the straight time rate plus $3.50 per hour. The additional amounts that are to be paid are only applicable when working shifts. Shifts that begin on Saturday morning through those shifts which end on Sunday morning will be paid at time and one-half these rates. Shifts that begin on Sunday morning through those shifts which end on Monday morning will be paid at double time these rates.

NO. 23: Means the regular workweek shall start on Monday and end on Friday, except where the Employer elects to work Monday through Thursday, (10) hours per day. All work over ten (10) hours in a day or forty (40) hours in a week shall be at the overtime rate of one and one-half (1½) times the regular hourly rate. The regular workday shall be either eight (8) or ten (10) hours. If a job can't work forty (40) hours Monday through Friday because of inclement weather or other conditions beyond the control of the Employer, Friday or Saturday may be worked as a make-up day at straight time (if working 4-10's). Saturday may be worked as a make-up day at straight time (if working 5-8's). An Employer, who is working a four (4) ten (10) hour day work schedule may use Friday as a make-up day when a workday is lost due to a holiday. A workday is to begin at the option of the Employer but not later than 11:00 a.m. except when inclement weather, requirements of the owner or other conditions beyond the reasonable control of the Employer prevent work. Except as worked as a make-up day, time on Saturday shall be worked at one and one-half (1½) times the regular rate. Work performed on Sunday shall be paid at two (2) times the regular rate. Work performed on recognized holidays or days observed as such, shall also be paid at the double (2) time rate of pay.

FRANKLIN COUNTY
OVERTIME SCHEDULE – HEAVY CONSTRUCTION

NO. 25: Means a regular work week of forty (40) hours, starting on Monday and ending on Friday. The regular work day shall be either eight (8) or ten (10) hours. If a crew is prevented from working forty (40) hours Monday through Friday, or any part thereof by reason of inclement weather, Saturday or any part thereof maybe worked as a make-up day at the straight time rate. Employees who are part of a regular crew on a make-up day, notwithstanding the fact that they may not have been employed the entire week, shall work Saturday at the straight time rate. A work day is to begin between 6:00 a.m. and 9:00 a.m. However, the project starting time maybe advanced or delayed if mutually agreed to by the interest parties. All hours worked on recognized holidays, or days observed as such, double (2) time shall be paid.

FRANKLIN COUNTY
HOLIDAY SCHEDULE – HEAVY CONSTRUCTION

NO. 4: All work performed on New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day, or days observed as such, shall be paid at the double time rate of pay. When a holiday falls on a Sunday, Monday shall be observed.

NO. 9: All work performed on Sundays and the following recognized holidays, or the days observed as such, of New Year's Day, Decoration Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day and Christmas Day, shall be paid at double (2) the hourly rate plus an amount equal to the hourly Total Indicated Fringe Benefits. Whenever any such holidays fall on a Sunday, the following Monday shall be observed as a holiday.

NO. 16: The following days are recognized as holidays: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on Sunday, it shall be observed on the following Monday. If a holiday falls on Saturday, it shall be observed on the preceding Friday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid to the worker unless worked. If workers are required to work the above recognized holidays or days observed as such, they shall receive double (2) the regular rate of pay for such work.

NO. 21: The following days are recognized as holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on a Sunday, it shall be observed on the following Monday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid the workman unless worked. An Employer working a four (4) day, ten (10) hour schedule may use Friday as a make-up day when an observed holiday occurs during the work week. Employees have the option to work that make-up day. If workmen are required to work the above enumerated holidays, or days observed as such, they shall receive double (2) the regular rate of pay for such work.

OUTSIDE ELECTRICIAN

These rates are to be used for the following counties:

Adair, Audrain, Boone, Callaway, Camden, Carter, Chariton, Clark, Cole, Cooper, Crawford, Dent, Franklin, Gasconade, Howard, Howell, Iron, Jefferson, Knox, Lewis, Lincoln, Linn, Macon, Maries, Marion, Miller, Moniteau, Monroe, Montgomery, Morgan, Oregon, Osage, Perry, Phelps, Pike, Pulaski, Putnam, Ralls, Randolph, Reynolds, Ripley, St. Charles, St. Francois, St. Louis City, St. Louis County, Ste. Genevieve, Schuyler, Scotland, Shannon, Shelby, Sullivan, Texas, Warren, and Washington

COMMERCIAL WORK

Occupational Title	Basic Hourly Rate	Total Fringe Benefits
Journeyman Lineman	$33.68	$4.75 + 42%
Lineman Operator	$29.08	$4.75 + 42%
Groundman	$22.48	$4.75 + 42%

OVERTIME RATE: Eight (8) hours shall constitute a work day between the hours of 7:00 a.m. and 4:30 p.m. Forty (40) hours within five (5) days, Monday through Friday inclusive, shall constitute the work week. Work performed in the 9th and 10th hour, Monday through Friday, shall be paid at time and one-half (1½) the regular straight time rate of pay. Contractor has the option to pay two (2) hours per day at the time and one-half (1½) the regular straight time rate of pay between the hours of 6:00 a.m. and 5:30 p.m., Monday through Friday. Work performed outside the regularly scheduled working hours and on Saturdays, Sundays and recognized legal holidays, or days celebrated as such, shall be paid for at the rate of double (2) time.

HOLIDAY RATE: All work performed on New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day, Christmas Day, or days celebrated as such, shall be paid at the double time rate of pay. When one of the foregoing holidays falls on Sunday, it shall be celebrated on the following Monday. When one of the foregoing holidays falls on Saturday, it shall be celebrated on the Friday before the holiday.

UTILITY WORK

Occupational Title	Basic Hourly Rate	Total Fringe Benefits
Journeyman Lineman	$33.68	$4.75 + 39.05%
Lineman Operator	$29.08	$4.75 + 39.05%
Groundman	$22.48	$4.75 + 39.05%

OVERTIME RATE: Eight (8) hours shall constitute a work day between the hours of 7:00 a.m. and 4:30 p.m. Forty (40) hours within five (5) days, Monday through Friday inclusive, shall constitute the work week. Work performed in the 9th and 10th hour, Monday through Friday, shall be paid at time and one-half (1½) the regular straight time rate of pay. Contractor has the option to pay two (2) hours per day at the time and one-half (1½) the regular straight time rate of pay between the hours of 6:00 a.m. and 5:30 p.m., Monday through Friday. Worked performed in the first eight (8) hours on Saturday shall be paid at the rate of one and eight tenths (1.8) the regular straight time rate. Work performed outside these hours and on Sundays and recognized legal holidays, or days celebrated as such, shall be paid for at the rate of double (2) time.

HOLIDAY RATE: All work performed on New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day, Christmas Day, or days celebrated as such, shall be paid at the double time rate of pay. When one of the foregoing holidays falls on Sunday, it shall be celebrated on the following Monday. When one of the foregoing holidays falls on Saturday, it shall be celebrated on the Friday before the holiday.