

CONSTRUCTION OF DIVISION 1
BUS MAINTENANCE FACILITY
FOR THE
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

BID DUE DATE 10/28/85
BID NO. CA-05-0133-E
CONTRACT NO. _____
September 16, 1985

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NOTICE

Bidders are strongly encouraged to attend the Pre-Bid Conference to become fully informed of the District's plans, specifications and policies.

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

NOTICE INVITING BIDS FOR
CONSTRUCTION OF DIVISION 1
BUS MAINTENANCE FACILITY
FOR THE

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

BID NO. CA-05-0133-E

BID DUE DATE: 10/28/85

Sealed bids will be received by the Southern California Rapid Transit District at the reception desk of the office of Contracts, Procurement and Materiel (OCPM) located on the fourth floor at 124 West Fourth Street, Los Angeles, California 90013 until 3:00 P.M. on the above stated Due Date for the CONSTRUCTION OF DIVISION 1 BUS MAINTENANCE FACILITY in accordance with plans and specifications therefor.

Copies of the plans and specifications may be obtained at the office of the Director of the Office of Contracts, Procurement and Materiel (OCPM), 124 W. Fourth Street, Los Angeles, California 90013.

Work consists of site development and construction of a Maintenance Building, a Fuel & Vacuum Building, a Bus Washing Facility, a Fare Retrieval Facility and a Tire Repair Building and other related work as shown on the plans and specifications.

Refer to Specifications for complete details and bid requirements. Specifications and this Notice shall be considered as part of any contract made pursuant thereto.

The Southern California Rapid Transit District hereby notifies all bidders that it will affirmatively insure that in regard to any contract entered into pursuant to this advertisement, Disadvantaged Business Enterprise will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

All bidders will be required to comply with the Disadvantaged Business Enterprise (DBE) and Women Business Enterprise (WBE) Policy as set forth in Section 20 of the Specifications.

All bidders will be required to certify that they are not on the Comptroller General's list of ineligible contractors.

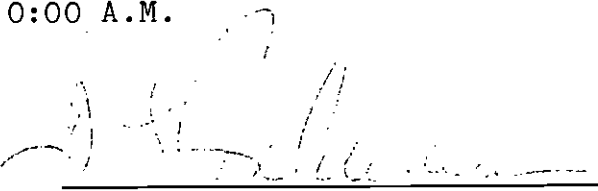
The contract to be let is subject to a financial assistance contract between the District and the United States Department of Transportation.

The successful bidder will be permitted to substitute securities for any monies withheld by District to ensure performance under the contract pursuant to Section 4590 of the California Government Code.

Full compliance with all applicable safety and health standards, and Equal Employment Opportunity laws and regulations will be required of the successful bidder.

A Pre-Bid Conference to familiarize prospective bidders with the District's policies and the "Nature of Work" will be held at Division 1, 1016 E. 6th Street, Los Angeles, California, on Monday, September 30, 1985 at 10:00 A.M.

DATED: September 16, 1985



Maynard Z. Walters, Director
Office of Contracts,
Procurement & Materiel
SOUTHERN CALIFORNIA RAPID
TRANSIT DISTRICT

BID PROCEDURES & FORMS

SECTION 1

INSTRUCTIONS TO BIDDERS

1. General

Contract documents (each set consists of one each Specifications and one each plans) may be obtained at the Southern California Rapid Transit District, 124 West Fourth Street, Los Angeles, at a non-refundable cost of fifty dollars (\$50,00) for each set.

The information concerning the Work required is described in the specifications and is believed to be correct; however, each bidder will be solely responsible for having acquainted himself thoroughly, with all conditions affecting the Work. Each bidder will also be held solely responsible for having estimated the cost of the Work as well as the difficulties and contingencies attendant upon the Work.

2. Discrepancies

If a bidder becomes aware of any discrepancy, ambiguity, error or omission, it shall be reported immediately to the Purchasing Agent who will determine the necessity for clarification.

3. Addenda

Clarification or any other notice of a change in the Contract Documents will be issued only by the District's Purchasing Agent and only in the form of written addenda mailed or otherwise delivered to the address of record of each bidder. Each addendum will be numbered, dated and identified with the Project. Under extreme circumstances, an addendum may be in the form of a telegram. Oral statements or any instructions in any form, other than addenda as above described, shall have no consideration.

Each addendum received during the bidding period shall be acknowledged in the designated space in the Bid Form with the information therein requested. If none are received, the words "no addenda received" shall be written in the said space.

4. Pre-Bid Conference

A pre-bid conference to familiarize prospective bidders with the District's policies and the "Nature of the Work" will be held at Division 1, 1016 E. 6th St., Los Angeles, California, on Monday, September 30, 1985, at 10:00 A.M..

5. Submittal

Bids shall be submitted only on one copy of the Bid Form furnished to bidders herewith. No other form of bid or proposal will be acceptable. The only acceptable method for modifying a bid is by letter, if it is received by the person assigned to open the bids prior to the time set for opening of bids.

Bid Forms shall be carefully and completely filled out with ink or typewriter only. All signatures shall be in longhand.

Every designated space or list noted with a number 1 on the Bid Form shall be filled in or otherwise marked to show the bidder's intention clearly. Interlineations, alterations, erasures, or any other change may constitute unacceptable irregularities in the bid. In any case, such erasure, interlineation or other change must be clearly initialed by the bidder. All amounts shall be stated in figures.

6. Identification of Bidders

Each bid shall contain the following:

- a. The full business address of the bidder.
- b. A concise description of the legal nature of the entity submitting the bid.
- c. The name and official title of each person signing, typed or printed below the signature.

7. Signatures

- a. Bid Forms submitted by individuals shall be signed by the individuals making the bids or by the persons authorized to sign for the individuals. If signatures other than those of the bidders appear, the authority for such signatures must be attached to the Form.
- b. Bids signed for a corporation shall bear the signature of the president or other authorized officer, written in longhand below the corporation name and following the word "BY" signature. If such bid is signed by an individual other than the president, a certified copy of a resolution of the board of directors of the corporation, evidencing the authority of that individual to sign, shall be attached to the Bid Form. Such bids shall also bear the attesting signature of the secretary and the impression of the corporate seal.

8. Unit Prices

When unit prices are called for in the Bid Form, complete all designations using amounts that include all costs for completed work in place, with taxes, overhead, profits and other costs covered. The Southern California Rapid Transit District is exempt from payment of Federal Excise and Transportation taxes, so such taxes must not be included in proposed prices.

9. Bid Bond

Each bidder shall furnish at his own expense a bid bond satisfactory to the District, in the form presented herewith; or cash, certificate of deposit, cashiers' or certified check, equal to 10% of the full amount of the bid.

10. Marking and Mailing Bids

Each bid, together with the bid bond, when required, shall be securely sealed in a suitable envelope and marked:

CONSTRUCTION OF DIVISION 1
BUS MAINTENANCE FACILITY

BID NO. CA-05-0133-E

in capital letters on front and back of the envelope. That envelope shall also include the following:

Name and address of bidder.

Name and address of mailing as follows:

Southern California Rapid Transit District
124 West Fourth Street
Los Angeles, California 90013

ATTENTION: Director, Office of Contracts,
Procurement and Materiel

11. Delivery of Bids

Bids shall be delivered to:

Southern California Rapid Transit District
124 West Fourth Street
Los Angeles, California 90013

ATTENTION: Director, Office of Contracts,
Procurement and Materiel

Bids must be received by 3:00 P.M. Bids received after this time cannot be considered and will be returned to contractor.

12. Receiving Bids

Bids received will be kept unopened until the time fixed for the bid opening. The person whose duty is to open the bids will determine when the time stated above has arrived and no bid received thereafter will be considered. All bids will be opened in public at the bid opening. At that time, any person present shall have the right to have any part of the bids read aloud.

13. Withdrawal of Bids

Bids may be withdrawn only by signature of bidder, provided the request is received by the person whose duty is to open bids, prior to the time fixed for bid opening. Each bid opened will be considered to be a valid offer, and may not be withdrawn for a period of sixty consecutive calendar days following the opening bids, unless the bidder is given written notice that his bid is unacceptable.

14. Award or Rejection of Bid

Award will be made within sixty days to the Lowest Responsible Bidder or Bidders. The District reserves the right to reject any, or all bids, or to waive any irregularity or informality in bids when it is in the interest of the District as required by PUC - Section 30570.

Any bid conditioned in whole or in part on the revision or omission of any requirement or provision in the Contract Documents or on the inclusion of an escalation clause of any other requirement or provision not contained in the bidding or Contract Documents, will be rejected.

The District reserves the right to require, prior to the award of a contract, presentation of evidence in detail, describing the business and technical organization and plant of a bidder, including the financial resources, experience, and ability of the organization.

The District will award a contract based on either Option I or Option II on the Bid Form. It is the intention of the District to award a contract on the basis of the "Total Contract Price", rather than award separate contracts for the various separate items; however, the District reserves the right to award contracts for all or a portion of the items or to delete items from the contract, if such action is in the District's best interest.

After award of the contract, the District will provide the Contractor, at no charge, with the following items:

- 1) One set of full size reproducibles
- 2) One set of full size blueprints
- 3) One set of specifications

The extra plans and specifications left over after the bidding process may be made available to the Contractor at cost.

15. Responsible Bidder's Report

This project is being carried out under the District's Disadvantaged Business Enterprise (DBE) and Women Business Enterprise (WBE) Program. A participation goal for this project has been established and is shown on the Bid Form. A Responsive Bidder as defined in Section 20.3 of the Specifications, must either meet this goal or submit with his bid full documentation evidencing good faith efforts to meet the goal.

16. Bid Packages

There are two bid packages which should be submitted by the Due Date in two separate envelopes as follows:

(I) First Envelope: Bid Forms

- A. Bidder's Certification Regarding Ineligible Contractors (Page 11).
- B. Bid Form (Pages 12-13).
- C. List of Subcontractors, if any (Page 14).
- D. List of DBE/WBE Subcontractors or Suppliers (Page 15).
- E. Bid Bond or Cashier's Check in the amount of 10% of the bid price (Page 16).
- F. Worker's Compensation Certificate (Page 20).
- G. Buy America Certificate (Page 146).

(II) Second Envelope: DBE/WBE Good Faith Efforts Documents

The second envelope shall include full documentation evidencing good faith efforts as specified in Section 20.3.2.. This envelope is not required to be submitted if the bidder meets or exceeds the specified goal by utilizing DBE/WBE contractors who have already been certified by the District.

17. Instructions for Filling in Bid Form

Certain parts of the bid form have caused problems to bidders. Since each of these parts must be completed and completed correctly, we are going to review each of them separately and give you instructions on how they should be filled in. All blanks or lists which must be filled in are on colored sheets and have been numbered and circled. Fill in the blanks as follows:

BID FORM

1. Name of Bidder
2. Amount of Bid
Option I: Work to be performed without construction phasing.
Option II: Work to be performed with construction phasings in accordance with Drawings PH-1 and PH-2.
- 2A. Percentage of dollar amount of bid assigned to Disadvantaged Business Enterprise.
- 2B. Percentage of dollar amount of bid assigned to Women Business Enterprise.
3. If you did not receive an addendum, write "No addenda received".

If you did receive one or more, list each addendum and the date it was received by you.
4. Bidder's Contractor's License Number
5. Type of Contractor's License
6. Name of Bonding or Insurance Company which will write your Faithful Performance and Contractor's Bond if you are awarded the contract.
7. Address of Bonding or Insurance Company
8. Telephone Number of Bonding or Insurance Company
9. Name of Bidder
10. Signature of Authorized Representative of Bidder
11. Title of Authorized Representative of Bidder
12. Address and Telephone Number of Bidder
13. Date of Signature
14. List of Subcontractors
15. List of DBE/WBE Subcontractors or Suppliers

LIST OF SUBCONTRACTORS

List name and locations* of, and type of work to be performed by subcontractors on your job. If you will not subcontract any of the work, write "None" on this form. In any case you must return this form with the bid package. This form is required by California law (commencing with Government Code Section 4100).

*Location is defined as one of the following:

- a. City and state
- b. County and state, if located in an unincorporated area
- c. Complete street address

LIST OF DBE/WBE SUBCONTRACTORS OR SUPPLIERS

Refer to Section 20 of the General Provisions when completing this form. This form must be submitted for all projects with DBE/WBE goals.

CONSTRUCTION OF DIVISION 1
BUS MAINTENANCE FACILITY
FOR THE
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

BIDDER'S CERTIFICATION
REGARDING
INELIGIBLE CONTRACTORS

Provide the following information if you are not on the comptroller's ineligible contractor and/or company debarred list.

Contractors or firms who are included on the U. S. Comptroller General's list of persons or firms currently DEBARRED for violations of various public contracts incorporating Labor Standard Provisions cannot be awarded this contract.

BIDDER'S NAME

SIGNATURE OF BIDDER'S
AUTHORIZED REPRESENTATIVE

TITLE OF BIDDER'S
AUTHORIZED REPRESENTATIVE

DATE OF SIGNATURE

CONSTRUCTION OF DIVISION 1
 BUS MAINTENANCE FACILITY
 FOR THE
 SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
BID FORM

The Contractor shall furnish, as part of this bid, all of the following information. Failure to fill in all the blanks will result in rejection of the bid.

Bidder: 1
 having examined the Contract Documents attached hereto and entitled "DOCUMENT AND SPECIFICATIONS - CONSTRUCTION OF DIVISION 1 BUS MAINTENANCE FACILITY" and having examined all conditions affecting the work hereby proposed, agrees to furnish all labor, materials, equipment and other services including taxes and import duties, which are necessary for the completion of the work.

	Bid Quantity (Cubic Yds.)	Unit Price (\$/C.Y.)	Total Price Option I	Total Price Option II
(A) Site Excavation (including stock-piling and disposal of unsuitable material)	<u>32,000</u>	\$ _____	\$ _____	\$ _____
(B) Site Compacted Fill (including on-site soils and imported borrow)	<u>30,000</u>	\$ _____	\$ _____	\$ _____
(C) Lump Sum (All Other Work excluding Items A & B above)			\$ _____	\$ _____
TOTAL BID AMOUNT: (SUM OF A, B, & C)			\$ _____	\$ _____
PERCENTAGE OF DOLLAR AMOUNT ASSIGNED TO MINORITY FIRMS OF THE LUMP SUM OF BID:			_____ % DBE	_____ % DBE
			_____ % WBE	_____ % WBE

** CONTINUED ON NEXT PAGE **

DBE/WBE Goals

The District has established goals for participation by Disadvantaged and Women's Business Enterprises (DBEs and WBEs) for this contract as set forth below. Please refer to Section 20 of the General Provisions for a full discussion of the DBE/WBE bidding requirements applicable to this project.

DBE Goal	<u>10</u>	<u>%</u>
WBE Goal	<u>2</u>	<u>%</u>

APPLICABLE IF DBE/WBE GOALS ARE NOT MET

Reference Section 20.3 paragraph 2.,C, of the General Provisions, the District has determined that in the event the DBE/WBE goals are not met for this contract, the following constitutes "sufficient and reasonable" number of DBE/WBE firms which the Bidder should have contacted as part of his/her good faith efforts to meet the above stated goals. (These figures represent a threshold, and may be exceeded; however, no credit is allowed for exceeding the threshold.)

No. of DBEs	<u>40</u>
No. of WBEs	<u>6</u>

CONSTRUCTION OF DIVISION 1
BUS MAINTENANCE FACILITY
FOR THE
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

BID FORM

(Continued)

ADDENDA RECEIVED

Addendum No. (3) _____ Date Received: _____

Contractor's License No. (4) _____

Type (5) _____

Bonding Company to be used if successful bidder.

(6) _____
Name

(7) _____
Address

Telephone: (8) _____

Bidder: (9) _____

By: (10) _____
(Signature)

Title: (11) _____

Address: (12) _____

Telephone: _____

Dated (13) _____, _____, 198__

CONSTRUCTION OF DIVISION 1
BUS MAINTENANCE FACILITY
FOR THE
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
LIST OF SUBCONTRACTORS

<u>NAME</u>	<u>ADDRESS</u>	<u>TYPE OF WORK</u>
(14)		

List only those subcontractors whose participation of the work will amount to one-half of one percent (1/2%) or more of the total contract.

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

LIST OF DBE/WBE SUBCONTRACTORS OR SUPPLIERS

15

DBE/WBE firms will participate in this contract as follows (check all options applicable to this bid):

- The Bidder is a DBE or WBE firm. (Attach a statement in accordance with Section 20.3, para. 1., c.); and/or
- The Bidder is a joint venture. One or more of the joint venture partners is a DBE or WBE. (Submit "Schedule B" certification application form in accordance with Section 20.7 of the General Provisions.); and/or,
- The Bidder intends to meet the DBE/WBE goals by sub-contracting to the DBE/WBE firms listed below:

NAME OF DBE/WBE SUB-CONTRACTOR OR SUPPLIER	ADDRESS	WORK TO BE PERFORMED MATERIAL SUPPLIED	% PARTICIPATION	CHECK ONE	
				DBE	WBE

List all DBE/WBE subcontractors and suppliers, regardless of percentage of participation. Refer to Section 20.6 of the General Provisions for instructions on calculation of goal. Information disclosed on this form must be legible and complete in order to make a determination of bid responsiveness.

This form must be completed and attached to Bid unless a certified check is attached. (See Paragraph 9 of "Instructions to Bidders.")

CONSTRUCTION OF DIVISION 1
BUS MAINTENANCE FACILITY
FOR THE

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

BID BOND

KNOW ALL PEOPLE BY THESE PRESENTS, that we _____ as Principal, hereinafter called the Principal, and _____ a corporation duly organized under the laws of the State of _____ as Surety, hereinafter called the Surety, are held and firmly bound unto the SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT, as Obligee, hereinafter called the Obligee, in the sum of _____ Dollars (\$ _____), for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for _____

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

SIGNED AND SEALED THIS _____ DAY OF _____ 19____

(Principal) (Seal)

(Witness)

(Title)

(Surety) (Seal)

(Witness)

(Title)

CONSTRUCTION OF DIVISION 1
BUS MAINTENANCE FACILITY
FOR THE
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
FAITHFUL PERFORMANCE BOND

KNOW ALL PEOPLE BY THESE PRESENTS:

That _____, as Principal, and _____, as Surety, are held and firmly bound unto the SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT, as Obligee, in the just and full amount of _____

_____ for the payment whereof we (words and figures)

hereby bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Given under our hands and sealed with our seals this _____ day of _____, 19__.

The condition of the foregoing obligation is such that, WHEREAS, the above-named Principal is about to enter into a contract with the Southern California Rapid Transit District whereby said Principal agrees to _____

_____ as provided in said contract, which said contract is hereby referred to and made a part hereof to the same extent as if the same were herein specifically set forth;

NOW THEREFORE, if the said Principal shall well and truly do and perform all things agreed by it/him in said contract to be done and performed, then this obligation is to be void; otherwise to remain in full force and effect;

PROVIDED, that any alteration in the work to be done, or the material to be furnished, which may be made shall not in any way release the Principal or the Surety hereunder, nor shall any extensions of time granted release either the Principal or the Surety, and notice of such alterations or extensions of the contract is hereby waived by the Surety.

WITNESS our hands this _____ day of _____ 19__.

Principal _____

Surety _____

By _____

By _____

And _____

CONSTRUCTION OF DIVISION 1
BUS MAINTENANCE FACILITY
FOR THE
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

CONTRACTOR'S BOND

KNOW ALL PEOPLE BY THESE PRESENTS:

That _____, as Principal, and
_____, as Surety, are held and firmly
bound unto the SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT, as
Obligee, in the just and full amount of _____

_____ for the payment whereof we
(words and figures)
hereby bind ourselves, our heirs, executors, administrators,
successors and assigns, jointly and severally, firmly by these
presents.

Given under our hands and sealed with our seals this _____
day of _____, 19____.

The condition of the foregoing obligation is such that, WHEREAS,
the above-named Principal is about to enter into a contract with the
Southern California Rapid Transit District whereby said Principal

agrees to _____

as provided in said contract, which said contract is hereby referred
to and made a part hereof to the same extent as if the same were
herein specifically set forth;

NOW THEREFORE, if the said Principal or his Subcontractors fail
to pay for any materials, provisions, provender or other supplies, or
teams used in, upon for, or about the performance of said work
contracted to be done, or for any work or labor thereon of any kind,
or for amounts due under the Unemployment Insurance Code with respect
to such work or labor, the Surety will pay for the same in an amount
not exceeding the sum hereinabove specified, and in case suit is
brought hereon, a reasonable attorney's fee to be fixed by the Court,
otherwise this Bond shall be void and of no effect;

Contractor's Bond

PROVIDED, that any alteration in the work to be done, or the material to be furnished, which may be made shall not in any way release the Principal or the Surety hereunder, nor shall any extensions of time granted release either the Principal or the Surety, and notice of such alterations or extensions of the contract is hereby waived by the Surety.

This Bond shall inure to the benefit of any and all persons entitled to file claims under Section 3181 et. seq. of the Civil code of the State of California, and shall give a right of action to such persons or their assigns in any suit brought upon this Bond.

WITNESS our hands this _____ day of _____ 19__.

Principal

By _____

And _____

Surety

By _____

CONSTRUCTION OF DIVISION 1
BUS MAINTENANCE FACILITY
FOR THE
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
WORKER'S COMPENSATION CERTIFICATE

"I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for Workers' Compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract".

SIGNED: _____
(Contractor)

DATED: _____

GENERAL PROVISIONS

SECTION 2

SCOPE OF WORK

The work herein proposed consists of all work and operations including but not limited to labor, transportation, materials, equipment and supplies necessary for the CONSTRUCTION OF DIVISION 1 BUS MAINTENANCE FACILITY located at 1130 East 6th Street, Los Angeles, California, in accordance with the plans and specifications.

SECTION 3

DEFINITIONS

The following definitions are used in these documents:

Government	Federal Government
District	Southern California Rapid Transit District. When "Owner" is used, it shall mean "District".
Purchasing Agent	Director of Office of Contracts, Procurement and Materiel for the Southern California Rapid Transit District
Contracting Officer	Purchasing Agent
Engineer	Chief Engineer - Bus Facilities Engineering Department for the Southern California Rapid Transit District or his authorized representative. When "Architect" is used, it shall mean "Engineer".
DOT	United States Department of Transportation
UMTA	Urban Mass Transportation Administration or the U.S. Department of Transportation
EEO	Equal Employment Opportunity
CALOSHA	California Occupational Safety and Health Act of 1973
OFCC	Office of Federal Contract Compliance
Standard Specifications	Standard Specifications for Public Works Construction, 1982 Edition
Contract Documents	The written documents consists of the formal District-Contractor Contract, the Specifications and the Plans and all addenda issued prior to and all modifications and Change Orders issued after execution of the Contract.
Specification(s)	General Provisions, Supplementary General Provisions and Technical Provisions of the Specifications.

SECTION 3

DEFINITIONS
(Continued)

Plan(s)	The drawings, profiles, cross sections, working drawings and supplementary drawings or reproductions thereof, approved by the Engineer, which show locations, character, dimensions, or detail of work.
Contractor	The individual, partnership, corporation, joint venture or other legal entity entering into a contract with the District.
Subcontractor	The individual, partnership, corporation, joint venture or other legal entity entering into a contract with the Contractor to perform a portion of the work.
Working Day	Every single day, except Saturdays, Sundays, State of California legal holidays and non-operational days as determined and approved by the Engineer.

SECTION 4

CONTROL OF WORK

4.1 When "specifications" is used, it shall mean the Documents and Specifications entitled "CONSTRUCTION OF DIVISION 1 BUS MAINTENANCE FACILITY".

4.2 The work embraced herein shall be done in accordance with the specifications, ASTM Standards, Uniform Building Code, local City Building Code and Fire Code and all other standards herein referenced, as the same may apply, and in accordance with the following conditions.

4.3 The Contract Documents including Drawings are complementary, any item that is required or specified by one document shall be as binding as if required or specified by all.

4.4 COORDINATION AND INTERPRETATION OF PLANS AND DRAWINGS

In case of conflict between any of the documents described in Paragraph 4.2, the Specifications shall take precedence over and be used in lieu of such conflicting portions. In case of conflict between General Provisions and Technical Provisions, the Technical Provisions shall take precedence. In case of conflict on the drawings, the details shall take precedence over plans; and large scale details shall take precedence over small scale details. In case of conflict between the Drawings and Specifications, the Drawings shall take precedence.

4.5 AUTHORITY OF THE ENGINEERS

Contractors work shall be under the direction of the Engineer and the Engineer shall exercise such authority as is necessary to assure compliance by the Contractor with the Contract Specifications. The Engineer may direct the removal or replacement of nonconforming work. Inspections and acceptance of the work will be completed by the Engineer in such a manner and within such time constraints as are necessary to support the orderly prosecution of the work. All correspondence from the Contractor to the District shall be considered delivered when receipted by the Engineer.

The Engineer shall interpret the Drawings and Technical Specifications on behalf of the District, approve shop drawings and other required submittals, approve progress payments, order tests and make acceptances of materials incorporated within the work, and issue notices of changed or extra work.

Construction Contract Change Orders covering such changed or extra work shall be subject to approval of the Contracting Officer. Claims and waivers of liquidated damages shall be resolved by the Engineer in conjunction with and subject to the approval of the Contracting Officer.

SECTION 5

ORDINANCES, PERMITS AND INSPECTIONS

- 5.1 The District will not be required to obtain a building permit for the on site work from the Building and Safety Department of the local City. However, all municipal, county and state laws, rules and regulations governing or related to any portion of this work are hereby incorporated into and made a part of these Specifications. All permits, licenses and inspections required by municipal, county and state authority shall be obtained, maintained in force and paid for by the Contractor. Any tests required by such authorities shall be conducted in the presence of such authorities or their authorized representative. The District will pay for such required tests.
- 5.2 The Contractor shall obtain and pay for all permits and bonds required for all off-site work including all utility connections, traffic signal, street lighting relocation and installation work, and street improvement work.

SECTION 6

INDEMNITY

- 6.1 Contractor shall indemnify and hold the District, its officers, its consultants and employees harmless from and against all claims, losses, actions and expenses (including attorney's fees), on account of bodily injury to or death of any person (including employees of District) or for damage to or loss of use of property (including property of District) arising out of or in any way connected with the work and services to be performed under the agreement, unless caused solely by the negligence of the District, its officers, its consultants or employees.

SECTION 7

INSURANCE

7.1 Contractor shall, at its own expense, procure and maintain during the term of this agreement liability insurance coverage of the following types and with not less than the following limits of liability:

Comprehensive Public Liability and Property damage, including Automobile	\$1,000,000 Combined Single Limit
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7.2 Prior to the commencement of work, Contractor shall furnish the District with a Certificate of Insurance evidencing the above coverage requirements.

The Certificate shall make provision for cross liability, and shall contain the following language:

- (1) "The Southern California Rapid Transit District is an additional insured."
- (2) "The liability assumed by Contractor under the provisions of the hold harmless and indemnity clause contained in the contract is covered by the terms of the policy."
- (3) "The Contractor's policy is primary over any other insurance carried by the District."
- (4) "The policy will not be cancelled or materially changed without thirty days prior written notice to the District."

7.3 As required by Section 1860 of the California Labor Code, the Contractor shall secure the payment of Worker's Compensation to his employees in accordance with the provisions of Section 3700 of the California Labor Code and shall furnish the District with a certificate evidencing such coverage together with a verification thereof prior to the commencement of work in the form presented on Page 20.

SECTION 8

COOPERATION AND COORDINATION

8.1 Cooperation and Coordination with Other Contractors

8.1.1 During the progress of work under this contract it will be necessary for other contractors and persons employed by the District to work in or about the project. The District reserves the right to put such other contractors to work and to afford such access to the site of the work to be performed hereunder at such times as the District deems proper. The contractor shall not impede or interfere with the work of such other contractors engaged in or about the work and shall so arrange and conduct his work that such other contractors may complete their work at the earliest date possible. The cooperation and coordination of the Contractor with other contractors and District employees is mandatory.

8.1.2 The Contractor shall attend such meetings and conferences arranged by the Engineer for the purpose of coordinating project work. One such conference shall be a pre-construction meeting.

The pre-construction meeting shall be held within ten working days after award of the Contract to discuss the following aspects of the project.

- a. Project schedule
- b. Sequence and staging of construction
- c. Administrative procedures
- d. Cost breakdown
- e. List of Subcontractors

8.2 Contractor's Representative

The Contractor shall at all times be represented at the project site of the work in person or by a competent superintendent satisfactory to the Engineer. The Contractor's representative shall have authority to act for the Contractor in all matters concerning the work, and shall have the ability to so organize the work and the work of the subcontractors as to attain complete cooperation and minimize delays.

SECTION 9

SUBCONTRACTOR REQUIREMENTS

9.1 All sections of these Specifications shall apply to subcontractors in addition to the prime contractor.

SECTION 10

TEMPORARY FACILITIES

- 10.1 The Contractor shall provide and maintain such lights, protective devices, barricades and warning signs as are required by the Engineer and as are otherwise necessary for the safety of personnel and the public. The Contractor shall be responsible for the timely erection and removal of such safeguards without specific instructions from the District, or anyone else.
- 10.2 No signs, billboards or any type of advertising is permitted on, about or adjacent to the premises, or on any structure on the premises, except by written consent of the Engineer.
- 10.3 The Contractor shall keep work areas free of accumulations of rubbish and surplus material obstructions. No rubbish or waste or debris shall be burned on the site.
- 10.4 The Contractor shall provide a Type "B" office for his staff in the field as specified in Section 8-2.2 of the Standard Specifications.
- 10.5 The Contractor shall determine the need for temporary utility services required by him and shall make all arrangements with utility companies and governmental agencies to secure such services. All costs incurred shall be at the sole expense of the Contractor. All temporary services shall be furnished, installed, connected and maintained by the contractor in a workman-like manner, satisfactory to the Engineer and shall be removed by the Contractor in like manner at his expense prior to final acceptance except for such temporary facilities as may be specified to remain in place.
- 10.6 Adequate sanitary conveniences of an approved type for the use of persons employed on the site, and properly secluded from public observation, shall be provided and maintained by the Contractor in such a manner and at such points as shall be required by the Engineer. These conveniences shall be maintained at all times without nuisance and their use shall be strictly enforced. Upon completion of the work, they shall be removed from the premises, leaving the premises clean and free from nuisance.

SECTION 11

CONSTRUCTION SAFETY AND HEALTH STANDARDS

- 11.1 It shall be a condition of the contract to be entered into, and shall be made a condition of each subcontract entered into pursuant to this contract, that the Contractor and any subcontractor shall not require any laborer or mechanic employed in performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous to his or her health or safety, as determined under the California Occupational Safety and Health Act of 1973 (Chapter 993, Statutes of 1973).
- 11.2 Contractor shall be solely responsible for maintaining safe working conditions at the worksite and shall follow all the CALOSHA requirements. He shall submit the minutes of his weekly safety meetings to the Engineer along with his weekly payroll for record.
- 11.3 Contractor shall hold the District harmless from any claims or charges by reason of Contractor's or any subcontractor's failure to comply with the above acts or any regulations adopted pursuant thereto and shall reimburse the District for any fines, damages or expenses of any kind incurred by it by reason thereof.
- 11.4 The Contractor shall conform to all applicable occupational safety and health standards, rules, regulations, and orders established by the State of California.
- 11.5 The Contractor shall require that all employees, tradesmen, visitors, and others engaged in any work or business at the site wear approved head protection (hard hats) at all times, as directed by the Engineer. The Contractor shall also require that employees wear all other required personal protective equipment dependent upon the type of exposure present.

SECTION 12

PATENT RIGHTS

- 12.1 The Contractor agrees to defend and pay the entire cost of defending any claim or suit whenever or wherever made or brought against the District based upon infringement or alleged infringement of such letters patent, and to indemnify and save harmless the said District from and against any and all liability, damage, loss or injury adjudged or sustained in any such claim or suit, or adjudged or sustained by reason of the equipment to be furnished hereunder constituting an infringement of any letters patent, or adjudged or sustained by reason of inability of said District to use said equipment because of any infringement or alleged infringement of any letters patent.

SECTION 13

CONTRACT DURATION

- 13.1 If awarded the Contract, the Contractor shall furnish the necessary bonds and insurance certificates within eight working days. The District will review and accept necessary bonds and insurance certificates and issue Notice to Proceed. Contractor shall commence work within five working days after date of Notice to Proceed and shall diligently prosecute the work to completion.
- 13.2 A delay of starting the work after date of Notice to Proceed due to circumstances under the control of the Contractor shall not be a cause for granting a time extension.
- 13.3 The Contractor shall diligently prosecute the work to completion within 200 working days from date of the Notice to Proceed for either Option I or Option II. This shall include time required to obtain permits as required by any regulatory agencies.

SECTION 14

CONTRACT CHANGES

14.1 CHANGE ORDERS -- GENERAL

The District reserves the right to order in writing changes in the plans and specifications, at any time prior to the acceptance of the work without voiding the contract, and Contractor shall comply with such order. Changes or deviations from the plans and specifications shall not be made without authority in writing from the District. On the basis set forth herein, contract price shall be adjusted for any change order requiring labor, material, equipment or quality of materials or equipment over and above that originally required or result in lesser quantity or quality thereof. Whenever it appears to the District that a change is necessary, and when so ordered by District, Contractor shall halt work in the area that may be affected. Changed work shall be performed in accordance with original requirements of the contract subject to the sole exception that if previously modified by change order, then in accordance with such original requirements as so modified.

14.2 CHANGE ORDERS -- ORDINARY

- A. Procedure -- Proposed Change Orders: Subject only to the provisions of Section 14.3, changes in the contract requirements and contract price will be effected as set forth herein.

Contractor will be issued a proposed change order request describing intended change upon which, and within 15 days, he shall indicate his proposed price to be added or deducted from contract sum due to the change, supported by full and completely detailed estimates of cost by contractor, subcontractor, vendor or supplier, and any adjustment in time of final completion of the entire work which is directly attributable to changed work. Contractor shall upon request by District permit inspection of his original contract estimate, subcontract agreements or purchase orders relating to the change. If agreement is reached as to the adjustment in compensation for performance of changed work, but agreement is not reached as to the time adjustment for such work, then Contractor shall proceed with the work at the agreed price reserving to Contractor the right to further pursue his claim for time adjustment.

If Contractor fails to submit his cost estimate within such 15-day period, or there is failure to agree to such cost, the District has the right to order contractor, in writing, to commence work immediately and contract price shall be adjusted in accordance with District's estimate of cost, unless, within 15 days following completion of added work or with written notice to delete work, Contractor presents proof that District's estimate was in error.

- B. Procedure -- Failure to Agree as to Cost: If the District and Contractor fail to agree as to the cost of the proposed change order, Contractor upon written order from the District shall proceed immediately with changed work. Contractor shall maintain daily job record in quadruplicate containing detailed summary of labor, materials, and equipment required for the changed work. Upon being signed and agreed to by the District and Contractor at the end of each day's performance, it will become the basis for payment for the changed work. Upon completion of the work under the change order, Contractor shall submit his invoice therefore containing only the items of labor, materials and equipment which are in addition to requirements of the contract and as approved by both parties, together with allowable mark-ups.

When there has been failure to agree as to cost, no payment will be made to Contractor until completion of work called for in the change or in the written order authorizing performance of the work, except that when performance of such work continues for more than 90 days after date of written order to proceed, or aggregates a cost of \$10,000 or more, then in either such case, Contractor may request progress payments for work already accomplished. Written request shall be accompanied by detailed breakdown of labor, materials and equipment used, based on daily job cost record agreed on by both parties to the contract. Progress payments will be limited to those portions of such work as to which Contractor and District can agree on the value of work payable under the contract.

When proposed change order contains deletion of any work and District and Contractor are unable to agree upon the cost thereof, the District's estimate shall be deducted from contract price, unless within 15 days Contractor presents proof that District's estimate is in error.

C. Allowable Costs Upon Change Orders: The only costs which will be allowed because of changed work and the manner in which such costs shall be computed are set forth in this paragraph. Where the term "actual cost" is used in this Subparagraph C, it shall be read to mean "estimated cost" where adjustment in contract price is in fact to be based upon estimated costs.

1. Labor: The Contractor will be paid the cost of labor for workmen (including foremen when authorized by the District), used in the actual and direct performance of the work. The cost of labor, whether the employer is the Contractor, Subcontractor, or other forces, will be the sum of the following:

a. Actual Wage -- The actual wages paid shall include any employer payments to or on behalf of the workman for health and welfare, pension, vacation and similar purposes.

b. Labor Surcharge -- To the actual wages, as defined in 1a. will be added a labor surcharge not to exceed 20%. Said surcharge shall constitute full compensation for all payments imposed by State and Federal laws and for all other payments made to, or on behalf of, the workmen, other than actual wages as defined in 1a. and subsistence and travel allowance as specified in 1c.

c. Subsistence and Travel Allowance -- The actual subsistence and travel allowance paid for such workmen.

2. Materials: Actual cost to Contractor for materials directly required for performance of changed work. Such cost of materials may include costs of procurement, transportation and delivery if incurred. If trade discount by actual supplier is available to Contractor, it shall be credited to the District. If materials are obtained from supply or sources owned wholly or in part by Contractor, payment therefor will not exceed current wholesale price for such materials. The term "trade discount" does not include the concept of cash discount. If, in the opinion of the District, the cost of materials is excessive, or if Contractor fails to furnish satisfactory evidence of cost to him

from actual supplier thereof, then in either case cost of materials shall be deemed to be lowest current wholesale price at which similar materials are available in quantities required. The District reserves the right to furnish such materials required by the change order as he deems advisable, and Contractor shall have no claims for costs or profits on material furnished by District.

3. Equipment: Actual cost to Contractor for use of equipment directly required in performance of the changed work as specified herein. In computing hourly rental of equipment, any time less than 30 minutes shall be considered one-half hour. No payment will be made for time while equipment is inoperative due to breakdowns or for nonworking days. In addition, rental time shall include time required to move equipment to the work from nearest available source for rental of such equipment, and to return it to the source. If such equipment, is not moved by its own power, then loading and transportation costs will be paid in lieu of rental time therefor. However, neither moving time nor loading and transportation costs will be paid if the equipment is used on the project for any portion of the work other than upon the changed work. Individual pieces of equipment having replacement value of \$100 or less shall be considered to be tools or small equipment, and no payment therefore will be made. The Contractor shall be paid the actual cost of equipment rentals except that such rates paid to the Contractor will not exceed the rental rates listed for such equipment in the Department of Transportation publication entitled "Equipment Rental Rates and General Prevailing Wage Rates", which is in effect on the date upon which the work is accomplished and which is a part of the contract. If such equipment is owned by the Contractor, the above-mentioned Department of Transportation rates shall be used. If it is deemed necessary by the District to use equipment not listed in the said publication, a suitable rental rate for such equipment will be established by the District. The Contractor may furnish any cost data which might assist the District in the establishment of such rental rate.

Rate to be paid to Contractor for use of equipment as set forth above shall constitute full compensation to Contractor for cost of fuel, power, oil lubrication, supplies, small equipment, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance and any and all costs to Contractor incidental to use of such equipment. Operators of rental equipment will be paid for as provided in Section 1 - Labor.

4. Subcontractors: Actual cost to Contractor for work performed by subcontractor. Subcontractor shall compute his costs as set forth in Paragraphs 1, 2 and 3.

5. Mark-ups:

For added or deleted work: When work is added or deleted, mark ups to allowable costs may be added as follows:

- a. Labor -- an amount not to exceed 15 percent for overhead and profit.
- b. Materials and Equipment -- an amount not to exceed 15 percent for overhead and profit.
- c. Subcontractors -- an amount not to exceed 5 percent for overhead and profit.
- d. Profit Mark-up Limitation -- the mark-up for profit shall in no case exceed 10% of the direct cost portion of any Change Order. Contractor shall itemize the profit mark-up of a Change Order as a separate item.

The actual amount of the markup shall be approved by the District and will be commensurate with the scope of the change.

6. General Limitation: In no event shall actual cost to Contractor for added work be recognized in excess of market values prevailing at time of the change, unless Contractor can establish to the complete satisfaction of the District that

he investigated all possible means of obtaining such work at prevailing market values and that the excess cost could not be avoided by him notwithstanding actual charges to Contractor for overhead and profit on work performed or furnished to him by others, no such mark-ups will be recognized or considered in excess of those prevailing in the trade or industry. Lump sum quotations may be accepted at the option of the Engineer. When change order deletes work from contract, computation of cost thereof shall be values which prevailed at time bids for the work were opened.

- a. Allowable Time Extensions: For change in the work, Contractor shall be entitled only to such adjustments in time by which completion of the entire work is delayed due to performance of changed work. Each estimate for change in the work submitted by Contractor shall state amount of extra time that he considers should be allowed for making requested change. An extension in time commensurate with the delay in completion. Failure to request extra time when submitting such estimate shall constitute waiver of the right to subsequently claim adjustment in the time for final completion based upon such changed work.

14.3 EMERGENCY CHANGES

Changes in the work made necessary due to unexpected or unforeseen site conditions, discovery of discrepancies or errors in plans or specifications requiring immediate clarification in order to avoid serious work stoppage are types of emergency changes which may be authorized by the Engineer in writing to Contractor. Contractor shall commence performance of emergency change immediately upon authorization. Daily job record shall be maintained in such manner as required by Section 14.2B.

14.4 CHANGED WORK -- EFFECT ON SURETIES

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

14.5 CONTRACTING OFFICER'S APPROVAL

All contract change orders modifying the contract price and contract duration are subject to approval of the Contracting Officer.

14.6 CLAIMS

A. Notice of Potential Claim

1. The Contractor shall not be entitled to additional compensation otherwise payable for any act or failure to act by District, the occurrence of any event or any other cause, unless it shall have given the District a written notice of potential claim within five working days after the occurrence of the act or event.
2. The written notice of potential claim shall set forth the reasons the Contractor believes additional compensation is or will be due, the nature of the costs involved, and insofar as possible, the amount of the potential claim. If based on an act or failure to act by District, the written notice shall be given to the District prior to the time that the Contractor has started performance of Work giving rise to the potential claim for additional compensation.

B. Submittal of Claims

1. Claims shall be filed by the Contractor within 30 days after the occurrence of the event and shall be in sufficient detail to enable the District to ascertain the basis and amount of the claims. The Contractor shall furnish, when requested by the District further information and details required to determine the facts or contentions involved in the claims. Failure to submit the information and details will be sufficient cause for denying the Contractor's claims.

2. Each claim the Contractor makes for equitable adjustment on account of delay for any cause shall be accompanied by a revised progress schedule, in such detail as is required by the District, reflecting the effects of the delay and proposals to minimize the effects. If no analysis of the progress schedule has been previously submitted to the District reflecting conditions prior to and after the delay for which relief is sought, then such an analysis reflecting those conditions shall be prepared and submitted with the claim. Failure to submit the analysis will be sufficient cause for denying the Contractor's claim.
3. In no event shall claims be made after final payment is made.
4. Contractor shall continue to perform the work during the pendency of the claim.
5. Adjustment in the Contract Price or Schedule arising out of a claim shall be effective only if expressly agreed to by the District by the issuance of a Change Order.

14.7 DISPUTES

- A. If a dispute arises, every effort shall be made to resolve the dispute through negotiation. However, in the absence of settlement, the District may, upon its own initiative or promptly upon the written request of the Contractor, make a determination thereof and such determination shall immediately be complied with by the Contractor pending resolution pursuant to the provisions of sub-article 14.7.B.
- B. Each determination made by the District pursuant to sub-article 14.7.A shall be set forth in a written notice thereof to the Contractor and, within 30 days after the receipt of such notice, the Contractor may respond to the District, in writing, either accepting the determination or stating in general terms the Contractor's factual or legal objections to the determination. If the response is an objection to the determination, the District shall respond, in writing, to the response. Contractor's failure to respond to the District's determination within the thirty day period shall be deemed an acceptance thereof. No further responses by either party shall be required. Thereafter, either party may seek a judicial determination of a dispute, except when the Contractor

accepts the District's determination or fails to respond to the District's determination within the 30 day time limit. Neither the District's determination, nor either party's response, nor the continued performance of the Contract shall constitute an admission as to any factual or legal position in connection with the dispute, or a waiver of rights under this Contract or at law.

- C. Disputes subject to this Article shall be governed by California law. However, to ensure that the Contract is performed in all respects in compliance with the provisions of all capital grants between the District and the United States Government relating to this Contract, and with the laws and regulations governing such grants and the relationship between the District and the United States Government in all other respects, questions arising in connection therewith shall be governed by the applicable Federal law.

SECTION 15

INSPECTIONS

- 15.1 Government Inspections: The Government shall have access to the site of construction and shall have the right to inspect all project works.
- 15.2 Construction Inspections:
- A. In order to allow for inspection by the Engineer, by the local City or any inspection required elsewhere in these specifications, the Contractor shall notify the Engineer a sufficient length of time in advance of the permanent concealment of any materials or work by other materials or work.
 - B. Whenever the Contractor desires to carry on the work of this Contract at night or on a Saturday, Sunday, or holiday, he shall request authorization in writing from the Engineer for such work at least twenty-four (24) hours in advance so that inspection may be provided for if authorization is granted.
 - C. If any work is concealed or performed without the prior notice specified above, then the work shall be subject to such tests or exposure as may be necessary to prove to the Engineer that the materials used and the work done are in conformity with the plans and specifications. All labor and equipment necessary for exposing and testing shall be furnished by the Contractor at his expense. The Contractor shall replace, at his own expense, any materials or work damaged by exposure and any faulty materials or workmanship evidenced by such exposure or testing.
 - D. When in order to comply with the intent of the specifications, and when not otherwise specified, inspection must be made at the plant or mill of the manufacturer or fabricator of material. The Contractor shall notify the Engineer a sufficient length of time in advance to allow for arrangements to be made for such inspection.
 - E. Any inspection or approval by Engineer will not relieve the Contractor of the responsibility of incorporating in the work only those materials which conform to the specifications, and any nonconforming materials shall be removed from the site whenever identified, at the expense of the Contractor.

SECTION 16

INTEREST OF MEMBERS OF CONGRESS

- 16.1 No member of or delegate to the Congress of the United States shall be admitted to any share or part of this contract or to any benefit arising therefrom.

SECTION 17

PROHIBITED INTEREST

- 17.1 No member, officer or employee of the District, or of a local public body, during his tenure or for one year thereafter shall have any interest, direct or indirect, in this contract or the proceeds thereof.
- 17.2 To the District's or Contractor's knowledge, no Board member, officer or employee of the District has any interest whether contractual, non-contractual, financial or otherwise in this transaction, or in the business of the Contractor, and if any time, a full and complete disclosure of all such information will be made in writing to the other party, even if such interest would not be considered a conflict under Article 4 of Chapter 1 of Division 4 of Title 1 (commencing with Section 1090) and Title 9, Article 7 (commencing with Section 87100) of the Government Code.

SECTION 18

CONTRACTOR PARTICIPATION

- 18.1 The Contractor shall perform with his own staff, work equivalent to at least 20% of the total amount of construction work at the site. The percentage of participation will be evaluated on the basis of the dollar value of work determined from the cost schedule required in Section 42.

SECTION 19

PERFORMANCE AND PAYMENT BONDS

- 19.1 The successful bidder shall furnish at his own expense a Faithful Performance Bond satisfactory to the District in the form presented herewith, (Page 17) equal to 100% of the full amount of the contract as a guarantee of good faith on behalf of the Contractor that the terms of this contract shall be complied with in every particular and Contractor's Payment Bond (Page(s) 18-19) in an amount of not less than 100% of the full amount of the contract as security for the payment of all persons performing labor or furnished material used in this contract. Such bonds shall meet the requirements set forth in Civil Code Section 3247 et seq.

SECTION 20

DISADVANTAGED AND WOMEN'S BUSINESS ENTERPRISE

20.1 Policy and Obligation

It is the policy of the Southern California Rapid Transit District (District) and the United States Department of Transportation that Disadvantaged and Women's Business Enterprises (DBEs and WBEs), as defined in the federal regulations published at 49 CFR Part 23, shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part with Federal funds. Consequently, the DBE/WBE requirements of 49 CFR Part 23 apply to this Contract.

Each bidder agrees to ensure that DBE/WBE's as defined herein have the maximum opportunity to participate in the performance of the District's contracts and subcontracts. In this regard, Bidders shall take all necessary and reasonable steps in accordance with 49 CFR Part 23 to ensure that DBE/WBE's have the maximum opportunity to compete for and perform contracts.

Bidders shall not discriminate on the basis of race, age, creed, color, national origin, sex or handicapped status, in the award and performance of the District's DOT-assisted contracts.

20.2 Goals

The District will establish goals for participation by DBE and WBE firms in contracts where appropriate and feasible.

The District has established DBE/WBE participation goals for this contract as indicated on the BID FORM.

Bidders are to refer to Section 20.6 of these General Provisions for guidance in calculating DBE/WBE participation.

20.3 Responsive Bidder

To be responsive, a Bidder must meet the DBE/WBE goals set forth On the Bid Form of this solicitation, or if the goals are not met, full documentation evidencing good faith efforts to meet the goal must be submitted as stated in 20.3, paragraph 2, below.

If a bidder submits a bid containing DBE/WBE subcontractors or joint venture partners which are certified as DBE or WBE by the District, and which meet all other DBE/WBE participation requirements as discussed in section 20.6 below, the Bidder need not submit evidence of good faith efforts to meet the goal.

If the bid contains DBEs or WBEs which meet all other DBE/WBE requirements except that they are not certified by the District, but if certified would meet the DBE/WBE goal, submission of evidence of good faith efforts is not a mandatory requirement. Caveat: Failure to submit evidence of good faith efforts will result in rejection of the bid if the proposed DBE/WBEs are not certifiable and, as a result, the goal is not met, unless evidence of good faith efforts has been submitted with the bid. Submission of evidence of good faith efforts with the bid is therefore strongly recommended.

The Bidder shall furnish the forms listed in item 1, below as part of his/her bid. Documents to support the undertaking of good faith efforts referenced in item 2, below, shall be submitted in a separate sealed envelope concurrently with the bid.

1. DBE/WBE - Related Bid Forms

The Bidder shall clearly reflect his/her commitment to DBE/WBE participation in the following bid forms.

- a. BID FORM: The DBE/WBE level of participation shall be expressed as a percentage of the total bid price.
- b. LIST OF DBE/WBE SUBCONTRACTORS AND SUPPLIERS: The Bidder shall list all DBE/WBE subcontractors and suppliers which he/she intends to use to meet the goal, including those whose participation in the contract is less than one-half of one percent. This form shall include the following information for each DBE/WBE subcontractor and supplier listed.
 - o Name of Subcontractor or Supplier
 - o Address
 - o Type of Work to be Performed
 - o Identify whether DBE or WBE
 - o Percentage of Participation in the Contract

Bidders may enter into joint venture agreements with DBE/WBEs, and in that event, the DBE/WBE joint venture partner shall comply with item 1.c, below.

- c. DBE/WBE Prime Bidder's Statement: If the Bidder is a DBE or WBE, (including joint venture partners) he/she shall attach to the LIST OF DBE/WBE SUBCONTRACTORS AND SUPPLIERS form, a statement describing the scope of work and percentage of total bid price which the bidder intends to do with its own workforce.

2. Good Faith Efforts

All Bidders, except those who have met the DBE/WBE goals, must submit separately, but concurrently with the Bid, full documentation evidencing the efforts made to meet the goals. This evidence must be submitted in a sealed envelope separate from the Bid Forms listed above, and include narrative, affidavits or exhibits to support actions taken.

Following is a description of "good faith efforts" and the types of documentation necessary to evidence such efforts:

a. Advertisements in newspapers of general circulation, trade association publications and minority focus media The advertisements shall be placed in the business, classified, or request for sub-bid section and appear at least 20 calendar days before bid opening. If 20 calendar days are not available, publication for the shorter available time is acceptable. These ads shall include the following information:

- (1.) Project Name and Location;
- (2.) Indication of SCRTD as Owner;
- (3.) Location where Plans and Specifications may be obtained or viewed;
- (4.) Sub-Bid Due Date;
- (5.) Trades or Scopes of Work for which Sub-Bids are being solicited;
- (6.) Statement that Bid solicitation is in response to SCRTD DBE/WBE Program; and
- (7.) Statement that Bidder intends to seriously negotiate with DBE/WBE firms for participation on the project.

Documentation: Affidavits of Publication in minority focus media and trade publications or copies of tear sheets showing date and name of publication.

b. Selection of portions of the work for which interest from DBE/WBE potential joint venture partners, subcontractors, or suppliers will be solicited in a manner to increase the likelihood of achieving the stated goal. Where appropriate, breaking down subcontracts into economically feasible units to facilitate DBE/WBE participation.

Documentation: Provide a narrative stating whether the bidder decided to breakdown any sub-trades into smaller units to facilitate DBE/WBE participation. Also, include a narrative stating the work that the bidder intends to perform with its own workforce and areas of work which the bidder has identified for DBE/WBE joint venture partnership or subcontracting.

- c. Extension of written invitations to DBE/WBE firms for at least the number of trades, subcontractors, or material quotations identified in the Special Conditions of this solicitation, including for trades or areas selected by the bidder for joint venturing or subcontracting as specified in response to good faith effort (b), above. Written invitation shall be such that receipt by DBE firms can be confirmed, e.g., Registered Mail, Certified/Return Receipt Requested, self-addressed stamped postcards or letters requesting interest. A listing of DBE/WBE certified contractors is available in the District's Equal Opportunity Department.

Documentation: A list of DBE/WBE firms which the bidder identified (from the RTD listing and through the DBE/WBE associations and sources contacted in response to 20.3.2.f., below) to solicit interest in the contract. Copies of letters, mail receipts or postcards sent to these DBE/WBE firms.

- d. Oral or written follow-up of initial solicitation to DBE/WBE firms by contacting them to determine with certainty whether they were interested in submitting a sub-bid, quotation, or participating as a joint venture partner. A written record of any oral followup is required.

Documentation: Records which can be verified to document contact with these DBE/WBE firms (e.g., copies of phone bills highlighting DBE/WBE firms telephone number and date called; letters of followup; minutes or notes of meetings held with DBE/WBE firms; copies of responses from DBEs/WBEs; telephone logs). Altogether, this documentation must record the following:

- (1.) Name of DBE/WBE firm contacted, contact person, telephone number, date and time of the contact;
- (2.) A description of the information provided to the DBEs/WBEs regarding the work to be performed;
- (3.) A statement of any other subject matter discussed with DBEs/WBEs contacted (e.g., bonding, entertaining quotations on portions of the work);
- (4.) A list of DBEs/WBEs who submitted quotations, the work on which they bid.
- (5.) A list of DBEs/WBEs who were contacted but who did not bid and the reasons therefor.

- e. Assistance to DBEs/WBES contacted who request assistance in obtaining bonding, lines of credit or insurance, if required by the bidder. The bidder shall contact on behalf of the DBEs/WBES bonding companies, lenders and insurance companies. The bidder, as an alternative, may waive such requirements for the DBEs/WBES interested in bidding. Concerning assistance with bonding, the bidder as an alternative may refer the DBEs/WBES to the resource agencies listed in Attachment I to these General Provisions.

Documentation: Statement of bidder's decision to waive any of these requirements. If the bidder required bonding, insurance, etc., provide a list of DBEs/WBES who requested assistance in these areas and evidence of any assistance provided by the bidder.

- f. Notification of minority and women contractor, trade and professional associations and other DBE/WBE sources, at least 20 calendar days prior to bid opening and effective utilization of services offered to the bidder by these organizations and other sources. If 20 calendar days are not available, notification for a shorter time is acceptable. This contact must be verifiable.

Documentation: Records or correspondence which confirm notification of the association, contact person, telephone number, dates and times contacted. Information provided to these associations and other sources that provide assistance in the recruitment, outreach, and technical assistance to DBE's and WBE's. If the association or other source responded to the Bidder, evidence of how the Bidder used the information and assistance provided. If the bidder solicited sub-bids through these associations' publications, provide copies of the publication's page displaying this ad, and a narrative stating known response thereto. If the Bidder received names of members, clients or other businesses known to that association or source in addition to those identified in 20.3.2.c above, please list name of firm and source of referral.

- g. Verifying with the District, the current DBE/WBE certification status of prospective subcontractors. Encouraging those not currently certified, with whom the bidder might subcontract, to apply for certification with the District. Taking reasonable steps to ascertain that purported DBE/WBE subcontractors are such.

Documentation: Evidence that the Bidder has contacted the District's Department of Equal Opportunity prior to the bid date in order to ascertain certification status of its proposed DBE/WBE subcontractors. Include copies of letters sent to the EO Department requesting verification of DBE/WBE firms' certification status with the District and reply thereto.

Include names of DBE/WBE subcontractors not certified which bidder queried about the ownership and control of their business and prior certification by any other public agency; persons to whom bidder spoke, dates contacted, questions asked, responses given and any encouragement and assistance provided by the bidder to the prospective subcontractor to apply to the District for certification.

20.4 Bid Evaluation

1. Evaluation of DBE - Related Forms

Based on a review of the information reflected on the bid forms referenced in section 20.3 above, if the District determines that the bidder has met the goal and all DBE/WBE firms it intends to use, are certified or certifiable by the District during the bid evaluation period, the District will return, unopened, to the bidder the second sealed envelope containing the documentation of good faith efforts, which was submitted in response to the requirements of section 20.3, paragraph 2.

If, however, the bidder does not meet the goal, or if any of the subcontractors identified in the LIST OF DBE/WBE SUBCONTRACTORS form are uncertifiable and therefore cause the Bidder to drop below the goal, the District will open the second sealed envelope and review the bidder's claim of good faith efforts.

2. Evaluation of Good Faith Efforts

The DBE/WBE Officer will review the documentation submitted by the bidder in support of his/her claim of good faith efforts. Verification of the information with third parties will be conducted if needed.

If necessary, the bidder will be provided an opportunity to clarify any of the documentation in an informal conference with the DBE/WBE Officer. Additional material from the bidder will not be accepted after the bids are submitted to the District.

In order to award a contract to a Bidder that has failed to meet the DBE/WBE goals, the District must determine that the Bidder's efforts were as specified.

If the District deems necessary in the interest of expediting the award of the Contract, the bid evaluation procedures set forth in these General Provisions may be carried out with respect to the bids of one or more additional Bidders at the same or different times with each such proceeding to be separately conducted.

After all information has been evaluated, and the informal conference held (if necessary), the DBE/WBE Officer will make a recommendation for determination to the AGM for Equal Opportunity concerning the Bidder's responsiveness to the invitation for bid.

The AGM for Equal Opportunity will make further recommendation to the District's Purchasing Agent for final determination.

The District's Purchasing Agent shall notify the bidder of the District's decision concerning its responsiveness to the DBE/WBE requirements of the bid. If it is determined that the bidder is not responsive, the Purchasing Agent will inform the bidder that its bid will not be accepted, the reasons therefor, and his/her right to petition the Board of Directors when the contract is scheduled to be acted upon.

20.5 Definitions

The following definitions apply to the terms as used in this DBE/WBE solicitation provision.

1. "Disadvantaged Business Enterprise (DBE)" means a small business concern; (a) which is at least 51 percent owned by one or more socially and economically disadvantaged individuals, or, in the case of any publicly owned business at least 51 percent of the stock of which is owned by one or more socially and economically disadvantaged individuals; and (b) whose management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own it.
2. "Owned and controlled": means a business: (a) which is at least 51 percent owned by one or more minorities or women or, in the case of a publicly owned business at least 51 percent of the stock of which is owned by one or more minorities or women; and (b) whose management and daily business operations are controlled by one or more such individuals.
3. "Small business concern": means a small business as defined pursuant to section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto.
4. "Socially and Economically Disadvantaged Individuals": means those individuals who are citizens of the United States (or lawfully admitted permanent residents) and who are Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, or Asian-Indian Americans and any other minorities or individuals found to be disadvantaged by the Small Business Administration pursuant to Section 8(a) of the Small Business Act, or by the District pursuant to 49 CFR 23.62. Members of the following groups are presumed to be socially and economically disadvantaged:

- (a) "Black Americans," which includes persons having origins in any of the Black racial groups of Africa;
 - (b) "Hispanic Americans," which includes persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race;
 - (c) "Native Americans," which includes persons who are American Indians, Eskimos, Aleuts, or Native Hawaiians;
 - (d) "Asian-Pacific Americans," which includes persons whose origins are from Japan, China, Taiwan, Korea, Vietnam, Laos, Cambodia, The Philippines, Samoa, Guam, the U.S. Trust Territories of the Pacific, and the Northern Marianas; and
 - (e) "Asian-Indian Americans," which includes persons whose origins are from India, Pakistan, and Bangladesh.
5. Other Socially and Economically Disadvantaged Individuals": means those individuals who are citizens of the United States (or lawfully admitted permanent residents) and who, on a case-by-case basis, determined by SBE or the District to meet the social and economic disadvantage criteria described below.

Social Disadvantage

- a. The individual's social disadvantage stems from his/her color, national origin, gender, physical handicap, long-term residence in an environment isolated from the mainstream of American society, or other similar cause beyond the individual's control.
- b. The individual must demonstrate that he/she has personally suffered social disadvantage, not merely claim membership in a group which would be considered socially disadvantaged.
- c. The individual's social disadvantage must be rooted in treatment which he/she has experienced in American society, not in other countries.
- d. The individual's social disadvantage must have negatively affected his/her entry into, and/or advancement in, the business world.
- e. A determination of social disadvantage must be made before proceeding to make a determination of economic disadvantage.

Economic Disadvantage

- a. The individual's ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities, as compared to others in the same line of business and competitive market area who are not socially disadvantaged.

- b. The following criteria will be considered when determining the degree of diminished credit and capital opportunities of a person claiming social and economic disadvantage:
 - (1) With respect to the individual:
 - (a) availability of financing
 - (b) Bonding capability
 - (c) availability of outside equity capital
 - (d) available markets
 - (2) With respect to the individual and the business concern:
 - (a) personal and business assets
 - (b) personal and business net worth
 - (c) personal and business income and profits
6. "Women's Business Enterprise (WBE)" means: a small business concern that: (a) is at least 51 percent owned by one or more women or in the case of a publicly-owned business, at least 51 percent of the stock of which is owned by one or more women; and (b) the management and daily business operations of which are controlled by one or more women who own it.

20.6 Method of DBE/WBE Goal Calculation

The Bidder shall be guided by the following criteria when calculating the DBE/WBE level of participation in his/her bid.

1. A DBE or WBE may participate as a prime contractor, subcontractor, joint venture partner with a prime or subcontractor or vendor of materials or supplies.
2. A DBE or WBE joint venture partner must be responsible for a clearly defined portion of the work to be performed, in addition to satisfying the requirements for ownership and control.
3. A DBE or WBE must perform a commercially useful function, that is, must be responsible for the execution of a distinct element of the work and must carry out its responsibility by actually performing, managing and supervising the work;
4. Credit for the participation of DBE or WBE vendors of materials and supplies is limited to 20 percent of the price unless the vendor manufactures or substantially alters the goods before resale.
5. The total dollar value of a contract with a DBE/WBE owned and controlled by "Disadvantaged" women is counted toward either the DBE goal or the WBE goal, but not for both. The Bidder employing the firm may choose the goal to which the contract value is applied.

6. The total value of a contract with a WBE owned and controlled by "Non-disadvantaged" women is counted toward the goal for WBE only and cannot be counted toward the DBE goal.
7. The total dollar value of a contract to a DBE/WBE owned and controlled by both "Non-disadvantaged" women and "Disadvantaged" men is counted toward the goals for DBE and WBE, respectively, in proportion to the percentage of ownership and control of each group in the business.
8. In calculating the total DBE and WBE utilization percentages, the bidder shall include:
 - (a) The dollar value of all DBE and WBE sub-bids;
 - (b) The dollar value of all materials and supplies to be supplied by DBEs and WBEs (to be credited as noted in item 4, above).
 - (c) The dollar value of all work performed with Bidder's own forces if Bidder is a DBE or WBE. If the Bidder is a DBE or WBE joint venture, he/she shall include only DBE or WBE proportionate interest in the joint venture.

20.7 DBE/WBE Certification

DBE/WBE firms need not be certified by the District prior to the bid date.

However, in order for the Bidder to be determined to meet the DBE/WBE goals of this solicitation, the DBE/WBE firms Bidder intends to credit toward the goal must be certified by the District prior to contract award. The District will review the Bidder's good faith efforts documentation referenced in Section 20.3, paragraph 1. g. of these General Provisions if any of these DBE/WBE firms are not certified during the bid evaluation period.

If during the consideration by the District of Bidder's good faith efforts to meet the DBE/WBE goals, the Bidder shall be deemed to be in compliance with the requirements of Section 20.3 of these General Provisions.

Bidders are urged to encourage their prospective DBE/WBE subcontractors, joint venture partners or suppliers, who do not have current certification from the District, to apply for certification prior to the bid date.

The District's List of Certified DBE and WBEs identifies firms which have been certified by the District. This directory may be obtained by contacting:

Southern California Rapid Transit District
Equal Opportunity Department, DBE Section
425 South Main Street
Los Angeles, CA 90013
(213) 972-6454

Application for certification by the District may be obtained by submitting Schedule A or Schedule B forms (copies attached).

Within five (5) working days of date of request of the Assistant General Manager, Equal Opportunity, a Bidder who is requested to do so shall cause each of its subcontractor DBE and WBE firms to submit to the Equal Opportunity Department information to confirm DBE or WBE status. Schedule A and Schedule B (attached to this section) with supporting documentation shall be submitted for each DBE/WBE firm or DBE/WBE joint venture not already certified.

The District may require that this information be submitted within a shorter timeframe in the interest of expediting contract award and meeting project schedules.

20.8 SUBSTITUTION OF SUBCONTRACTORS

If a Bidder should request a substitution of DBE or WBE subcontractors after the District has accepted the bid and pursuant to the provisions of the California Government Code, Section 4107, the Bidder shall use efforts in cooperation with the district's staff to replace a DBE or WBE subcontractor with another DBE or WBE subcontractor subject to the approval of the District. These efforts shall be similar to those specified in Section 20.3.

20.9 CONTRACT COMPLIANCE

1. Contract Compliance Reporting Requirements

The contractor shall submit to the Equal Opportunity Department, a progress report on its DBE/WBE participation which shall include:

- ° Name of each DBE/WBE subcontractor;
- ° General work assignment of each DBE/WBE subcontractor
- ° The specific portion of work executed by each DBE/WBE subcontractor during the report period;
- ° The dollars committed to each DBE/WBE subcontractor;
- ° The dollars paid to each DBE/WBE subcontractor during the reporting period;

- ° The dollars paid to date as a percentage of the total commitment to each DBE/WBE

2. Noncompliance

Failure to carry out the requirements of this section constitute a breach of contract and, after notification of the U.S. Department of Transportation, may result in termination of the contract by the District or imposition of other appropriate sanctions. This notice is given pursuant to 49 CFR Section 23.43(c).

ATTACHMENT I

DBE/WBE RESOURCE ORGANIZATIONS

One of the good faith efforts that firms bidding on RTD contracts can take in order to solicit interest from potential DBE/WBE subcontractors, is to outreach to these firms through minority and women contractor associations, professional associations, and public and private entities which provide technical assistance to minority and women businesses. Listed below are some of these resources.

RTD is not responsible for changes in the contact person, address, or telephone number for these organizations subsequent to the publication of this list. Contractors are encouraged to maintain on-going contact with these organizations as needed.

MINORITY CONTRACTORS ASSOCIATIONS

1. ASIAN BUSINESS ASSOCIATION
Attn: Clifton Mizokami A.B.A., Director
7876 Berner St.
Long Beach, CA 90808
(213)598-3782
2. BLACK BUSINESS ASSN. of Los Angeles
5140 Crenshaw Blvd., Suite B
Los Angeles, CAa 90043
(213)292-0271
(213)385-0351
3. CALIFORNIA ASSOCIATION OF MINORITY CONTRACTORS
Celso Martinez, Executive Director
670 Monterey Pass Road
Monterey Park, CA 91754
(818)282-3109
4. LATIN BUSINESS ASSOCIATION
P.O. Box 7095
Los Angeles, Ca 90022
(213)260-7138
5. MINORITY CONTRACTORS ASSOCIATION OF LOS ANGELES
John Thompson
3707 West Jefferson Boulevard
Los Angeles, CA 90016
(213)737-7952

6. ORIENTAL BUILDERS ASSOCIATIONS
Mr. George Sunabe
Aloha Electric Company
1100 S. Lincoln Avenue
Monterey Park, CA 91754
(213) 283-1572
7. SO. CALIFORNIA CHI-AM CONSTRUCTION/PROFESSIONAL ASSOCIATION
Mr. Johnny Li, V.P.
Li & Associates, Architects
716 Monterey Pass Road
Monterey Park, CA 91754
(213) 265-3298
8. UNITED INDIAN DEVELOPMENT ASSOCIATION
Walter I. Hare, Jr.
1541 Wilshire Blvd, Suite 418
Los Angeles, CA 90017
(213)483-1460

WOMEN'S CONTRACTORS/BUSINESS ASSOCIATIONS

1. ASSOCIATION FOR WOMEN IN ARCHITECTURE
c/o The Tanzmann Associates
The Bradbury Bldg.
304 South Broadway, Suite 524
Los Angeles, CA 90013
(213)598-3782
2. NATIONAL ASSOCIATION OF WOMEN BUSINESS OWNERS
5300 Beethoven Street
Los Angeles, CA 90066
3. NATIONAL ASSOCIATION OF WOMEN IN CONSTRUCTION
Roz Lang, Region 12 Director
c/o Levine Seegel Assoc.
2601 Ocean Park Blvd., Suite 212
Santa Monica, CA 90405
(213)450-1990
4. WOMEN CONSTRUCTION OWNERS & EXECUTIVES, USA
Nina S. Tate, Natl. President
P.O. Box 91464
Long Beach, CA 90809
(818)240-2630
5. F.M. ASSOCIATES
Connie McDowell
121 West Whittier Blvd.
La Habra, CA 0-631
(213)690-3418

OTHER RESOURCES

1. U.S. SMALL BUSINESS ADMINISTRATION
Attn: Kiyo Kaneshiro
World Trade Center
350 S. Figueroa St. Ste. 600
Los Angeles, CA 90071
(213)688-2960

2. BUSINESS DEVELOPMENT CENTER OF SOUTHERN CALIFORNIA*
Mr. Cleveland O. Neil, Executive Director
2651 South Western Avenue, Suite 300
Los Angeles, California 90018
(213) 331-2131

3. EQUIVEST ASSOCIATES (U.S. DOT PROGRAM MGMT. CENTER)
Attn: Michiko Brazzee
307 N. Santa Anita Ave.,
Arcadia, CA 91006
(818)445-7193

4. LOS ANGELES MINORITY BUSINESS DEVELOPMENT CENTER*
3460 Wilshire Boulevard, Suite 1006/7
Los Angeles, California 90010
(213) 382-5032

5. MAYOR'S OFFICE OF SMALL BUSINESS ASSISTANCE
Attn: Will Marshall
Room 1400, City Hall
Los Angeles, CA 90012
(213)485-6142

6. PDCD (METRO RAIL CONSTRUCTION MGMT. CONSULTANT)
Attn: Evelyn Martinez
100 W. Walnut St.
East Annex 509
Pasadena, CA 91124
(213)440-3437

* For a list of other Minority Business Development Centers funded by U.S. Department of Commerce, Minority Business Development Agency (MBDA). (Consult MBDA at (213)688-7157.

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RTD

ATTACHMENT II

SCHEDULE A

APPLICATION FOR
DISADVANTAGED BUSINESS ENTERPRISE (DBE)
AND
WOMEN'S BUSINESS ENTERPRISE (WBE)
CERTIFICATION
(Individual Business Concern)

Are you bidding/proposing on a current RTD Contract at this time?

Yes
No

If yes, please complete the following.

Project Name: _____

RTD Bid/Proposal Number: _____

S/20:3



Dear

As part of our continuing outreach effort, the Disadvantaged Business Enterprise Department of the Southern California Rapid Transit District is soliciting for certification purposes Disadvantaged and Women-Owned Businesses who are interested in bidding for District contract opportunities.

If your firm is a Disadvantaged or Women Business Enterprise and you are interested in potential participation in the District's procurement activities, we invite you to apply for certification. You may apply by submitting copies of the following items in addition to a signed and notarized Schedule A.

- A. All disadvantaged and/or women-owned businesses must submit items 1-6.
 1. License to do business and/or fictitious name statement for sole proprietorship.
 2. Most recent federal tax return.
 3. Resumes of principals and key personnel.
 4. Third party agreements such as rentals, lease agreements and professional services agreements.
 5. Proof of ethnicity/gender (birth certificate, passport, etc.).
 6. Company profile including a description of the firm's product or services.

- B. Partnerships: Must submit the following items in addition to those required in A (1-6) above:

1. Partnership agreements and any other amendments thereto.
 2. Profit sharing agreements.
 3. Buy-out rights.
- C. Corporation: Must submit the following items in addition to those required in A (1-6) above:
1. Articles of Incorporation.
 2. By-laws.
 3. Stockholders options.
 4. Stockholders agreements.
 5. Stock certificates of each holder.
 6. Stock transfer ledger.
 7. Stock voting rights.
 8. Record of first organization meeting.

Claims of prior certification must be supported with documentary evidence. Where banks or business references are required, please provide the full address and name of contact person. This information should be forwarded to:

Southern California Rapid Transit District
Disadvantaged Business Enterprise Department
Attn: Virginia Heredia
DBE/WBE Programs
425 South Main Street
Los Angeles, CA 90013

Failure to apply for certification does not preclude your firm from competing for District contracts. However, as a federally funded agency we are required under the guidelines of 49CFR 23 to certify firms who wish to participate in our project as a Disadvantaged or Women Business Enterprise.

Should you need additional information and/or assistance concerning our certification procedure or DBE programs, please call the undersigned at (213)972-

-3-

Thank you for taking the time to apply for certification. We look forward to hearing from you and would also like to share with you the District's opportunities available to Disadvantaged and Women Business Enterprises.

Sincerely,

M EC: VH

EEO: 26

-66b-

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
DEPARTMENT OF EQUAL OPPORTUNITY

OFFICE OF DISADVANTAGED/WOMEN-OWNED BUSINESS ENTERPRISE

DISADVANTAGED AND WOMAN-OWNED BUSINESS ENTERPRISE
DISCLOSURE AFFIDAVIT



1. Certification Status Sought:

DBE WBE Dual Status

2. Business Name _____

Address _____

Telephone Number (____) _____

Contact Person _____

Title _____

Nature of Business _____

3. The business is organized as a:

Proprietorship Partnership

Joint Venture Corporation

Date Established _____

4. Person(s) qualifying firm as a DBE or WBE:

<u>Name</u>	<u>Length of Time with Firm</u>	<u>Date Controlling or Qualifying Interest Acquired</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

5. The business is 51 percent owned and controlled by one or more socially and economically disadvantaged individuals who are:

White Hispanic Black Native American
 Asian-Pacific American Asian-Indian American
 Other (specify) _____

6. The business is 51 percent owned and controlled by one or more women.

Yes No

7. The business is a small business concern as defined by the Small Business Administration in 13 CFR Part 21.

Yes No

If Firm is SBA Section 8(a) certified, attach copy.

7a. Total Number of employees for the business and its affiliates

7b. Average annual gross receipts for the past three years

Ownership

Identify below those who possess ownership of 5% or more of the firm

<u>Name</u>	<u>U.S. Citizen Yes / No</u>	<u>Ethnicity</u>	<u>Sex</u>	<u>% Owned</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

IF OWNER LISTED ABOVE IS NOT A U. S. CITIZEN, PROOF OF LEGAL RESIDENCE MUST BE SUBMITTED.

8a. Identify below all corporate officers or key personnel of the firm.

<u>Name</u>	<u>Ethnicity</u>	<u>Sex</u>	<u>Title</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

9. Are there any:

a. Outstanding stock purchase options, warrants or agreements for the issuance of such options for warrants? If yes, explain fully.

b. Shares pledged, subject to lien or agreement or beneficially owned by anyone other than the person in whose name it stands? If yes, explain fully.

10. State Contractor License or Professional Registration Number:

11. Local business License Number:

12. Federal Employer Tax Identification Number:

13. Does the firm own its offices?

_____ Yes _____ No

a. If the firm rents its offices, identify by name and address the owner of the premises and provide a copy of the rental agreement.

b. Identify any firms with whom you share office space.

14. State the total number of employees and the number of minority persons now employed by the firm in each of the following categories:

	<u>Total Employees</u>	<u>Minority Employees</u>
Management	_____	_____
Professional & Technical	_____	_____
Administrative	_____	_____
Supervisory	_____	_____
Clerical	_____	_____
Craftsmen & Laborer	_____	_____

15. Identify by name, address and employer, all persons who provided management or financial consulting services to the firm during the past 12 months.

16. Identify the individuals responsible for day to day management and policy decision making:

a. Financial Decisions

<u>Name</u>	<u>Title</u>	<u>Ethnicity</u>	<u>Sex</u>
<hr/>	<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>	<hr/>

b. Management Decisions

<u>Name</u>	<u>Title</u>	<u>Ethnicity</u>	<u>Sex</u>
<hr/>	<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>	<hr/>

c. Hiring and Firing of Management Personnel

<u>Name</u>	<u>Title</u>	<u>Ethnicity</u>	<u>Sex</u>
<hr/>	<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>	<hr/>

d. Marketing and Sales

<u>Name</u>	<u>Title</u>	<u>Ethnicity</u>	<u>Sex</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

e. Purchase of Major Items or Supplies

<u>Name</u>	<u>Title</u>	<u>Ethnicity</u>	<u>Sex</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

f. Supervision of Field Operations

<u>Name</u>	<u>Title</u>	<u>Ethnicity</u>	<u>Sex</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

17. Identify any outstanding loans greater than \$10,000:

<u>Amount</u>	<u>Lender</u>	<u>Guarantor(s)</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

18. List Major equipment owned or leased by the firm:

a. If any equipment is leased identify owner.

19. Identify the firm's Bonding or Business Insurance Carrier.

Name: _____

Address: _____

Bonding Limit _____

Type and Amount of Coverage _____

Contact Person _____

20. Identify the firm's bank _____

Name: _____

Branch: _____

Address: _____

Contact Person: _____

21. Have any of the officers or owners of the firm conducted business under another business name?

_____ Yes _____ No

a. If so, please provide the following:

<u>Business Name</u>	<u>Officer/Owner</u>	<u>Dates of Operation</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

22. If any owner of the firm is a business entity please provide the following:

Business Name	Address	Owner(s)
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

23. Has the firm been previously certified as a DBE/WBE/MBE or SBA Section 8(a)?

Certifying Authority _____

Date Certified _____

ATTACH EVIDENCE OF PREVIOUS CERTIFICATION.

a. Has the firm ever been denied certification?

_____ Yes _____ No

ATTACH EVIDENCE OF DENIAL OF CERTIFICATION.

24. Describe or attach a copy of any stock options or other ownership options that are outstanding, and any agreements between owners, or between owners and third parties which restrict ownership or control of minority owners.

25. Identify any owner, or management official, of firm who is or has been an employee of another firm that has an ownership interest in, or a present business relationship with the named firm:

a. Owner/Management Official

- b. Describe the nature of the ownership interest or present business relationship with the named firm.

- c. Name of the firm which has an ownership interest or present business relationship with named firm.

AFFIDAVIT

I/We, the undersigned swear that the foregoing statements are true and correct and include all material information necessary to identify and explain the operations of _____

(Name of Firm)

as the ownership thereof.

Further, I/We the undersigned agree to provide through the prime contractor or, if no prime directly to the Southern California Rapid Transit District current, complete and accurate information regarding actual work performance on the project, the payment therefor and any proposed changes, if any, of the foregoing arrangement and to permit the audit and examination of books, records and files of the named firm. Any material misrepresentation will be grounds for terminating any contract which may be awarded and for initiating action under Federal or State Laws concerning false statements.

Signature _____

Name _____

Title _____

Date _____

Corporate Seal (where appropriate)

Date _____

State of _____

County of _____

On this _____ day of _____, 19____, before me appeared _____

_____, proved to me on the basis of satisfactory evidence who being

duly sworn, did execute the foregoing affidavit, and did state that he/she was properly authorized by

_____ (Name of Firm) to execute the

affidavit and did so as his or her free act and deed.

Notary Public _____

Commission Expires _____



ATTACHMENT III

SCHEDULE B

APPLICATION FOR
DISADVANTAGED BUSINESS ENTERPRISE (DBE)
AND
WOMEN'S BUSINESS ENTERPRISE (WBE)
CERTIFICATION
(Joint Venture)

Are you bidding/proposing on a current RTD Contract at this time?

- Yes
 No

If yes, please complete the following.

Project Name: _____

RTD Bid/Proposal Number: _____

S/20:3

Southern California Rapid Transit District
Human Relations Department
Minority Business Enterprise Section

SCHEDULE B

1. Name of Joint Venture Business _____

Business Address _____

City State & Zip Code _____

2. Nature of Joint Venture Business _____

3. List Products and/or Service Rendered: _____

4. Identify firms which comprise joint venture and provide a copy of joint venture agreement.

<u>Name of Firm</u>	<u>Minority</u>	<u>Female</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

A. Describe the role of the MBE/Female firm in the joint venture:

B. Briefly describe the experience and business qualifications of each Non-MBE/Female Joint Venture Partner:

5. What is the percentage of MBE/Female Ownership:

<u> </u> %	<u> </u> %
MBE	Female

6. Please fill in this part if ownership is not described in joint venture agreement:

Name of Joint Venture Partners	Profit & Loss Sharing	Capital Contributions Including Equip.	Other Ownership Interest

7. Control of Joint Venture:

	Name	Title	Business Name	Race	Sex
A. Financial Decisions:					
B. Management Decisions:					
1. Estimating					
2. Marketing & Sales					

AFFIDAVIT

I/We, the undersigned swear that the foregoing statements are true and correct and include all material information necessary to identify and explain the operations of _____

(Name of Firm)

as the ownership thereof.

Further, I/We the undersigned agree to provide through the prime contractor or, if no prime directly to the Southern California Rapid Transit District current, complete and accurate information regarding actual work performance on the project, the payment therefor and any proposed changes, if any, of the foregoing arrangement and to permit the audit and examination of books, records and files of the named firm. Any material misrepresentation will be grounds for terminating any contract which may be awarded and for initiating action under Federal or State Laws concerning false statements.

Signature _____

Name _____

Title _____

Date _____

Corporate Seal (where appropriate)

Date _____

State of _____

County of _____

On this _____ day of _____, 19____, before me appeared _____

_____, proved to me on the basis of satisfactory evidence who being duly sworn, did execute the foregoing affidavit, and did state that he/she was properly authorized by

_____ (Name of Firm) to execute the

affidavit and did so as his or her free act and deed.

Notary Public _____

Commission Expires _____

SECTION 21

NOT USED

SECTION 22

NONDISCRIMINATION DURING THE PERFORMANCE OF THIS CONTRACT

- 22.1 The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor will take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to the following: employment upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this non-discrimination clause.
- 22.2 The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.
- 22.3 The Contractor will send to each labor union or representative of worker with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- 22.4 The Contractor will comply with all provisions of Executive Order 11246, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- 22.5 The Contractor will furnish all information and reports required by Executive Order 11246, as amended, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

- 22.6 In the event of the Contractor's noncompliance with nondiscrimination clauses of this Contract or with any of the said rules, regulations or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246, as amended, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246, as amended, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
- 22.7 The Contractor will include the provisions of Paragraph 22.1 through 22.8 in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246, as amended, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided, however, that if a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.
- 22.8 The Contractor agrees to abide by the provision of Labor Code Section 1777.5 with respect to the employment of indentured apprentices.

SECTION 23

AFFIRMATIVE ACTION REQUIREMENTS
EQUAL EMPLOYMENT OPPORTUNITY

Part I Equal Employment Opportunity

A. Notice of Requirements for Affirmative Action to Ensure Equal Employment Opportunity pursuant to Executive Order 11246.

1. The bidder's attention is called to the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" (Part I.B) and the "Equal Opportunity Clause" (Part I.C) set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the Los Angeles County Area are as follows:

Goals and Timetables for Female Participation in the Construction Industry.

<u>Timetable</u>	<u>Trade</u>	<u>Goal</u>
From April 1, 1980 until March 31, 1981	All	6.9%

Goals and Timetables for Minority Participation in Construction Industry.

<u>Timetable</u>	<u>Trade</u>	<u>Goal</u>
Until further notice by OFCCP	All	28.3%

These goals are applicable to all the Contractor's construction work (whether or not it is federal or federally assisted) performed in the Los Angeles County Area. The Contractor's compliance with Executive Order 11246, the regulations in 41 CFR Part 60-4, and the Southern California Rapid Transit District's Minority Business Enterprise Policy shall be based on its implementation of the Equal Employment Opportunity Clause, specific affirmative action obligations required by the specifica-

tions set forth in 1.B below, and its efforts to meet the goals established for the Los Angeles County geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goal shall be a violation of the contract, Executive Order 11246, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number; estimated dollar amount of subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.
4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is the area of jurisdiction of the Los Angeles Building and Construction Trades Council.

B. Equal Employment Opportunity Construction Contract Specifications Pursuant to 41 CFR 60-4.3 (a) and the Southern California Rapid Transit District Policy.

1. As used in the following specifications:
 - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted.

- b. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP) United States Department of Labor, and any person to whom the Director delegates authority.
- c. "Employer Identification Number" means the Federal Social Security Number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
- d. "Minority" includes:
 - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origins);
 - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race);
 - (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
- e. "District" means the Southern California Rapid Transit District (SCRTD).
- f. "Administering Agency" means the Urban Mass Transportation Administration (UMTA).

2. Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan Area (including goals and time-tables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and time-tables.
4. The Contractor shall implement the specific affirmative action standards provided in Paragraphs 7a through 7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The Contractor is expected to make substantially uniform progress towards its goals in each craft during the period specified.
5. Neither the provisions of any collective bargaining agreement, nor the failure by a union, with whom the Contractor has a collective bargaining agreement; to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, the regulations promulgated pursuant thereto.
6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the

training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these actions fully and implement affirmative action steps at least as extensive as the following:
 - a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
 - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
 - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be

documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.

- d. Provide immediate written notification to the District's Manager of Human Relations and OFCCP's Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
- e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.
- f. Disseminate the Contractor's EEO Policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations: by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO Policy on bulletin boards accessible to all employees at each location where construction work is performed.
- g. Review, at least annually, the company's EEO Policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents, General Foreman, etc., prior to the initiation of

construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

- h. Disseminate the Contractor's EEO Policy externally by including it in any advertising in the news media, and providing written notification to and discussing the Contractor's EEO Policy with other Contractors and subcontractors with whom the Contractor does or anticipates doing business.
- i. Direct its recruitment efforts both oral and written, to minority, female and community organizations, to schools with minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source. The Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
- j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.
- k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training etc., such opportunities.

- m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO Policy and the Contractor's obligations under these specifications are being carried out.
 - n. Ensure that all facilities and company activities are non-segregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
 - o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female Contractor associations and other business associations.
 - p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO Policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in Paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO Policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.
15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).
16. The Contractor shall provide the District, by the fifth day of each month, following the preceding month's construction activity, the Monthly Construction Manpower Utilization Report, Department of Labor Form CC 257. This report shall cover the Contractor's entire work force by trade performing under this contract. Subcontractors, also, shall provide the same reports, through the Contractor, by the fifth day of each month. If the Contractor or a subcontractor is unable to submit its report on time, it shall notify the District's Manager of Human Relations, and request additional time to submit its report. Failure of the Contractor to report in a timely manner shall result in a penalty of \$10.00 per day per report.

SECTION 24

WAGE SCALES

SUPERCEDEAS DECISION

STATE: California

Counties: Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, and Ventura Counties and California

DECISION NO.: CA83-5118
VOLUME #48 No. 181

DATE: September 16, 1983
MODIFICATION NO. 1 (9-30-83)

Supersedes Decision No. CA82-5118 dated August 20, 1982 in 47 FR 36513.

DESCRIPTION OF WORK: Building; Heavy (excluding Water Well Drilling); and Highway Projects; and Residential Projects (excluding Inyo and Mono Counties California); and Dredging.

	<u>BASIC HOURLY RATES</u>	<u>FRINGE BENEFITS</u>
ASBESTOS WORKERS	\$21.29	\$3.88
BOILERMAKERS	21.39	3.96
BRICKLAYERS; STONEMASONS:		
Area 1	19.09	3.59
Area 2	17.19	4.11
Area 3	20.50	3.52
Area 4	17.65	4.00
Area 5	17.40	4.56
Area 6	17.72	4.46
Area 7	20.75	2.97
BRICK TENDERS	13.47	7.28
CARPENTERS:		
Area 1:		
Carpenters; Cabinet Installers; Insulation Installers	18.29	6.52
Saw Filers	18.37	6.53
Table Power Saw Operator	18.39	6.53
Shinglers; Bridge or Dock Carpenters; Derrick Bargeman and Rockslinger	18.42	6.53
Hardwood Floor Layer and Acoustical Installer Pneumatic Nailer or Power Stapler	18.54	6.53
Piledrivermen	18.57	6.53
Millwrights	18.79	6.53
Wood Fence Builder (Residential)	12.70	6.53

	<u>BASIC HOURLY RATES</u>	<u>FRINGE BENEFITS</u>
AREA 2:		
Carpenters; Cabinet Installers; Insulation Installers	16.29	6.53
Saw Filers	16.37	6.53
Table Power Saw Operator	16.39	6.53
Shinglers, Bridge or Dock Carpenters; Derrick Bargeman and Rockslinger	16.42	6.53
Hardwood Floor Layer and Acoustical Installer	16.49	6.53
Pnuematic Nailer or Power Stapler	16.54	6.53
Piledrivermen	16.57	6.53
Millwrights	16.79	6.53
Wood Fence Builder (Residential)	10.70	6.53
CEMENT MASONS:		
AREA 1:		
Cement Masons	18.56	6.35
Cement Floating and Troweling Machine Operators	18.81	6.53
AREA 2:		
Cement Masons	16.56	6.35
Cement Floating and Troweling Maching Operators	16.81	6.35
DRYWALL INSTALLERS/LATHERS	18.06	6.56
Divers:		
Diver, Wet	37.84	6.53
Diver, Stand-by	18.92	6.53
Diver, Tender	17.92	6.53
ELECTRICIANS:		
AREA 1:		
Electricians	22.15	3.78 + 3%
Cable Splicers	22.60	3.78 + 3%
Sound Installers	16.47	1.46 + 3%
Utility Technicians	16.50	0.47 + 3%
AREA 2:		
Electricians	20.15	4.55 + 3%
Cable Splicers	22.17	4.55 + 3%
Residential Electricians	11.40	2.00 + 3%
AREA 3:		
Electricians	22.97	4.62 + 3%
Cable Splicers	23.57	4.62 + 3%
Sound Technicians	16.95	2.25 + 3%
AREA 4:		
Electricians	22.88	3.55 + 3%
Cable Splicers	23.93	3.55 + 3%
AREA 5:		
Electricians	21.79	4.13 + 3%
Cable Splicers	22.29	4.13 + 3%

AREA 6:		
Electricians	20.80	5.10 + 3%
Cable Splicers	21.30	5.10 + 3%
AREA 7:		
Electricians	21.73	3.36 + 3%
Cable Splicers	23.90	3.36 + 3%
Residential Electricians	10.90	3.36 + 3%
AREA 8:		
Electricians	22.20	3.18 + 3%
Cable Splicers	23.70	3.18 + 3%
AREA 9:		
Electricians	23.11	4.97 + 3%
Cable Splicers	25.42	4.97 + 3%
AREA 10:		
Electricians	25.70	3.18 + 3%
Cable Splicers	27.20	3.18 + 3%
AREA 11:		
Electricians	23.90	4.55 + 3%
Cable Splicers	25.92	4.55 + 3%
Residential Electricians	12.40	2.00 + 3%
ELEVATOR CONSTRUCTORS:		
AREA 1:		
Mechanics	22.24	2.69 + a
Helpers	15.57	2.69 + a
Probationary Helpers	11.12	
AREA 2:		
Mechanics	28.35	3.00 + a
Helpers	19.845	3.00 + a
Probationary Helpers	14.175	
CLAZIERS:		
AREA 1	17.62	5.03
AREA 2	17.87	3.15
IRONWORKERS:		
Fence Erectors	16.41	8.53
Structural, Ornamental, Reinforcing	17.30	8.53
IRRIGATION and LAWN SPRINKLERS	15.00	39%
LINE CONSTRUCTION:		
AREA 1:		
Groundman	16.83	3.65 + 4%
Lineman	21.86	3.65 + 4%
Cable Splicers	22.16	3.65 + 4%
AREA 2:		
Groundman	15.11	4.40 + 4%
Lineman	20.15	4.40 + 4%
Cable Splicers	22.17	4.40 + 4%
AREA 3:		
Groundman	14.73	2.28 + 3%
Lineman; Equipment Operators	18.09	2.28 + 3%
AREA 4:		
Lineman	19.32	4.47 + 3%
AREA 5:		
Lineman	18.22	4.70 + 3%

AREA 6:		
Groundman	13.17	3.78 + 3%
Lineman; Equipment Operators	17.56	3.78 + 3%
AREA 7:		
Groundman	16.30	3.33 + 3%
Lineman; Equipment Operators	21.73	3.33 + 3%
Cable Splicers	23.90	3.33 + 3%
AREA 8:		
Groundman	17.69	4.97 + 3%
Lineman; Equipment Operators	23.11	4.97 + 3%
Cable Splicers	25.42	4.97 + 3%
AREA 9:		
Groundman	20.15	3.15 + 4%
Lineman; Equipment Operators	25.70	3.15 + 4%
Cable Splicers	27.70	3.15 + 4%
AREA 10:		
Groundman	18.86	4.40 + 4%
Lineman	23.90	4.40 + 4%
Cable Splicers	25.92	4.40 + 4%
AREA 11:		
Groundman	16.65	3.15 + 4%
Lineman; Equipment Operators	22.20	3.15 + 4%
Cable Splicers	23.70	3.15 + 4%
MARBLE SETTERS:		
AREA 1	14.89	5.96
AREA 2	18.50	2.95
MARBLE FINISHERS:		
AREA 1	14.14	3.30
PAINTERS:		
AREA 1:		
Brush; Painter Burners	18.37	4.67
Paperhangers	18.87	4.67
Sandblaster; Iron, Steel and bridge (Swing Stage)	19.37	4.67
Sheet Rock Tapers	19.37	4.67
Brush (Swing Stage); Spray	18.62	4.67
Steeplejack	20.02	4.67
AREA 2:		
Brush	18.27	4.68
Brush Painter, Structural Steel; Paint Burner	18.39	4.68
Swing Stage, under 13 Stories; Sandblaster; Pressure Roller Operator; Paperhanger	18.52	4.68
Swing Stage, over 13 stories	18.64	4.68
Paste Machine Operator	18.77	4.68
Spray Painter; Steeplejack	19.52	4.68
Taper	19.31	4.68

AREA 3:		
Brush	13.70	3.82
Brush or Roller (Swing Stage); Paperhangers; Tapers (Sheet Rock)	14.20	3.82
Spray; Sandblaster	14.70	3.82
Steeplejack	14.70	3.82
AREA 4:		
Brush; Pot Tender		
Brush; Steeplejack	18.48	3.61
Paperhangers: Paste Machine Operators; Iron and Steel	18.73	3.61
Spray; Taper; Sandbasters	18.98	3.61
Sign Painter	19.13	3.61
Iron and Steel Spray Painter	19.23	3.61
Steeplejack	19.48	3.61
Drywall Taper and Spray Texture	19.81	3.61
Parking Lot Striping Work and/or Highway Markers:		
Traffic Delineating Device Applicator	14.48	1.65 + b
Wheel Stop Installer, Traffic Surface Sandblaster; Striper	13.95	1.65 + b
Slurry Seal Operation: Mixer Operator	13.95	1.65 + b
Squeegee Man; Applicator Operator and Shuttleman	12.37	1.65 + b
Top Man	10.39	1.65 + b
High Iron and Steel Construction, Bridges over 30 ft.:		
Brush, Steeplejack (brush)	20.23	3.61
Steel, Sandblaster, Waterblaster, Power Cleaning, Steam Cleaning	20.73	3.61
Steeplejack (Spray)	21.73	3.61
PLASTERERS:		
AREA 1	18.59	4.905
AREA 2	23.90	
AREA 3	21.77	
AREA 4	18.07	3.35
AREA 5	19.62	5.17
AREA 6		
Plasterers	15.57	4.41
Nozzleman	15.695	4.41
PLASTERERS' TENDERS:		
AREA 1	16.16	7.36
AREA 2	12.75	6.10
AREA 3	16.015	7.31
AREA 4	14.14	7.16
AREA 5	17.97	6.52
AREA 6	16.25	6.10
PLUMBERS; STEAMFITTERS:		
AREA 1	21.38	7.49
AREA 2	18.14	5.53
AREA 3	23.14	5.53
REFRIGERATION and AIR CONDITIONING:		
AREA 1	19.89	7.85

ROOFERS:		
AREA 1	14.54	5.16
AREA 2	14.55	1.55
AREA 3	17.65	4.55
AREA 4	18.17	5.485
AREA 5	17.055	2.435
SHEET METAL WORKERS:		
AREA 1	20.35	4.16
AREA 2	18.80	3.33
AREA 3	18.12	4.62
AREA 4	14.16	3.87
AREA 5	20.08	4.28
AREA 6	19.57	4.59
AREA 7	23.80	3.33
SOFT FLOOR LAYERS:		
AREA 1	18.45	3.94
AREA 2	18.17	4.05
AREA 3	15.57	3.49
SPRINKLER FITTERS:		
AREA 1	21.87	3.23
AREA 2	22.39	2.57
TERRAZZO WORKERS:		
AREA 1	18.50	2.95
AREA 2	17.00	4.80
TILE SETTERS:		
AREA 1	18.50	2.95
AREA 2	20.03	3.51
AREA 3	15.89	3.95
AREA 4	18.00	4.20
AREA 5	16.60	1.90
TILE FINISHERS:		
AREA 1	13.73	3.71
AREA 2	12.80	3.30
LABORERS:		
AREA 1:		
Group 1	14.82	7.53
Group 2	14.97	7.53
Group 3	15.17	7.53
Group 4	15.47	7.53
Group 5	15.67	7.53
TUNNEL LABORERS:		
Group 1	16.73	7.16
Group 2	16.85	7.16
Group 3	17.01	7.16
Group 4	17.29	7.16
AREA 2:		
Group 1	12.82	7.53
Group 2	12.97	7.53
Group 3	13.17	7.53
Group 4	13.47	7.53
Group 5	13.67	7.53
GUNNITE LABORERS:		
Group 1	15.31	7.16
Group 2	14.36	7.16
Group 3	13.10	7.16

TUNNEL LABORERS:		
Group 1	14.73	7.16
Group 2	14.85	7.16
Group 3	15.01	7.16
Group 4	15.29	7.16
RESIDENTIAL LABORERS:		
Areas 1 and 2:		
Cleanup; Landscaping; Fencing	9.00	7.53
All Other Residential Laborers	10.00	7.53
POWER EQUIPMENT OPERATORS:		
DREDGING:		
(Hydraulic Suction Dredges):		
Leverman	18.10	7.24
Watch Engineer; Welder; Deckmate	17.52	7.24
Winchman (Stern Winch or Dredge)	16.97	7.24
Bargeman; Deckhand; Fireman; Oiler; Leveehand	16.43	7.24
Dozer	17.63	7.24
(Clamshell Dredges):		
Leverman	18.10	7.24
Watch Engineer; Deckmate	17.52	7.24
Barge Mats	17.04	6.42
Bargeman; Deckhand; Fire- man; oiler	16.43	7.24
POWER EQUIPMENT OPERATORS:		
Group 1	16.25*	7.24
Group 2	16.53*	7.24
Group 3	16.82*	7.24
Group 4	16.96*	7.24
Group 5	17.18*	7.24
Group 6	17.29*	7.24
Group 7	17.41*	7.24
Group 8	17.58*	7.24
Group 9	17.71*	7.24

*When the home of any employee is over 30 road miles from the center of the job or project on Vandenberg Air Force Base, a rate of \$22.00 per scheduled work day shall be added to the base pay.

TRUCK DRIVERS:		
Group 1	16.48*	4.61
Group 2	15.65*	4.61
Group 3	16.62*	4.61
Group 4	16.71*	4.61
Group 5	16.74*	4.61
Group 6	16.76*	4.61
Group 7	16.80*	4.61
Group 8	16.81*	4.61
Group 9	16.86*	4.61
Group 10	16.89*	4.61

Group 11	\$16.94*	\$4.61
Group 12	16.96*	4.61
Group 13	17.01*	4.61
Group 14	17.26*	4.61
Group 15	17.51*	4.61
Group 16	17.61*	4.61
Group 17	17.71*	4.61
Group 18	18.01*	4.16
Group 19	18.51*	4.16

*When the home of an employee is over 30 road miles from the center of the job or project on Vandenberg Air Force Base, a rate of \$20.00 per scheduled work day shall be added to the Base Pay.

FOOTNOTES:

- a. Employer contributes 8% of basic hourly rate for over 5 years' service and 6% of basic hourly rate for 6 months to 5 years' service as Vacation Pay Credit. Six Paid Holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; and Christmas Day.
- b. Employer contributes \$.23 per hour to Holiday Fund plus \$.14 per hour to Vacation Fund for the first year of employment, 1 year but less than 5 years \$.34 per hour to Vacation Fund, 5 years but less than 10 years \$.44 per hour to Vacation Fund, over 10 years \$.54 per hour to Vacation Fund.

AREA DESCRIPTIONS

BRICKLAYERS; STONEMASONS:

- Area 1: Imperial County
- Area 2: Inyo, Kern, and Mono Counties
- Area 3: Los Angeles County
- Area 4: Riverside and San Bernardino Counties
- Area 5: Santa Barbara and San Luis Obispo Counties
- Area 6: Ventura County
- Area 7: Orange County

CARPENTERS:

- Area 1: Camp Roberts, Edwards Air Force Base, Naval Ordnance Test Station, Point Arguello and Vandenberg Air Force Base.
- Area 2: Remaining Counties

CEMENT MASONS:

- Area 1: Camp Roberts, Edwards Air Force Base, Naval Ordnance Test Station, Point Arguello and Vandenberg Air Force Base.
- Area 2: Remaining counties.

DIVERS:*

Shall receive a minimum of 8 hours pay for any day or part thereof.

ELECTRICIANS:

- Area 1: Imperial County
- Area 2: Kern County (Remainder of County)
- Area 3: Los Angeles County
- Area 4: Orange County
- Area 5: Riverside County
- Area 6: Inyo, Mono, and San Bernardino Counties
- Area 7: San Luis Obispo County
- Area 8: Santa Barbara (Remainder of County)
- Area 9: Ventura County
- Area 10: Point Arguello and Vandenberg Air Force Base
- Area 11: China Lake Naval Ordnance Test Station and Edwards Air Force Base

ELEVATOR CONSTRUCTORS:

- Area 1: Imperial and Inyo Counties; Kern County (south of Tehachapi Range); Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, and Ventura Counties
- Area 2: Kern County (north of Tehachapi Range)

GLAZIERS:

- Area 1: Los Angeles, Orange, Riverside, San Bernardino, Santa Barbara, San Luis Obispo, and Ventura Counties
- Area 2: Imperial County

IRONWORKERS:

Where the project is located 60 miles or more from the City Halls indicated below, the following amount shall be added to the Base Pay:

- 60 miles to 100 miles - \$18.00 per day
- 100 miles and over - \$24.00 per day

City Hall of San Francisco, Oakland, San Jose, Sacramento, Stockton, Fresno, Bakersfield, Eureka, Redding, Napa, Los Angeles, San Diego, San Bernardino, Ventura, and El Centro

LINE CONSTRUCTION:

Area 1: Imperial County
Area 2: Kern County (Remainder of County)
Area 3: Orange County
Area 4: Los Angeles County
Area 5: Inyo, Mono, and San Bernardino Counties
Area 6: Riverside County
Area 7: San Luis Obispo County
Area 8: Ventura County
Area 9: Point Arguello and Vandenberg Air Force Base
Area 10: China Lake Naval Ordnance Test Station and Edwards Air Force Base
Area 11: Santa Barbara (Remainder of County)

MARBLE SETTERS:

Area 1: Inyo and Mono Counties
Area 2: Imperial County

MARBLE FINISHERS:

Area 1: Imperial County

PAINTERS:

Area 1: Imperial, Orange, and Riverside Counties; Los Angeles County (Pomona Area); San Bernardino County (excluding western portion)
Area 2: Inyo County; Los Angeles County (except Pomona Area); Mono County; San Bernardino County (west of a line north of Trono including China Lake Area, Johannesburg, Boron, south including the Wrightwood Area); Kern County east of the Los Angeles Aqueduct)
Area 3: Kern County (except the portion lying east of the Los Angeles Aqueduct)
Area 4: San Luis Obispo, Santa Barbara, and Ventura Counties

PLASTERERS:

Area 1: Los Angeles and Orange Counties
Area 2: Imperial, Riverside, and San Bernardino Counties
Area 3: San Luis Obispo County
Area 4: Santa Barbara County
Area 5: Ventura County
Area 6: Kern, Inyo, and Mono Counties

PLASTERERS' TENDERS:

Area 1: Imperial, Inyo, Mono, Riverside, and San Bernardino Counties
Area 2: Kern County
Area 3: Los Angeles and Orange Counties
Area 4: San Luis Obispo and Santa Barbara Counties
Area 5: Ventura County
Area 6: China Lake Naval Ordnance Test Station and Edwards Air Force Base

PLUMBERS; STEAMFITTERS:

Area 1: Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, and Ventura Counties

- Area 2: Inyo, Kern, and Mono Counties
- Area 3: Edwards Air Force Base, Naval Weapons-Center and China Lake Naval Ordnance Test Center

REFRIGERATION and AIR CONDITIONING:

- Area 1: Los Angeles and Orange Counties

ROOFERS:

- Area 1: Imperial County
- Area 2: Inyo, Kern, and Mono Counties
- Area 3: Riverside and San Bernardino Counties
- Area 4: Los Angeles, Orange, and Ventura Counties
- Area 5: San Luis Obispo and Santa Barbara Counties

SHEET METAL WORKERS:

- Area 1: Imperial County
- Area 2: Kern County and all of Inyo and Mono Counties; Los Angeles County (that portion north of a straight line drawn between Gorman and Big Pines)
- Area 3: Los Angeles County (Remaining portion)
- Area 4: Orange County
- Area 5: Riverside and San Bernardino Counties
- Area 6: San Luis Obispo, Santa Barbara, and Ventura Counties
- Area 7: Edwards Air Force Base and China Lake Naval Weapons Base

SOFT FLOOR LAYERS:

- Area 1: Imperial County
- Area 2: Los Angeles, Orange, Riverside, Santa Barbara, San Luis Obispo, San Bernardino, and Ventura Counties
- Area 3: Kern, Inyo and Mono Counties

SPRINKLER FITTERS:

- Area 1: Imperial, Inyo, Kern, and Mono Counties; Orange County (except Santa Ana); Riverside County, San Bernardino County (except Ontario); San Luis Obispo, Santa Barbara and Ventura Counties
- Area 2: Los Angeles City and area within 25 miles and Pomona Area; Orange County (Santa Ana); San Bernardino County (Ontario); and Ventura County (Santa Paula, Point Mugu and Port Hueneme)

TERRAZZO WORKERS:

- Area 1: Imperial County
- Area 2: Remaining Counties

TILE SETTERS:

- Area 1: Imperial County
- Area 2: Los Angeles, Orange, and Ventura Counties
- Area 3: San Luis Obispo and Santa Barbara Counties
- Area 4: Riverside and San Bernardino Counties
- Area 5: Inyo, Kern, and Mono Counties

TILE FINISHERS:

- Area 1: Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties

Area 2: Kern, Inyo, and Mono Counties

LABORERS:

Area 1: Point Arguello, Camp Roberts, Edwards Air Force Base, Naval Ordnance Test Center, Vandenberg Air Force Base
Area 2: Remainder of Counties

LABORERS
AREAS 1 and 2

- Group 1: Cleaning and Handling of Panels Forms; Concrete Screeding for rough strike-off; Concrete, water curing; Demolition laborer, the cleaning of brick and lumber; Dry packing of concrete, plugging, filling of Shee-bolt Holes; Fire Watcher, Limber, Brush Loaders, Pilers and Debris Handlers; Gas, oil and/or water pipeline Laborer; Laborer, general or construction; Laborer, general or construction; Laborer, general cleanup; Laborer, landscaping; Laborer, jetting, temporary water and air lines; Material Hoseman (walls, slabs, floors, and decks); Rigging and Signaling; Scaler; Slip Form Raisers; Slurry Seal Crews (Mixer Operator, Applicator Operator, Squeegee Man, Shuttle Man, Top Man); Striper, Concrete or other paved surfaces; Tarman and Mortar Man; Tool Crib or Tool House Laborer; Traffid Delineating; Device Applicator; Window Cleaner; Wire Mesh, pulling all concrete pouring operations.
- Group 2: Asphalt Shoveler; Cement Dumper (on 1 yard or larger Mixer and handling bulk cement); Cesspool Digger and Installer, Chucktender; Chute Man, pouring concrete, the handling of the Chute from Ready Mix Trucks, such as walls, slabs, decks, floors, foundations, footings, curb, gutters, and sidewalks; Concrete Curer, Impervious Membrane and Form Oiler; Cutting Torch Operator (demolition); Fine Grader, highways and street paving, airport, runways, and similar type heavy construction Gas, oil and/or water Pipeline Wrapper; Pot Tender and Form Man; Guinea Chaser; Headerboard Man, asphalt; Laborer, packing rod steel and pans; Power Broom Sweepers (small); Riprap tonepaver, placing stone or wet sacked concrete; Roto Scraper and Tiller; Sandblaster (Pot Tender); Septic Tank Digger and Installer (Leadman); Tank Scaler and Cleaner; Tree Climber, Faller, Chain Saw Operator, Pittsburgh Chipper and similar type Brush Shredders; Underground Laborer, including Caisson Bellower.
- Group 3: Asphalt Raker, Luteman, Ironer and asphalt spreader boxes (all types); Buggymobile Man; Concrete Core Cutter, Grinder or Sander; Concrete Cutting Torch; Concrete Saw man, cutting, scouring old or new concrete; Driller, Jackhammer, 2 1/2 ft. drill steel or longer; Dri Pak-it Machine; Gas, oil and/or water Pipeline Wrapper, 6" pipe and over, by any method, inside and out; Hydro Seeder and similar type; Impact Wrench Multi-plate; Kettlemen, Potmen and Men applying asphalt, Lay-kold, creosote, lime caustic and similar type materials ("applying" means applying, dipping, brushing or handling of such materials for pipe wrapping and waterproofing); Operators or pneumatic, gas, electric tools; Vibrating Machines, Pavement Breakers, Air Blasting, Come-alongs, and similar mechanical tools not separately classified herein; Pipelayer's Backup Man, coating, grouting, making of joints, sealing, caulking, diapering and including Rubber Gasket Joints, pointing and any and all other services; Rock Slinger; Rotary Scarifier or Multiple Head Concrete Chipping Scarifier; Steel Headerboard Man and Guideline Settler; Tampers; Barko, Wacker, and similar type; Trenching Machine, hand propelled.

- Group 4: Cribber, Shorer, Lagging, Sheeting and Trench Bracing, handguided Lagging Hammer; Head Rock Slinger; Laser Beam; Over-size Concrete Vibrator Operator, 70 lbs. and over; Pipelayer, including water, sewage, solid, gas or air; Prefabricated Manhole Installer; Sandblaster (Nozzlemán), water blasting; Welding in connection with Laborers' work.
- Group 5: Blaster Powderman, all work of loading holes, placing and blasting of all powder and explosives of whatever type, regardless of method used for such loading and placing; Driller; All power drills, excluding Jackhammer, whether Core, Diamond, Wagon, Track, Multiple Unit, and any and all types of mechanical drills.

GUNNITE

- Group 1: Nozzlemen and Rodmen
- Group 2: Gunmen
- Group 3: Reboundmen

TUNNEL

- Group 1: Batch Plant Laborers; Bull Gang Mucker, Trackman; Concrete Crew, including Rodders and Spreaders; Changehouseman; Dumpman, Dumpman (outside); Swamper (Brakeman and Switchman on tunnel work); Tunnel materials handling Man; Tool Man.
- Group 2: Cable Tender; Chuck Tender; Nipper; Steel Form Raiser and Setter's Tender; Vibratorman, Jackhammer, pneumatic tools (except Driller); Loading and unloading Agitator Cars; Pot Tender, using mastic or other materials.
- Group 3: Blaster, Driller Powderman; Chemical Grout Jetman; Cherry Pickerman; Grout Gunman; Grout Mixerman; Grout Pumpman; Jackleg Miner; Jumbo Man; Kemper and other pneumatic concrete Placer Operator; Miner, tunnel (hand or machine); Powderman (Primer House); Primer Man; Shotcrete man, Steel Form Raiser and Setter; Timberman; Retimber (wood or steel); Tunnel Concrete Finisher; Nozzlemán; Operating Troweling and/or Grouting Machine; Sandblaster.
- Group 4: Shaft, Raise Miner; Diamond Driller

POWER EQUIPMENT OPERATORS

- Group 1: Brakeman; Compressor (less than 600 C.F.M.); Engineer Oiler; Generator; Heavy Duty Repairman; Tender; Pump; Signalman; Switchman.
- Group 2: Compressor (600 C.F.M. or larger); Concrete Mixer, Skip type, Conveyor; Fireman; Hydrostatic Pump; Oiler Crusher (asphalt or concrete plant); Plant Operator; Generator, Pump or compressor; Rotary Drill Helper (Oilfield); Skiploader, wheel type up to 3/4 yard without attachments; Soils Field Technician; Tar Pot Fireman; Temporary Heating Plant; Trenching Machine Oiler; Truck Crane Oiler.
- Group 3: A-Frame or Winch Truck; Elevator Operator (inside); Equipment Greaser (rack); Ford Ferguson (with dragtype attachments); Helicopter Radioman (ground); Power Concrete Curing Machine; Power Concrete Saw; Power driven Jumbo Form Setter; Ross Carrier (job site); Stationary Pipe Wrapping and Cleaning Machine.

- Group 4: Asphalt Plant Fireman; boring Machine; Boxman or Mixerman (asphalt or concrete); Chip Spreading Machine; Concrete Pump (small portable); Bridge type Unloader and Turntable; Dinkey Locomotive or Motorman (up to and including 10 tons); Equipment Greaser (Greaser Truck); Helicopter Hoist; Highline Cableway Signalman; Hydra-Hammer-Areo Stomper; Power Sweeper; Roller (compacting); Screed (asphalt or concrete); trenching Machine (up to 6 feet).
- Group 5: Asphalt Plant engineer; Backhoe (up to and including 3/4 yard); Batch Plant; bit Sharpener; Concrete Joint Machine (canal and similar type); Concrete Planer; Deck Engine; Derrick Man (Oilfield type); Drilling Machine Operator (including water wells); Forklift (under 5 ton capacity); Hydrographic Seeder Machine (straw, pulp or seed); Machine Tool Operator; Maginnis Internal Full Slab Vibrator; Mechanic Berm, Curb or Gutter (asphalt or concrete); Mechanical Finisher (concrete-Clary, Johnson, Bidwell, or similar); Pavement Breaker (truck mounted); Road Oil Mixing Machine; Roller (asphalt or finish); Rubbertired Earth Moving equipment (single engine, up to and including 25 yards struck); Self-propelled Tar Pipelining Machine; Slip Form Pump (power driven hydraulic lifting device for concrete forms); Skip-loader (crawler and wheel type, over 3/4 yard and up to and including 1 1/2 yards); Stinger Crane (Austin-Western or similar type); Tractor, Bulldozer, Tamper Scraper (single engine, up to 100 HP, flywheel and similar types, up to and including D-5 and similar types); Tugger Hoist, 1 drum; Tunne' Locomotive (over 10 tons up to and including 30 tons); Welder-general.
- Group 6: Asphalt or Concrete Spreading (tamping or finishing); Asphalt Paving Machine (Barber Greene or similar type); Bridge Crane Operator; Cast-in-place Pipe Laying Machine; Combination Mixer and Compressor, (Gunitite work); Compactor, self-propelled; Concrete Mixer-paving; Concrete Pump (truck mounted); Crane Operator up to and including 25 ton capacity) (Long-boom pay applicable); Crushing Plant, Drill Doctor, Elevating Grader; Forklift (over 5 tons); Grade Checker; Grade-all; Grouting Machine; Heading shield; Heavy Duty Repairman; Hoist Operator (Chicago Boom and similar type); Kolman Belt Loader and similar type; LeTourneau Blob Compactor or similar type; Lift Mobile; Lift Slab Machine (Vagtborg and similar types); Loader (Athey, Euclid, Sierra and similar type); Material Hoist, Mucking Machine (1/4 yard rubber tired, rail or track or similar type); Pneumatic Heading Shield (tunnel); Pumpcrete Gun; Rotary Drill (excluding Caisson type); Rubber-tired Earth Moving Equipment (single engine, Caterpillar, Euclid, Athey, Wagon and similar types with any and all attachments, over 25 yards struck); Rubber-tired Scraper (self-loading paddle wheel type, John Deere, 1040 and similar single unit); Skip-loader (Crawler and wheel type, over 1 1/2 yds., up to and including 6 1/2 yds.); Surface Heaters and Planer; Trenching Machine (over 6 ft. depth capacity); Tower Crane; Tractor Compressor Drill Combination; Tractor (any type larger than D-5-100 flywheel HP and over, or similar); Bulldozer, Tamper, Scraper and Push Tractor (single engine); Tractor (boot attachments); Traveling Pipe Wrapping, Cleaning and Bending Machine; Tunnel Locomotive (over 30 tons); Shovel, Backhoe, Dragline, Clamshell (over 3/4 yd. and up to 5 cu. yds. M.R.C.) (Long-boom pay applicable); Self-propelled Curb and Gutter Machine.
- Group 7: Crane, over 25 ton up to and including 100 tons M.R.C. (Long boom pay applicable); Derrick Barge (Long boom pay applicable); Dual Drum Mixer; Heavy Duty Repairman, Welder combination; Hoise, Stiff-legs, Guy Derrick or similar type, up to and including 100 tons (Long boom pay applicable); Monorail Locomotive (diesel, gas or electric); Motor Patrol-blade Operator

(single engine); Multiple Engine Tractor (Euclid and similar type, except Quad 9 Cat); Rubber-tired Earth Moving Equipment (single engine, over 50 yds. struck); Rubber-tired Earth Moving Equipment (multiple engine, Euclid, Caterpillar and similar) (over 25 yards and up to 5 cu. yds. struck); Shovel, Backhoe, Dragline, Clamshell (over 5 cu. yds. M.R.C.) (Long boom pay applicable); Tower Crane Repairman; Tractor Loader (Crawler and wheel type, over 6 1/2 yards); Welder, certified; woods Mixer and similar Pugmill Equipment.

- Group 8: Auto Grader; Automatic Slip Form; Crane-over 100 tons (Long-boom pay applicable); Hoist, Stiff Legs, Guy Derrick or similar types (capable of hoisting 100 tons or more) (Long boom pay applicable); Mass Excavator, less than 750 cu. yds.; Mechanical Finishing Machine; Mobile Form Traveler; Motor Patrol, multi-engine; Pipe Mobile Machine; rubber-tired Earth Moving Equipment (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck); Rubber-tired Self-loading Scraper (paddle wheel, auger type self-loading, 2 or more units); Rubber-tired Scraper, pushing one another without Push Cat. Push-pull (50 cents per hour additional to base rate); Tandem Equipment (2 units only); Tandem Tractor (Quad 9 or similar type); Tunnel Mole Boring Machine.
- Group 9: Canal Liner; Canal Trimmer; Helicopter Pilot; Highline Cableway; Remote Controlled Earth Moving Equipment (\$1.00 per hour additional to base rate); Wheel Excavator (over 750 cu. yds.)

TRUCK DRIVERS

- Group 1: Warehouseman and Teamster
- Group 2: Driver of vehicle or combinations of vehicles of 2 axles (including all vehicles less than 6 tons); Traffic Control Pilot Car, excluding moving heavy equipment permit load.
- Group 3: Truck mounted power Broom
- Group 4: Drivers of vehicles or combination of vehicles of 3 axles
- Group 5: Bootman; Cement Distributor; Fuel Truck; Road Oil Spreader Truck; Water Truck, 2 axle
- Group 6: Dump, or less than 16 yards
- Group 7: Transit-mix, under 3 yards, Dumpcrete, less than 6 1/2 yards
- Group 8: Truck Repairman Helper
- Group 9: Water Truck, 3 or more axles
- Group 10: PB and similar type truck when performing within the Teamsters' jurisdiction; Pipeline and Utility working Truck including Winch, but limited to truck applicable to Pipeline and Utility work, where a composite crew is used; Slurry Driver; Truck Greaser and Tireman (50 cents per hour addition for Tireman)
- Group 11: Transit-Mix, 3 yards or more; Dumpcrete, 6 1/2 yards and over
- Group 12: Driver or vehicle or combination of vehicles of 4 or more axles
- Group 13: Dump, 16 yards but less than 25 yards
- Group 14: A-Frame or Swedish Crane, or similar type of equipment Driver; Fork Lift Driver; Ross Carrier, highway
- Group 15: All off-highway equipment within Teamsters' jurisdiction (off highway combination of vehicles or equipment with multiple power sources, \$1.00 per hour additional); Dump, 25 yds. or more; Truck Repairman
- Group 16: Truck Repairman Welder
- Group 17: Low Bed Driver, 9 axle or over

Group 18: Water Pull, single engine with attachments
Group 19: Water Pull, twin engine with attachments

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR, 5.5 (a) (1) (ii)).

SECTION 25

LABOR PROVISIONS

25.1 Minimum Wages - Davis-Bacon Act (40 U.S.C. 276a-276a-7)

- (a) All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b) (2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (d) of this clause; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in the clause entitled "Apprentices and Trainees." Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (b) of this clause) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(b)(1) The Contracting Officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator of the Wage and Hour Division, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(3) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator for determination. The Administrator of the Wage and Hour Division, or an authorized representative, will issue a determination within

30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

- (4) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (b) (2) or (b) (3) of this clause, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.
- (c) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
- (d) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program. Provided, that the Secretary of Labor has found, upon the written request of the Contractor, that applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.
- (e) Paragraphs (a) through (d) of the clause shall apply to this contract to the extent that it is (1) a prime contract with the Government subject to the Davis-Bacon Act, or (2) a subcontract also subject to the Davis-Bacon Act under such prime contract.

25.2 Contract work Hours and Safety Standards Act-Overtime Compensation (40 U.S.C. 327-333)

This contract is subject to the Contract Work Hours and Safety Standards Act and to the applicable rules, regulations, and interpretations of the Secretary of Labor.

- (a) Overtime requirements. No Contractor or subcontractor contracting for any part of the contract work which may require or involve the

employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of 8 hours in any calendar day or in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 8 hours in any calendar day or in excess of forty hours in such workweek, whichever is greater.

- (b) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions set forth in paragraph (a) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the provisions set forth in paragraph (a) of this clause, in the sum of \$10 for each calendar day for which such individual was required or permitted to work in excess of 8 hours or in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in paragraph (a) of this clause.
- (c) Withholding for unpaid wages and liquidated damages. The Contracting Officer shall upon his/her own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same Prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same Prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in paragraph (a) of this clause.

- (d) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts the provisions set forth in paragraphs (a) through (d) of this clause and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the provision set forth in paragraphs (a) through (d) of this clause.

25.3 Apprentices and Trainees

- (a) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a Contractor is performing construction on a project in a locality other than that in which its program is registered the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the

journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- (b) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee's rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee

performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination of the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- (c) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

25.4 Payrolls and Basic Records

- (a) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of 3 years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b) (2) (B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under paragraph (d) of the clause entitled "Davis-Bacon Act" that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b) (2) (B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and

certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

- (b) (1) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the Contracting Officer. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraphs (a) of this clause. The information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents, Government Printing Office. The Contractor is responsible for the submission of copies of payrolls by all subcontractors.
- (2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
- (i) That the payroll for the payroll period contains the information required to be maintained under paragraph (a) of this clause entitled "Payrolls and Basic Records" and that such information is correct and complete;
 - (ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR Part 3;
 - (iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or case equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

- (3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (b) (2) of this clause.
- (4) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.
- (c) The Contractor or subcontractor shall make the records required under paragraph (a) of this clause available for inspection, copying, or transcription by the Contracting Officer of the Department of Labor or their authorized representatives. The Contractor and subcontractors shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

25.5 Compliance with Copeland Act Requirements.

The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

25.6 Withholding.

The Contracting Officer shall upon his/her own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same Prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same Prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United

States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Prime Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

25.7 Subcontracts.

The Contractor or subcontractor shall insert in any subcontracts the clauses entitled "Davis-Bacon Act", "Contract Work Hours and Safety Standards Act-Overtime Compensation", "Apprentices and Trainees", "Payrolls and Basic Records", "Compliance with Copeland Act Requirements", "Withholding", "Subcontracts", "Contract Termination-Debarment", "Disputes Concerning Labor Standards", "Compliance with Davis-Bacon and Related Act Requirements", and "Certification of Eligibility", and such other clauses as the Contracting Officer may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with all the contract clauses cited above.

25.8 Contract Termination; Debarment.

A breach of the contract clauses entitled "Davis-Bacon Act", "Contract Work Hours and Safety Standards Act-Overtime Compensation", "Apprentices and Trainees", "Payrolls and Basic Records", "Compliance with Copeland Act Requirements", "Subcontracts", "Compliance with Davis-Bacon and Related Act Requirements", and "Certification of Eligibility", may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

25.9 Disputes Concerning Labor Standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6 and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, of the employees or their representatives.

25.10 Compliance with Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3 and 5 are herein incorporated by reference in this contract.

25.11 Certification of Eligibility.

- (a) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a) (1).
- (b) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a) (1).
- (c) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

SECTION 26

CERTIFIED PAYROLLS -- CONSTRUCTION PROJECTS

- 26.1 Each Contractor and subcontractor shall furnish a certified copy of each weekly payroll within seven days after the regular payroll date. Following a review by the District for compliance with State and Federal labor laws, the payroll copy shall be retained at the project site. Failure to provide such certified payrolls may be the basis for withholding progress payment to the Contractor.
- 26.2 A Contractor may use the Department of Labor Form WH-347, "Optional Payroll Form", which provides for all the necessary payroll information and certifications. This Department of Labor form may be purchased at nominal cost from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. However, the Contractor may use his own payroll form provided it includes the same information and certifications as the Department of Labor Form WH-348, "Statement of Compliance".

SECTION 27

FEDERAL PARTICIPATION SIGNS

- 27.1 The District will erect and maintain signs on the job site, satisfactory to UMTA, identifying the project and indicating Federal participation.

SECTION 28

WARRANTY

- 28.1 The Contractor warrants that the work performed, and all materials furnished hereunder by Contractor or his sub-contractors or suppliers will be free from defects in design, material and workmanship for a period of one year from the date of final acceptance unless otherwise specified in the Technical Provisions.
- 28.2 The Contractor shall remedy any such defect at his own expense.
- 28.3 Work which has been abused or neglected by the District is excluded from this warranty.
- 28.4 The Contractor shall furnish written warranties required by the respective sections of the Specifications for time stipulated therein. These warranties shall be in writing, on the Contractor's letterhead.
- 28.5 Nothing in these requirements, conditions or specifications including the District's right to a complete inspection shall constitute a disclaimer to or limit, negate, exclude or modify in any way any warranty created hereunder.

SECTION 29

LIQUIDATED DAMAGES

29.1 TIME IS OF THE ESSENCE IN THIS CONTRACT

In case all the work called for under the Contract is not completed before or upon the time limit as set forth in the specifications, damage will be sustained by the District. It is, and will be, impracticable to determine the actual damage which the District will sustain in the event of and by the reason of such delays; and it is therefore agreed that pursuant to Government Code Section 53069.85 the Contractor will pay the District the sum of \$800 for each and every working day that the project is delayed beyond the 200 working days stipulated in Section 13, subject to extensions granted thereto in writing. The Contractor agrees to pay such liquidated damages as herein provided and, in case the same are not paid, agrees that the District may deduct the amount thereof from any money due or to become due the Contractor under the Contract.

29.2 The Contractor will be granted an extension of time and will not be assessed with liquidated damages or the cost of engineering and inspection for any portion of the delay in completion of the work beyond the time named in these specifications caused by acts of God, or of the public enemy, fire, floods, epidemics, quarantine, restrictions, strikes, labor disputes, shortage of materials and freight embargoes, or other causes beyond his reasonable control, provided that the Contractor shall notify the Engineer in writing of the causes of delay within 15 days from the beginning of any such delay. The Chief Engineer shall ascertain the facts and extent of the delay, and his findings thereon shall be final and conclusive. Contractor has the burden of proof that the delay was beyond his control.

SECTION 30

AIR QUALITY CONTROL

- 30.1 The Contractor shall comply with all South Coast Air Quality Management District rules, regulations, ordinances, and statutes which apply to any work performed pursuant to the Contract, including any air quality control rules, regulations ordinances, and statutes, specified in Section 11017 of the California Government Code. All Contractors and Suppliers shall be required to submit evidence to the Engineer that the governing air quality control criteria will be met.
- 30.2 In the absence of any applicable air quality control rules, regulations, ordinances or statutes governing solvents, all solvents, including but not limited to the solvent portions of paint, thinners, curing compounds and liquid asphalt used on the project, shall comply with the applicable material requirements of the South Coast Air Quality Management District. All containers of paint, thinner, curing compound, or liquid asphalt shall be labeled to indicate that the contents fully comply with said requirements.
- 30.3 Material to be disposed of shall not be burned, either inside or outside the site.

SECTION 31

PAYMENT

31.1 Contractor shall submit to the Engineer a progress payment request, based on the estimated percentage of completion of each item or work, not later than the 25th day of each month. The District will make partial payment to the Contractor by the 10th day of the following month, based on the progress payment request as approved by the Engineer. The District shall retain 10% of the value of all of the work done and materials installed as part security for the fulfillment of the contract by the Contractor. However, at any time 50% of the work has been completed, if the Chief Engineer finds that satisfactory progress is being made, the District shall reduce the amount of the retention withheld to 5% of all of the work performed and materials installed and shall retain 5% in lieu of the 10% retention for the remainder of the project. Contractor shall notify Engineer, in writing, when the work is deemed completed. The Engineer shall inspect the work and prepare a punch list of items to be corrected prior to the District's acceptance upon compliance of the punch list items, the work will be inspected again by the Engineer. If the work is satisfactory to the Engineer, he shall accept the same in writing and immediately file a Notice of Completion.

31.2 Withholding Partial Payment

Pursuant to the requirements of Government Code Section 4590, upon the Contractor's request, the District will make payment of funds which would otherwise be withheld from progress payments upon the following conditions:

- A. The Contractor deposits in escrow with the District Treasurer or with a bank acceptable to the District either:
 - 1. Securities eligible for the investment of funds under Government Code Section 16430 or,
 - 2. Bank or savings and loan certificates of deposit.
- B. The Contractor shall bear the expense of the District and the escrow agent, either the District Treasurer or the bank or savings and loan, in connection with the escrow deposit made.

- C. Securities or certificates of deposit to be placed in escrow shall be of a value equivalent to the amounts of retention to be paid to the Contractor pursuant to Section 6.2B.
- D. The Contractor shall enter into an escrow agreement satisfactory to the District, which agreement shall include provisions governing at least the following:
 - 1. the amount of securities to be deposited;
 - 2. the providing of powers of attorney or other documents necessary for transfer of the securities to be deposited;
 - 3. the conditions under which the securities will be converted to cash to provide funds to meet defaults by the Contractor, such as cessation of work; termination of Contractor's control over the work; stop notices filed pursuant to law; assessment of liquidated damages; or other amounts to be kept or retained under the provisions of the contract;
 - 4. decrease in value of the securities on deposit;
 - 5. the termination of the escrow upon completion of the contract.
- E. The Contractor shall obtain the written consent of the surety to such agreement. The Contractor shall be the beneficial owner of any securities substituted for monies withheld and shall be refunded said securities along with any interest thereon upon the satisfactory completion of the contract.

31.3 After acceptance by the Engineer of all work, the Engineer will prepare a final statement of all costs for work performed by the Contractor, including any retentions, change orders, extra work, or other amounts the District is obligated to pay by virtue of work performed by the Contractor and file a Notice of Completion with the County Recorder. Within 30 days after said final statement is submitted to the Contractor, the Contractor shall submit to the Engineer his written approval of said final statement, or a written statement of any claims he may have arising under or by virtue of said contract. Thirty-five (35) days after the filing of Notice of Completion, but not prior to the receipt of the final statement from the Contractor, the District will

make final payment of the total retention, along with any other amounts due and payable under this contract, based upon the Engineer's final statement, of all costs. In the event of disagreement on the Engineer's final statement, payment will be made within ten days for all amounts not in dispute. In no case will payment be made earlier than 35 days after filing Notice of Completion.

- 31.4 Contractor shall be charged a penalty of \$10.00 per day for each day beyond the 5th day of each month in submitting all CC 257 Forms that are required. Such penalty may be deducted from any progress payment due or from the final payment.

SECTION 32

MATERIAL, WORKMANSHIP, SHOP DRAWINGS, SAMPLES AND RECORD DRAWINGS

- 32.1 All materials, parts and equipment furnished by the Contractor shall be new, high grade and free from defects. Workmanship shall be in accordance with generally accepted standards. Materials and workmanship shall be subject to the Engineer's approval.
- 32.2 Materials and workmanship not conforming to the requirements of the Plans and Specifications shall be considered defective and will be subject to rejection.
- 32.3 If the Contractor fails to replace any defective or damaged work or material after reasonable notice, the Engineer may cause such work or materials to be replaced. The replacement expense shall be deducted from the amount to be paid to the Contractor.
- 32.4 Unless otherwise specifically provided in the Plans and Specifications reference to any equipment, material, article or patented process, by trade name, made or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor may, at his option, use any material, article or process which, in the judgment of the Engineer, is equal to that named. The Contractor shall furnish, at his own expense, all information necessary or related thereto as required by the Engineer. The Engineer shall be the sole judge as to the comparative quality and suitability of alternative equipment or articles or materials and his decision shall be final.
- 32.5 SHOP DRAWINGS
- A. The Contractor shall submit one clear reproducible copy and three (3) copies of blue prints of all shop drawings required in these specifications to the Engineer for approval unless specified otherwise. These drawings shall be complete and detailed. Shop drawings shall consist of fabrication, erection and setting drawings and schedule drawings, manufacturer's scale drawings, and wiring and control diagrams, cuts or entire catalogs, pamphlets, descriptive literature, and performance and test data. The Contractor shall submit six (6) copies each of those Shop Drawings that cannot be submitted in clear reproducible form such as cuts or entire catalogs, pamphlets, descriptive literature, and others. The drawings shall be submitted completely identifying the name of project, Contractor, supplier, location of project and date of submittal. ;

- B. Drawings and schedules shall be checked and coordinated with the work of all trades involved, before they are submitted for the approval of the Engineer and shall bear the Contractor's stamp of approval as evidence of such checking and coordination. Drawings or schedules submitted without this stamp of approval may be returned to the Contractor for resubmission.
- C. The Contractor shall submit all drawings and schedules sufficiently in advance of construction requirements to permit no less than fifteen (15) working days for checking and appropriate action.
- D. The approval of drawings and schedules will be general, but approval shall not be construed:
1. as permitting any departure from the Contract requirements;
 2. as relieving the Contractor of the responsibility for any errors, including details, dimensions, and materials;
 3. as approving departures from details furnished by the Engineer, except as otherwise provided herein.
- E. If drawings show variations from the Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variations in the letter of transmittal. If acceptable, the Engineer may approve any or all such variations, subject to a proper adjustment in the Contract. The Contractor's failure to describe such variations shall not mean relief from the responsibility for executing the work in accordance with the Contract, even though such drawings have been approved.
- F. If the drawings or schedules as submitted describe variations per Subparagraph E above and show a departure from the Contract requirements, which the Engineer finds to be in the interest of the District and to be so minor as not to involve a change in the Contract price or time for performance, the Engineer may approve the drawings.

- G. After reviewed by the Engineer, the shop drawings will be stamped and dated for the action required. If corrections are required, resubmittals will be handled in the same manner as first submittals. On resubmittals, the Contractor shall direct specific attention in writing or on resubmitted shop drawings, to revisions other than the corrections required by the Engineer on previous submissions. The Contractor shall make any corrections required by the Engineer. If the Contractor considers any correction indicated on the drawings to constitute a change to the Contract Drawings or Specifications, notice shall be promptly given to the Engineer. The reproducible shop drawings will be returned to the Contractor.
- H. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.
- I. Before final payment is made, the Contractor shall furnish to the Engineer one set of record shop drawings, all clearly revised and completed and brought up to date, showing the permanent construction as actually made. Drawings shall be clear reproducible form.
- J. The Contractor shall be responsible for, and bear all cost of damages which may result from the ordering of any material or from proceeding with any part of the work prior to the approval by the Engineer of the necessary shop drawings.
- K. For additional information and requirements of shop drawings, see Technical Provisions.

32.6 SAMPLES

- A. When specified or requested by the Engineer, typical samples of materials and appliances, properly identified by tags, name of project, contractor, material, supplier, location in project and date of submittal, shall be submitted in triplicate by the Contractor for approval by the

Engineer. Samples shall be of size indicated in Technical Provisions, or, where no size is indicated, shall be of sufficient size to permit evaluation. Samples shall be submitted sufficiently in advance of the time when they are to be used so that rejections thereof will not delay the approved construction schedules. Allow fifteen (15) working days for checking and appropriate action. Approved samples will be so labeled and dated, and a transmittal of approval will be sent to the Contractor. One approved sample will be sent to the Contractor. One approved sample will be sent to the Engineer's field office, and one will be kept at District Headquarters.

32.7 RECORD DRAWINGS

For requirements of record drawings, refer to Technical Provisions.

SECTION 33

PROTECTION OF EXISTING IMPROVEMENTS

- 33.1 The Contractor shall be responsible for the protection of existing improvements within and adjacent to the job site and shall exercise due caution to avoid damage to such improvements.
- 33.2 Unless otherwise provided, the Contractor shall repair or replace all existing improvements damaged or removed as a result of his operation. Repairs and replacements shall be at least equal to existing improvements, and shall match them in finish and dimension.
- 33.3 All costs for protecting, removing and restoring existing improvements shall be at the sole expense of the Contractor.

SECTION 34

ASSIGNMENT AND TERMINATION OF CONTRACT

34.1 ASSIGNMENT OF CONTRACT

The performance of part or all of this contract may not be delegated or assigned except upon prior written consent of District's Board of Directors; except that Contractor may assign monies due or to become due hereunder, to the extent permitted by law, without such Board of Directors' consent.

34.2 TERMINATION OF CONTRACT

The District may terminate this contract for convenience at any time by giving Contractor written notice thereof. Upon termination, District shall pay Contractor its allowable costs incurred to date of termination and those costs deemed reasonably necessary by District to effect the Title 48 - Federal Acquisition Regulation, Part 49 or other applicable portions of federal regulations. In addition, District shall pay Contractor a mutually agreed upon percentage of profit which related to the contract work accomplished to date of termination. The effective date of such termination for convenience shall be the date of Notice of Termination.

In the event the Contractor breaches the terms or violates the conditions of the contract and does not within ten (10) days thereafter correct such breach or violation, the District may immediately terminate the contract for default. Contractor shall be liable for any and all such costs incurred by the District as a result of such default.

SECTION 35

AUDIT AND INSPECTION

- 35.1 The Contractor shall permit the authorized representatives of the District, the U.S. Department of Transportation and the Comptroller General of the United States to inspect and audit all data and records of the Contractor relating to its performance under this contract.

SECTION 36

PROGRESS SCHEDULE

- 36.1 The Contractor shall submit, within ten (10) working days after Notice of Award, a Progress Schedule satisfactory to the Engineer, showing the proposed order of work and the time required for the completion. Modified progress schedules shall be submitted if any major items of work are re-scheduled.

The format and work breakdown structure of the progress schedule shall be coordinated with the Engineer and shall relate to the Schedule of Values required under Section 42 of these specifications.

SECTION 37

CONSTRUCTION STAGING

- 37.1 All work under this Contract shall be performed in accordance with requirements as specified in these specifications and as required by the Contract Drawings, and in accordance with a detailed plan of the work in a logical sequence developed by the Contractor and approved by the Engineer. This plan shall be used in developing the Progress Schedule required in Section 36 of these specifications.
- 37.2 The Contractor shall schedule his operations so as to minimize interference with other Contractors and with the District operations.
- 37.3 The Contractor shall indicate by the progress schedule his anticipated dates for completing the various stages of construction and shall keep the District informed of any delays in his schedules.
- 37.4 For additional information and requirements, see Technical Provisions.

SECTION 38

PROJECT SITE MAINTENANCE

- 38.1 Throughout all phases of construction, and until final acceptance of the project, the Contractor shall keep the work site clean and free from rubbish and debris. The Contractor shall also abate dust nuisance by cleaning, sweeping and sprinkling with water.
- 38.2 The Contractor shall take care to prevent spillage on haul routes. Any such spillage shall be removed immediately and the area cleaned.

SECTION 39

SURVEY

- 39.1 Surveying adequate for construction will be done by the Contractor. The Contractor shall be responsible for preserving construction survey references and marks for the duration of their usefulness. If any construction survey references are lost or disturbed and need to be replaced, such replacement shall be by the Contractor at his own expense.
- 39.2 All work upon completion shall conform to the lines and elevations shown on the plans. Any variation shall be reported to the Engineer. In the absence of such report, the Contractor shall be responsible for any error of the finished work, and replace such work to comply with specification requirements at his own expense.

SECTION 40

SUBSURFACE DATA

- 40.1 Subsurface data has been identified in a Foundation Investigation Report. A copy of this report is included in the Technical Provisions. This report is made available in order that the Contractor will have the same information that is available to the District. District does not warrant the accuracy of said report.
- 40.2 It is the contractor's responsibility to determine and allow for the elevation of ground water at the date of project construction. Any ground water actually encountered during construction will not be considered as a basis for extra work.
- 40.3 The information as shown on the test hole logs shows the subsurface data for that particular boring only and the District does not imply or warrant that similar conditions or material exists.

SECTION 41

WAIVER OF CONDITIONS

41.1 The waiver of any provision, term or condition herein by the District on any occasion shall not constitute a general waiver and shall not release the Contractor from the obligation of otherwise performing or observing such provision, term or condition.

SECTION 42

SCHEDULE OF VALUES

- 42.1 The Contractor shall submit to the engineer within ten (10) working days after award of contract, a detailed breakdown of values to be used only as a basis for determining progress payments on a lump sum contract or any designated lump sum bid item. This breakdown of values should equal the total lump sum bid and be in such format and sufficiently detailed that it represents a reasonable apportionment of the lump sum and is subject to approval of the Engineer.

SECTION 43

CALIFORNIA MECHANICS LIEN

- 43.1 Preliminary 20-day Notices in accordance with Sections 3098 of the California Civil Code shall be filed with the Engineer.
- 43.2 Stop Notices in accordance with Chapter 4, Title 15, Part 4 of the California Civil Code, commencing with Section 3179, shall be filed with Office of the Secretary of the Southern California Rapid Transit District.

SECTION 44

BUY AMERICA

- 44.1 Material & Fabrication for steel are governed by Section 401 of the Surface Transportation Assistance Act of 1978, and regulations in 49 CFR part 660.
- 44.2 All bidders must submit a signed Buy America Certificate with their bid submittal. (Copy of certificate is attached.)
- 44.3 If a bidder feels that a waiver from the Buy America requirements is necessary, a waiver from the Buy America provision will be sought if the grounds for a waiver exist.

BUY AMERICA CERTIFICATE

The bidder or offeror hereby certifies that each end product is a domestic end product, as defined in 49 CFR 660,13(d); and that components of unknown origin have been considered to have been mined, produced, or manufactured outside the United States.

BIDDER'S NAME

SIGNATURE OF BIDDER'S
AUTHORIZED REPRESENTATIVE

TITLE OF BIDDER'S
AUTHORIZED REPRESENTATIVE

DATE OF SIGNATURE

SECTION 45

VALUE ENGINEERING PROPOSALS

45.1 VALUE ENGINEERING PROPOSALS -- GENERAL

The Contractor may submit to the Engineer, in writing, value engineering proposals for modifying the plans and specifications of the contract for the purpose of reducing construction costs. The value engineering proposal shall not impair the essential functions or characteristics of the project, including service life, economy of operation, ease of maintenance, desired appearance, or design and safety standards.

45.2 VALUE ENGINEERING PROPOSALS -- CONTENTS

Value engineering proposals shall contain the following information:

- a. A general description of the original contract requirements for the work and the proposed changes.
- b. An itemized list of all the proposed modifications to the drawings and specifications.
- c. An itemized list of all contract work items affected by the value engineering proposal.
- d. A detailed estimate of the construction costs based on the original contract requirements and based on the proposed changes, along with any requested time extensions to the contract duration or contract milestones. The detailed estimate shall be supported by full and completely detailed estimates of costs by the contractor, subcontractors, vendors and suppliers. The estimates of costs shall be determined in the same manner as if the work were to be paid as a contract change pursuant to the provisions of Section 14.2 C - "Allowable Costs Upon Change Orders." The Contractor shall, upon the request of the District, permit inspection of his original contract bid estimate, subcontractor contract agreements or purchase orders relating to the value engineering proposal. The contractor's cost of preparing the value engineering proposal shall be excluded from consideration in determining the estimated net savings in construction costs.

- e. The date by which the Contractor requires a decision from the Engineer concerning the value engineering proposal.

45.3 VALUE ENGINEERING PROPOSALS -- DISTRICT REVIEW

The Engineer shall be the sole judge of the acceptability of the value engineering proposal and the estimated net savings in construction costs from the acceptance of all or any part of the proposal. In determining the estimated net savings, the District reserves the right to disregard the original contract bid estimate for any work items, which in the judgement of the Engineer, does not represent a fair measure of the value of the work. The District will not be liable for delays or damages to the Contractor resulting from the District's failure to accept or act upon any value engineering proposal submitted pursuant to this section. If a value engineering proposal is submitted similar to a contract change already under consideration by the District, the District reserves the right to make such changes pursuant to the provisions of Section 14 - "Contract Changes".

45.4 CONTRACT CHANGE ORDERS - DISTRICT ISSUANCE

If the value engineering proposal is acceptable to the District, in whole or in part, such acceptance will be by issuance of a contract change order which shall specifically state that it is executed pursuant to Section 45 - "Value Engineering Proposals". Such change order shall identify all the changes in the plans, specifications, contract duration and contract milestones; shall specify net savings in construction costs; and shall provide that the Contractor be paid 30% of the said net savings amount.

45.5 CONTRACT CHANGE ORDERS -- CONTRACTOR REVIEW

The Contractor shall respond to any contract change order executed pursuant to this section within five (5) working days of the receipt date from the District. The Contractor must either accept or reject, in whole, any change order executed pursuant to this section. Failure of the Contractor to respond, in writing, to the contract change order within the stipulated five (5) working days period will constitute Contractor acceptance of the proposal. The District reserves the right to reissue, under the provisions of Section 14 - "Contract Changes", any contract change order executed

pursuant to Section 45 - "Value Engineering Proposals"
which is rejected by the Contractor. Contractor
acceptance of any contract change order executed
pursuant to this section shall constitute full
compensation to the Contractor for all work pursuant
thereof.

TECHNICAL PROVISIONS

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DOCUMENTS 0 - GENERAL PROVISIONS

When "Documents 0" is used, it shall mean General Provisions as covered from Pages 21 through 149 at the beginning of this document and specification. The General Provisions are hereby made a part of this specification and contract except as modified by the Technical Provisions hereunder. As a part of this specification and contract they shall apply to the General Contractor and all his Subcontractors.

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01010 - SUMMARY OF WORK

ARTICLE 1 - GENERAL REQUIREMENTS

- 1.01 Documents 0 and Division 1 of this Project Manual shall form an integral and essential part of each section of the specifications.

ARTICLE 2 - CONTRACT DRAWINGS

- 2.01 Drawings which form a part of the Contract Documents are listed in the Index of Drawings on the Drawings.

ARTICLE 3 - SCOPE OF GENERAL CONTRACT

- 3.01 The Contractor shall include all services, labor, materials, appliances, appurtenances, and incidental costs, including construction permits for his operations and for off-site work, and all other fees and costs necessary to complete the work indicated for the Project, and all work as listed and described in the various sections of the specifications and shown on the drawings.
- 3.02 Below ground work for connection to main lines for sanitary sewer, water mains, gas mains, storm drains and electrical work shall be part of this work.
- 3.03 The specifications are separated into sections of the work required under this Contract. Such separation shall not obligate the Engineer to define or establish the limits of any Contract between the General Contractor and Subcontractor, and each Subcontract shall depend upon its own Contract Agreements.
- 3.04 The General Contractor shall act as coordinator for the work and shall cooperate with any and all other contractors so that the work will proceed without any unnecessary delays or hindrances. The Contract contemplates a complete project, ready for use.
- 3.05 All contractors and subcontractors shall visit the site and familiarize themselves with all conditions. Under no circumstances will additional compensation be allowed for work necessary to be done to carry out the full purpose and intent of the drawings and specifications; all as necessary to provide and finish the work in a complete first-class manner, whether or not such work is indicated on the drawings, or specified herein.
- 3.06 Some of the Drawings may indicate phasing of work. Phasing of work is not required for this project. The entire Division with the exception of the Transportation Building will be vacated for the use of the work of this Contract.

ARTICLE 4 - WORK NOT IN GENERAL CONTRACT

4.01 Payments for initial testing and inspections.

4.02 Items marked N.I.C. on drawings.

ARTICLE 5 - SEPARATE CONTRACTS

5.01 For any items of work not in the General Contract, the separate contractors shall be permitted to install such work without any hindrances or delay. The General Contractor shall cooperate to the fullest extent possible with such separate contractors for storage of materials, completion of their work, and coordination of their work into the work schedule of this contract.

ARTICLE 6 - MISCELLANEOUS REQUIREMENTS

6.01 Before ordering any material, or doing any work, the Contractor shall verify all measurements at the building and shall be responsible for the correctness of same.

ARTICLE 7 - INTENT OF DRAWINGS AND SPECIFICATIONS

7.01 Reference must be made to the drawings for all dimensions. The dimensions given on the drawings shall be checked by the Contractor before proceeding with the work and any discrepancy shall be reported at once to the Engineer.

7.02 Should it appear that the proposed work is not clearly called out, or any of the matters relative thereto are not sufficiently detailed or explained on the drawings, or in the specifications, or if the Contractor has, in his opinion, a better construction technique or procedure, the Contractor shall apply to the Engineer for such further drawings or explanations or submit drawings and procedures as applicable as as may be necessary, and shall conform to the same as far as they shall be consistent with original drawings. In the event of any questions arising with respect to the true meaning of the drawings and specifications, reference shall be made to the Engineer whose decision shall be final and conclusive. In no case shall any work proceed in uncertainty.

7.03 It is the intention of this specification and the accompanying drawings to provide a job complete in every respect. Contractor shall be responsible for this result and to turn over the project in complete operating condition regardless of whether the drawings and specifications cover every individual item in minute detail.

- 7.04 Do not scale drawings. In the event figures are missing, consult the Engineer. In the event of a conflict between the specifications and the drawings, or similiar discrepancies, consult the Engineer.

ARTICLE 8 - PROCEDURE IN CASE OF ERRORS

- 8.01 Should an error or conflict appear on the drawings, in the specifications, or in the work done by others affecting this work, the Contractor shall notify the Engineer at once and he will issue instructions as to procedure. If the Contractor proceeds with the work so affected without instructions from the Engineer, he shall make good any resulting damage or defects. This includes typographical errors in the specifications and notational errors on the drawings where interpretation is doubtful.
- 8.02 Contractor, when bidding this job, shall ascertain that the drawings and specifications which he has received are complete and do conform to the respective indexes. If he finds that the printers inadvertently left out a drawing or specification page, he shall advise the Engineer immediately.

ARTICLE 9 - STANDARD SPECIFICATIONS

- 9.01 References to Standard Specifications, Regulatory Agencies' requirements, Federal Specifications, Handbooks, Codes, etc., throughout these specifications shall apply to the latest applicable issue, addenda, amendments or errata; the latter shall govern unless they are conflicting with the building code.

ARTICLE 10 - EXISTING UTILITIES

- 10.01 Notify all companies and authorities owning conduits, wires or pipes running over or under the property in ample time so that appropriate arrangements can be made for the removal of all utilities and the capping of all pipes that are to be abandoned. Check removed public services to see that they have been effectually plugged up to cut off. Similarly, carefully protect or reroute all conduits, drains, pipes and wires that are to remain on the property or that will serve adjacent properties, include all necessary offsite connections and tie-in off-site. Furnish record drawings showing exact locations, materials, and invert elevations of all rerouted utilities. Where underground utilities are encountered other than those known or shown on drawings, notify the Engineer for instructions before proceeding.

- 10.02 Coordinate work with that of other sections in order to minimize any interruptions in utility services.
- 10.03 Repair any damage to existing utilities resulting from work under this Contract.

ARTICLE 11 - JOB LAYOUT - UTILITY EASEMENTS

- 11.01 Contractor shall verify all conditions and dimensions on the job.
- 11.02 Examination: Carefully examine the documents and the construction site to obtain firsthand knowledge of existing conditions. No extra payments will be given to the Contractor for conditions which can be determined by examining the site and documents.
- 11.03 Survey Data: The Contractor shall lay out all lines and grades required for the work in this contract in accordance with the property survey and applicable drawings and he shall be responsible for their accuracy and proper correlation with control lines, monuments and datums of the survey.
- 11.04 Lines and Levels: Contractor shall employ a licensed Engineer to lay out the work and establish all points, grades and levels. If points, grades and levels which are shown on drawings do not conform with the physical conditions of the proposed work immediately notify the Engineer who will make the necessary revisions or corrections. Set all grade stakes and protect them in place as long as may be required by all trades and crafts.
- 11.05 Utilities Easements: The Contractor shall be responsible for establishing the location of all utility easements described in the property description and shown on the survey and for seeing that applicable utilities are confined to these reservations or easements.

ARTICLE 12 - SCHEDULES AND DIAGRAMS

- 12.01 Schedules and Diagrams: Certain schedules of materials, diagrams of mains, risers, etc. may accompany the plans. These schedules and diagrams have been prepared to avoid complicating the plans. They are to be used in conjunction with the plans and this specification, but are not to be interpreted as modifying or restricting them.

ARTICLE 13 - MATERIALS

- 13.01 Material Lists: Material lists shall be submitted in accordance with the General Provisions.
- 13.02 Ordering of Materials: Order all materials and equipment for the work as soon as possible after the award of the contract. It shall be the duty of the Contractor to keep the Engineer continuously informed of the availability of all specified materials and equipment.

ARTICLE 14 - FIRE PROTECTION

- 14.01 Immediately following the initial delivery and storage of combustible material at the site of the work, and throughout the construction period thereafter, the Contractor shall supply and maintain suitable means of approved fire protection until adequate means of such protection are made permanently available for uninterrupted service.

ARTICLE 15 - SUBCONTRACTORS LIST

- 15.01 The General Contractor shall submit to the Engineer a list of all subcontractors and suppliers and materials contemplated for use, before proceeding with the work.

ARTICLE 16 - TIME SCHEDULE

- 16.01 The Contractor shall prepare and submit to the Engineer for approval, in a form as directed, prior to starting construction work, a time schedule showing the time necessary to complete this Contract.

ARTICLE 17 - WORKMANSHIP

- 17.01 All work and materials covered by the drawings and specifications shall conform to the highest standards of the crafts involved and must meet with the approval of the Engineer.

ARTICLE 18 - DECISION OF THE ENGINEER

- 18.01 The Engineer shall have access to the work at all times, and shall have authority to accept or reject any material supplied or workmanship performed under the contract.

ARTICLE 19 - EXISTING CONDITIONS

19.01 Where drawings have existing conditions indicated, these conditions were copied from drawings of previous work. These existing conditions are not guaranteed to be accurate and variations may occur. The District is not liable for these variations. The Contractor shall notify the Engineer of these variations for further directions if any changes or corrections are required.

ARTICLE 20 - SHORING

20.01 Contractor shall coordinate all shoring work required during the demolition and construction work. Coordinate work with all other required trades.

ARTICLE 21 - EQUIPMENT

21.01 Equipment indicated on the drawings as being furnished and installed by Owner shall be "hooked-up" by the Contractor. This includes required plumbing, venting and electrical work.

ARTICLE 22 - BUSINESS AS USUAL

22.01 Contractor is hereby made aware of the 24-hours "Business As Usual" policy of the existing Transportation Building. Employees, patrons and visitors shall have unobstructed ingress and egress. Coordinate work with the District so that all work is performed properly, in proper order and to keep existing facilities operating.

* * * * *

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01060 - REGULATORY REQUIREMENTS

ARTICLE 1 - GENERAL

1.01 Description: This section covers general requirements for regulatory requirements pertaining to the work and is supplementary to regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

1.02 Codes and Standards:

- A. Requirements of Regulatory Agencies: Pertaining ordinances, laws, rules, regulations, standards and orders of public agencies and authorities having jurisdiction of the Work are intended where reference is made in either the singular or plural to the Code or Building Code, unless otherwise specified, including but not limited to, the following listing. Contractor shall make available at the site such copies of listed documents applicable to the Work as the Engineer may request, including mentioned portions of the California Administration Code (CAC), Title 22 and 24.

Los Angeles City Building Code.

Title 8, Industrial Relations, CAC, Chapter 4, Div. of Industrial Safety, Safety Orders (CAL/OSHA).

Title 19, Public Safety, CAC.

Uniform Mechanical Code.

Uniform Plumbing Code.

The National and Uniform Electrical Codes.

National Fire Protection Association.

State and Local Public Health Codes.

All other laws, regulations, rules, orders, codes, and ordinances specified in other sections of these specifications or bearing on the Work.

- B. Standard and Reference Type Specifications: Specifying by reference to standard and reference type specification documents or to another part of the contract documents shall be the same as if the document or

portion referred to were exactly repeated at the place where reference is made. In case of conflict between any applicable code, law, ordinance rule, regulation, or order and referenced standard or reference type specification documents, the Contractor shall conform to the most restrictive requirements if such conformance is legal. Standard or reference type specification documents shall be those of the current issue at time the Construction Documents Phase, as defined in AIA Document B141, is completed, unless otherwise specified. Contractor shall make available at the site such copies of referenced standard or reference type specification documents as the Engineer may request.

- C. Abbreviations used to indicate or specify standard and reference specification documents shall be interpreted according to their recognized and well-known technical, industry, or trade meanings; such abbreviations include but are not limited to the following:

A.A.M.A.	Architectural Aluminum Manufacturers' Association
A.I.A.	American Institute of Architects
A.C.I.	American Concrete Institute
A.G.A.	American Gas Association
A.I.E.E.	American Institute of Electrical Engineers
A.I.M.A.	Acoustical and Insulating Materials Association
A.I.S.C.	American Institute of Steel Construction, Inc.
A.M.C.A.	Air Moving and Conditioning Association, Inc.
A.N.S.I.	American National Standards Institute
A.S.H.R.A.E	American Society of Heating, Refrigerating and Air Conditioning Engineers
A.S.M.E.	American Society of Mechanical Engineers
A.S.T.M.	American Society of Testing & Materials
A.W.I.	Architectural Woodwork Institute (Millwork Quality Standards Adopted by A.I.A. and P.C.)
A.W.P.A.	American Wood Preservers Association
A.W.P.B.	American Wood Preservers Bureau
A.W.P.I.	American Wood Preservers Institute
A.W.W.A.	American Water Works Association
A.W.S.	American Welding Society
C.A.C.	California Administrative Code
C.B.M.	Certified Ballast Manufacturers
C.I.S.P.I.	Cast Iron Soil Pipe Institute
C.R.S.I.	Concrete Reinforcing Steel Institute
C.S.	Commercial Standard, U.S. Department of Commerce

C.S.I.	Construction Specifications Institute
E.T.L.	Electrical Testing Laboratories
Fed. Spec.	Federal Specification
F.M.	Factory Mutual
MIL-	Military Specification (leading symbol)
N.B.S.	National Bureau of Standards
N.E.C.	National Electrical Code
N.E.M.A.	National Electrical Manufacturers Association
N.F.P.A.	National Fire Protection Association
N.I.C.	Provided by Owner, Installed by Owner (Not in Contract)
N.S.F.	National Sanitation Foundation
N.W.M.A.	National Woodwork Manufacturer's Association
O.F.C.I.	Owner Furnished Contractor Installed
O.F.O.I.	Owner Furnished Owner Installed
O.S.A.	Office of the State Architect
O.S.H.A.	Occupational Safety and Health Act
P.C.	Producers Council
P.D.I.	Plumbing and Drainage Institute
P.S.	Product Standard, U.S. Department of Commerce
S.C.A.C.M.	Southern California Association of Cabinet Manufacturers
S.M.A.C.N.A.	Sheet Metal and Air Conditioning Contractors' National Association, Inc.
S.F.M.	State Fire Marshal
U.B.C.	Uniform Building Code
U.L.	Underwriters' Laboratories, Inc.
W.C.L.I.B.	West Coast Lumber Inspection Bureau
W.I.C.	Woodwork Institute of California
W.W.P.A.	Western Wood Products Association

ARTICLE 2 - PRODUCTS (Not Applicable)

ARTICLE 3 - EXECUTION (Not Applicable)

* * * * *

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01071 - DEFINITIONS

ARTICLE 1 - GENERAL

- 1.01 Description: This section covers additional definitions supplementary to those given in the Conditions of the Contract.
- 1.02 Definitions:
- A. Drawings: Words such as "shown," "indicated," "detailed," "noted," "scheduled," or words of similar import shall mean that reference is made to the information on the drawings unless stated otherwise.
 - B. Actions of the Engineer: Such words as "directed," "designated," "selected," and words of similar import shall mean that the direction, designation, selection, or similar action of the Engineer is intended unless stated otherwise.
 - C. Engineer shall mean the Chief Engineer of Bus facilities Engineering Department for the Southern California Rapid Transit District or his authorized representative.
 - D. Required: The word "required" and words of similar import shall mean "required to complete the work" and "required by the Engineer", as is applicable to the context of the place where used, unless stated otherwise.
 - E. Perform: The word "perform" shall be understood to mean that the Contractor shall perform, at his expense, all the operations necessary to complete the work or mentioned portions of the work, including furnishing and installing materials as are indicated, specified, or required to complete such performance.
 - F. Provide: The term "provide" shall be understood to mean that the Contractor, at his expense, shall furnish and install all labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations of the work and the mentioned portion of the work, complete and ready for the intended use. These definitions apply the same to future, present, and past tenses except "provided" may mean "contingent upon" where such is the context.

- G. Equal: Terms such as "equal," "approved equal," "equivalent," and all terms of similar import shall be understood to be followed by the phrase "in the opinion of the Engineer" unless stated otherwise.
- H. Submit: Such words as "submit," "submittal," "submission" and terms of similar import shall include the meaning of the phrase "submit to the Engineer for his approval" unless otherwise stated.
- I. Expense: Such terms as "at no extra cost to Owner," "with no extra compensation to Contractor," "at Contractor's expense," or phrases of similar import shall be understood to mean that the Contractor shall perform or provide the operation or Work with no increase to the Contract Sum stated in the Agreement.
- J. Language: Specifications are written in a modified brief style consistent with clarity. Generally, the words "the," "shall," "will" and "all" are not stated. Words requiring an action or performance, such as "perform," "provide," "erect," "install," "furnish," "connect," "test," "coordinate," and words and phrases of similar import, shall be understood to be preceded by the phrase "The Contractor shall" unless otherwise stated. The requirements indicated and specified apply to all work of the same kind, class and type, even though the word "all" is not stated.
- K. "As shown," "as detailed," "as indicated" or words of similar import mean as shown, as detailed, or as indicated on the drawings.
- L. "As selected," "as approved," "as accepted" or words of similar import mean as selected by, as approved by, or as accepted by the Engineer.
- M. "Shall" means mandatory.
- N. "As necessary" means essential to the completion of the work.

ARTICLE 2 - PRODUCTS (Not Applicable)

ARTICLE 3 - EXECUTION (Not Applicable)

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01340 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of General Provisions and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Shop drawings.
 - D. Product or catalog data.
 - E. Samples.
- 1.02 Conform with requirements of the General Provisions.
- 1.03 General Requirements:
- A. Construction Data: Shop drawings, samples, brochures, calculations, test reports, catalogs, equipment lists and all other similar required items are referred to hereinafter as construction data.
 - B. Where samples, shop drawings and other construction data are interrelated, submit all such data in one package.
 - C. Where manufacturers' printed literature is required to be submitted to Engineer, it shall be submitted in original forms. Fading type reproductions will not be acceptable.
 - D. Contractor is responsible for proper coordination of all parts of the Project under his Contract to the extent shown or indicated in the Specifications and on the Drawings. Contractor shall furnish to each of his

subcontractors such copies of shop drawings and other construction data supplied by other subcontractors as are needed for coordination of trades involved. Successful Bidder will be required to review and accept special conditions, schedules, terms of payment and shop drawings prepared and submitted by subcontractor. Review and acceptance are a prerequisite to award of this Contract.

- E. Contractor will be held responsible for any delay in progress of the work due to his failure to observe requirements of this Section; time for completion of his Contract will not be extended on account of his failure to submit construction data promptly.
- F. The Engineer will review shop drawings and samples only for conformance with design concept of the Project and with the information given in the Contract Documents. The Engineer's review of a separate item shall not indicate approval of an assembly in which the item functions.
- G. The Contractor shall make any corrections required by the Engineer and shall resubmit the required number of corrected copies of shop drawings or new samples until accepted. The Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than the corrections requested by the Engineer on previous submissions.
- H. The Engineer's review of construction data shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the Engineer in writing of such deviation at the time of submission and the Engineer has given written acceptance to the specific deviation, nor shall the Engineer's acceptance relieve the Contractor from responsibility for errors or omissions in the construction data.
- I. No portion of the work requiring a submission shall be commenced until the submission has been reviewed by the Engineer. All such portions of the work shall be in accordance with approved construction data.

1.04 Submittals:

- A. Contractor Review: All construction data shall be stamped approved by Contractor in conformance with requirements of General and Supplementary Conditions,

prior to submitting same to Engineer for review. Failure to comply with this requirement will result in immediate return of submittal with no action taken by Engineer.

- B. Submittal Schedule: Contractor shall submit a progress schedule for himself and from each of his subcontractors and suppliers, showing dates for submittal of construction data. This schedule shall allow for lead time, including lead time required by subcontractors and material and equipment manufacturers, fabricators and suppliers; delivery of affected materials and equipment in sufficient time for installation without delaying any portion of the work; and in sufficient time for Engineer's review of all construction data required for the Project.
- C. Letters of Transmittal: Construction data submittals must be accompanied by subcontractor's letter of transmittal and Contractor's letter of transmittal addressed to the attention of the Engineer. Letters of transmittal shall contain all information necessary for identification, including a listing of construction data transmitted; name of Project, Contractors', subcontractors' and manufacturers' or fabricators' names; Engineer's job identification number; applicable Contract drawing number and Specifications section and paragraph; ASTM, Federal Specifications, and other "standard" type specifications; and such additional information as required to identify the submittal.
- D. Time for Submittals: Each submittal must be received by the Engineer in time to permit him sufficient number of working days for his review. If a submittal is not received in time to allow sufficient time for Engineer's review without delaying construction, Contractor shall reimburse the District for Engineer's costs incurred by checking on an accelerated basis. The responsibility for time consumed in review of construction data and any claim made by Contractor (including subcontractor and supplier) that such time is excessive and has caused, or will cause, delay in completion of the work, will only be considered as starting from the time drawings, samples, and other construction data are correct in all respects and so submitted and signed as approved by Contractor. Preliminary and incomplete or incorrect submittals of said drawings and samples shall not be considered as official approval time.

1. "Sufficient time," as used herein, shall mean a minimum of 15 working days as indicated in Section 32 of Supplementary General Provisions; the maximum working days required by the Engineer cannot be established due to such intangibles as the completeness and legibility of the construction data; the type of material, equipment, system or work delineated (such items as hollow metal doors and frames, shop drawings, finish hardware schedules, mechanical or electrical systems, and numerous other types of construction data submittals, obviously take much more time than a submittal depicting handrailings).
- E. Method of Delivery: Send submittals by first class mail, UPS Blue Label, or hand carry to Engineer's office.
- F. Number of Copies Required:
 1. Shop Drawings: The Contractor shall submit 1 sepia and 3 prints for review. Revisions and corrections will be indicated on the sepia. Prints will be retained by the Engineer. The reviewed sepia will be returned to the Contractor, who shall then reproduce prints from the accepted sepia for his use and distribution.
 2. Brochures, Catalogs and Similar Data: Contractor shall submit a minimum of 6 copies each. After review, the Engineer will retain 3 copies and 3 copies will be returned to the Contractor.
- G. Number of Samples: The Contractor shall submit 6 samples. After selection, the Engineer will retain 2 samples, and the remaining samples will be returned to the Contractor.
- 1.05 Materials List: The Contractor shall submit a list of proprietary products he proposes to use within 30 days after award of Contract.
- 1.06 Samples:
 - A. When samples are required, materials and their installation shall conform in all respects to samples selected by the Engineer. Written acceptance of samples is required.
 - B. Failure of samples to conform with specified requirements may, at the Engineer's option, constitute a bar

against submission of other samples by same manufacturer, vendor or supplier.

- C. Acceptance of samples will not preclude rejection prior to final acceptance of completed work of any material upon discovery of defect in material which said sample failed to represent, even though such material or equipment has been installed or erected in place.
- D. After material has been reviewed, no change in brand or make will be permitted unless satisfactory written evidence is presented to, and accepted by the Engineer that manufacturer cannot make scheduled delivery of approved material, or that material delivered has been rejected and substitution of an alternate material is an urgent necessity, or that other conditions are apparent which indicate acceptance of such substitute material to be in the best interest of the District.
- E. All samples or material requiring laboratory tests shall be tested sufficiently in advance of the time they are required to be delivered to the Project site for:
 - 1. Testing.
 - 2. Engineer's review of test results.
 - 3. Re-testing and re-submittal as necessary to obtain Engineer's acceptance.
 - 4. Manufacture or fabrication.
 - 5. Delivery to job site without delaying the scheduled progress of the work.

NOTE: Engineer will not proceed with color schedule until all samples have been submitted and accepted.

- F. Each sample shall have physically attached to it, in a manner not easily removable, a label bearing the following information:
 - 1. Project identification.
 - 2. Contractor's and subcontractor's identification.
 - 3. Sample identification, including full information as to manufacturer, model, catalog number, finish numbers, and other required information.

4. Spaces for the Engineer's review stamp.
- G. When samples are rejected by Engineer, submit new samples immediately after notification of rejection, and mark them "Resubmitted Sample," in addition to other information required, on label.
- H. Right is reserved to require submission of samples of any material or any material lists, whether or not particularly mentioned in Specifications.

1.07 Shop Drawings:

- A. Before submitting shop drawings, check said drawings and subcontractors' work for accuracy. See that work contiguous with and having bearing upon work indicated on shop drawings is accurately and distinctly illustrated, and that indicated work complied with Contract requirements. Shop drawings must bear Contractor's stamp of approval.
- B. Shop drawings shall be dated and shall clearly delineate the following:
 1. The District's name.
 2. Project name, address, and Architect's name and job number.
 3. Drawing title, number, date and scale (number drawings consecutively).
 4. Names of Contractor, subcontractor and fabricator.
 5. Working and erection dimensions.
 6. Reference to applicable plan, elevation, section, or detail on Contract Drawing to which shop drawing, or portion thereof, applies.
 7. Arrangements and sectional views.
 8. Necessary details, including complete information for making connections with work of other trades; list name or names of all subcontractors involved.
 9. Kinds of materials and finishes.
 10. Show descriptive names of materials and equipment, and locations at which materials or equipment are to

be installed in the work. Use same reference identification as shown on Contract Drawings.

- C. Do not re-submit shop drawings unless Engineer so directs on his "Construction Data Review Stamp." If shop drawings are re-submitted without Engineer's instructions to do so, they will be returned to Contractor without being rechecked and restamped by Engineer. If, for any reason, Contractor changes and re-submits previously submitted shop drawings which have been returned to the Contractor marked "Review Completed, Do Not Resubmit," Contractor shall, in his transmittal letter accompanying the re-submittal, fully describe the changes made and the reasons for making them.
- D. Cost of changes in construction due to improper checking and coordination by Contractor shall be paid for by him. Contractor shall be responsible for all additional costs, including coordination and supervision.
- E. If shop drawings show variations from Contract requirements because of standard shop practice, or any other reason, make specific mention of variations in transmittal letter to Engineer as well as encircle variations on shop drawings to identify and call them to the Engineer's attention.
- F. Unless Contractor has notified Engineer in writing of variations, deviations, or omissions, and received his approval, Contractor will be required, at his sole expense, to repair, replace, furnish whatever materials are required, and perform all work, including adjacent work of other trades affected thereby necessary to rectify such deviations and variations, all as directed by Engineer at time such variations and omissions are discovered by Engineer even though this does not occur until after said shop drawings have been stamped "Review Completed" and work in question has been completed. Replacement and repair will be mandatory in such instances, and shall be performed at no cost to the District.
- G. Engineer's review of shop drawings will be general, for design, arrangement and appearance only, and shall not relieve Contractor of responsibility for accuracy of such shop drawings, dimensions, proper fitting, construction of work, providing materials required by the Contract Documents, even though such materials and their installation are not indicated on shop drawings.

Engineer's review of shop drawings shall not be construed as approving departure from Contract requirements or as acceptance of any responsibility by the District for any errors, omissions, or discrepancies shown thereon.

- H. Engineer's review of shop drawings and schedules shall not relieve Contractor from responsibility for any violation indicated on shop drawings, or other construction data, of local, county, state or federal laws, rules, ordinances, or rules and regulations of commissions, boards or other authorities or public utilities having jurisdiction.
- 1.08 Construction Coordination Drawings: Submit construction coordination drawings in conformance with applicable requirements specified for shop drawings.
 - 1.09 Submittals for Mechanical and Electrical Work: In connection with mechanical and electrical work, Contractor shall submit complete list of materials and other required information as listed under respective mechanical and electrical sections of these Specifications, within 30 days after receipt of notice to proceed. No consideration will be given to partial lists submitted from time to time without Engineer's prior acknowledgement.
 - 1.10 Color Schedule:
 - A. After award of Contract, Contractor shall obtain from his subcontractors and submit to Engineer, complete list of all materials for which colors are to be selected, and which they/he proposes to use, including manufacturer's name and all other pertinent data which will facilitate completion of color selections for Engineer's "Color Schedule." Engineer will not prepare Color Schedule until submittals and required samples have been submitted to and approved by Engineer.
 - B. Samples for color selection shall be submitted in the full range of applicable manufacturer's full line of standard colors.
 - 1.11 Operation and Maintenance Manuals: Where operation and maintenance manuals are required, submit in quadruplicate, bound in clear plastic covers, folded where required so that the size of the manuals does not exceed 8-1/2" x 11". Identify each manual on cover with project name and contents.

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01400 - TESTS AND INSPECTIONS

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of General Provisions and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. The testing laboratory will provide all services, plant, labor, materials, transportation and equipment necessary to perform all testing, inspection, supervision and reporting specified herein and as otherwise required.
- 1.02 Submittals: Submit shop drawings, manufacturer's technical data and material specifications, and samples, as applicable.
- 1.03 Special Provisions:
- A. Testing laboratory or testing agency will be a qualified independent testing laboratory or agency selected by the Engineer and approved by the Engineer. Laboratory inspectors assigned to the project shall be Deputy Inspectors licensed by the Los Angeles Building Department.
 - B. Reports shall be executed immediately upon conclusion of each procedure, stating conformance to requirements, and forwarded to the Engineer.
 - C. Payment: Costs of all testing procedures initiated by the District will be paid for by the District, but the laboratory shall be responsible to the Engineer. Costs of retests resulting from failure of initial tests shall be borne by the Contractor.
 - D. Tests and inspections shall be made in accordance with the requirements stipulated in the Technical Specifications.
 - E. The Engineer reserves the right to demand for test or special examination of any material or part thereof to insure compliance with the specification, and may reject for satisfactory replacement any material or part judged defective as a result thereof. This applies also to unidentified materials, materials or sources of

same substituted for those previously approved. Such tests and examinations, and retests of defective materials, even though not specified, shall be performed as and when required. Costs of these tests and re-tests shall be paid by the Contractor.

ARTICLE 2 - EXECUTION

2.01 Earthwork: Refer to "Earthwork" section and "Trenching" section.

- A. Testing Agency: Testing Agency or a Foundation Engineer employed by the District.
- B. Compaction: Referred to herein as ASTM D1557 and specified densities relate to maximum dry densities obtained thereby. If another method is used, degree of compaction shall be comparable to those specified according to this method.
- C. The Testing Agency shall be notified by the Engineer prior to commencement of earthwork and shall perform and report the following procedures. Contractor shall notify the Engineer of such service 48 hours in advance.
 - 1. Inspect and approve on-site material and imported borrow and backfill material and perform suitability tests as required.
 - 2. Perform field density tests on samples from in-place material as required.
 - 3. Inspections: Required as indicated below:
 - a. Site excavation, tank farm excavation and trenching.
 - b. Scarifying and recompacting cleaned sub-grade, periodic inspection as required.
 - c. Specified density fills and backfills, periodic inspection.
 - d. Structural excavation and approval of bearing material for all foundations and footings prior to placing of any concrete.

2.02 Reinforcing Steel: Refer to "Reinforcing Steel" section.

- A. Reinforcing Steel (Bars): All material shall be tested prior to use for compliance with requirements of ASTM Designation A615, Grade 40 and 60. Material identified to mill test reports shall require testing for each 10 tons or fraction thereof. Supplier shall furnish mill test reports to laboratory. All identified

steel shall be tagged at fabricator's shop by laboratory as being identified or sampled, and any material arriving on job without tags shall be sampled and tested as unidentified materials. Sample and test unidentified stock for each 2-1/2 tons or fraction thereof. Tests of unidentified reinforcing steel shall be paid by the Contractor.

- B. When special tests are ordered by the Engineer, samples shall be selected by representative of testing laboratory from material at the building site or place of distribution; to consist of 2 pieces, each 18" long of each size, furnished, cut and prepared for testing by Contractor, marked and delivered by representative of testing laboratory.
- C. Tests: Make one tensile and one bend test for each size of reinforcement.
- D. Inspections: The District will provide and pay for continuous inspection for all welding and placing of reinforcing steel by Laboratory Inspector.

2.03 Concrete: Refer to "Concrete" and "Portland Cement Concrete Pavement" sections.

- A. Tests: All concrete materials shall be tested and reported by the Contractor prior to any use of same.
- B. Portland Cement: Shall be sampled and tested at the plant by the manufacturer, who shall furnish Certificates of Compliance to the concrete producer for delivery to the Testing Laboratory. Certificates of Compliance shall positively identify the cement as to production lot, bin or silo number, date and routing of shipment and establish compliance with ASTM C150 for Type I or II (low alkali). Manufacturer shall furnish complete physical and chemical test data for any lot of cement used.
- C. Aggregate - Required Tests for Mix Designs: Once for job unless character of material changes, material is substituted, or at the request of the Engineer. Sample from source of supply or at ready-mix plant.
 - 1. Sieve analysis per ASTM C136 and to conform to Grading Tables.
 - 2. Specific gravity per ASTM Designation C127 and C128.

- D. Laboratory Tested Design Mixes: With approved aggregate and whenever character of source of materials is changed, the Contractor shall submit to the Engineer the Laboratory trial mix designs in accordance with ACI. Provide laboratory mix designs for all mixes.
- E. Molded Concrete Cylinders: Minimum of three molded cylinders, each sampling according to ASTM C172 made by Job Inspector, for each 150 cubic yards of each day's placing of concrete or fraction thereof. Cylinders shall be prepared and cured in the laboratory according to ASTM C31 and tested for compression according to ASTM C39. One cylinder shall be tested at 7 days, one cylinder tested at 28 days and the third cylinder shall be a spare.
- F. Core Tests: Only if and as required by the Engineer because of low cylinder test results. Cores, if required, shall be cut from locations directed by the Engineer, secured per ASTM C42, prepared and tested per ASTM C39. Results of core tests will be evaluated by the Engineer. Costs of these tests shall be paid by the Contractor.
- G. When air entrained concrete is used, air content tests shall be made daily or more often, as required, in accordance with ASTM C231 by the testing Laboratory. Cost of retests for non-conforming work shall be paid by the Contractor.
- H. Placement Inspections: Required for all concrete and to be performed by Laboratory Inspector. He shall ensure concrete is of required quality and consistency. He shall make slump tests and prepare all samples. He shall have authority to reject inferior or nonconforming workmanship and materials.

2.04 Masonry Work: Refer to "Masonry" section.

- A. Concrete Masonry Units:
 - 1. Supplier of units shall furnish recent (within one month) representative test reports and certificates of compliance to the test requirements specified below. If units are not certified, laboratory shall sample and test units at Contractor's expense.
 - 2. Sample and test in accordance with ASTM C140 to comply with requirements of ASTM C90.
- B. Cement: Test or certify as specified hereinbefore in Paragraph 2.03 B.
- C. Mortar: Laboratory Inspector shall sample and test 2 x 4 cylinders, one pair made on each of the first 3 consecutive days of work.

- D. Grout: Sample and test prisms, sampled by Laboratory Inspector at same frequency as mortar, made by filling cells in concrete block used for construction. Molds broken away after specimen has set. Tested in vertical position.
- E. Composite Prisms: Test fully grouted prisms per U.B.C. Section 2404(c).
- F. Core Tests: Required only because of questionable workmanship or materials: Not less than two; diameter not more than $\frac{2}{3}$ wall thickness, but not less than 6", taken, prepared and tested as specified for concrete. Shear test cores shall be 6" diameter. Results of core tests will be evaluated by the Engineer for acceptance. Costs of these tests shall be paid by the Contractor.

2.05 Structural Steel: Refer to "Structural Steel" section.

- A. Duties of Testing Laboratory: Inspect stock, mark identified stock, select and mark test specimens as required, perform required tests, inspections as specified, furnish required reports and certificates.
- B. Structural steel to conform to ASTM A36 or A572, Grade 50 as called for on the drawings. Make one tensile and one bend for each 5 tons or fraction thereof as each shape or size of unidentified stock. Identified stock accompanied by mill test reports must be certified for compliance by the testing laboratory. Testing of unidentified steel shall be paid by the Contractor.
- C. Shop welding inspection is required to be made by a qualified Inspector licensed by the City of Los Angeles, and paid for by the Contractor. Single pass welds may be inspected after completion of welding, before painting. Multiple pass welds and groove welds where required shall be continuously inspected. The Contractor shall submit evidence of qualified welders and certification of structural welds to the Engineer.
- D. Field Welding: All field welding of structural steel shall be performed under continuous inspection by the Inspector of the testing laboratory and paid for by the District. All partial and full penetration groove welds require ultrasonic inspection per AWS D1.1-72. Re-inspection of non-conforming or defective welds shall be paid by the Contractor.
- E. Nondestructive Testing:
 - 1. Welded connections between the primary members of ductile moment-resisting space frames shall be tested by nondestructive methods for compliance with UBC Standard No. 27-6 and job specifications.

2. All complete penetration groove welds contained in joints and splices shall be tested 100% either by ultrasonic testing or by radiography.
3. Partial penetration groove welds when used in column splices shall be tested either by ultrasonic testing or radiography when required by the plans and specifications.
4. Base metal thicker than 1-1/2 inches, when subjected to through-thickness weld shrinkage strains, shall be ultrasonically inspected for discontinuities directly behind such welds after joint completion.
5. Any material discontinuities shall be accepted or rejected on the basis of the defect rating in accordance with the (larger reflector) criteria of Table No. 27-6-E of UBC Standard No. 27-6.

F. High Strength Bolts and Connections:

1. Testing and inspection is required for all bolts and bolt connections.
2. Test each lot of bolts in accord with ASTM A325, Article 7.
3. Testing of torquing of field high-strength bolted connections will be performed under continuous inspection by testing laboratory inspectors.
 - a. Provide periodic inspections of high strength bolting in shop or field prior to using.
 - b. The Contractor shall permit laboratory inspector to calibrate torque wrenches, and check calibration of impact wrenches with a Skidmore-Wilhelm hydraulic bolt tension calibrator every morning and mid-day of work-day, before wrenches are used.
 - c. At least 10% of all connectors in every shop and field connection will be checked with a manual torque wrench.
 - d. If bolting is done using Coronet load indicators inspection may be done on a periodic basis, but each connector in every connection will be visually examined, and a minimum of 10% of connectors in each joint checked with a Coronet gap gauge.

4. Testing laboratory will certify in writing at completion of work, that high-strength bolting has been done in accord with Contract requirements and applicable standards.
- 2.06 Metal Deck and Metal Wall Siding: Refer to "Metal Deck" and "Metal Wall Siding" sections.
 - A. Steel Decking and Siding: The Contractor shall furnish certificates of compliance and test reports to the Engineer certifying that all decking conforms to specified requirements. Test Reports and certification shall be identified with the material used to satisfaction of the Engineer.
 - B. Welding Steel Decking and Siding: The Contractor shall provide to the Engineer the qualification of sheet metal welders for this work. The inspector of Testing Laboratory check for use of proper electrodes at the beginning of welding the deck and shall perform continuous visual inspection of all welding of the deck.
 - 2.07 Welding Metal Studs: Refer to applicable portions of Paragraph 2.05 and 2.06.
 - 2.08 Refer to each and every section of Technical Provisions for other specific Tests and Inspection requirements.

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- 1.02 Protection and Barricades: Provide, install, and maintain for the duration of the work as required all lawful or necessary barricades, fences and railings. Furnish temporary lights, warning signs and signals and take all other precautions as may be required to safeguard persons, the site and adjoining property, including improvements thereon, against injuries and damage of every nature whatsoever.
- 1.03 Construction Office: Provide a temporary construction office and the necessary storage space for tools and materials at an approved location on the site. Provide and maintain a telephone in the construction office at the beginning of the work for the use of the Engineer and himself, or the authorized representatives of these parties. Provide desk, chairs, reference boards, file cabinet, heating and air conditioning, as necessary.
- 1.04 Watchman Services: Provide watchman service as deemed necessary to properly safeguard materials, tools, appliances.
- 1.05 Responsibility for Access in the Project Area:
- A. Maintain roads in work area or areas.

- B. Provide and maintain access as required to carry out construction work by all trades connected with the project.
 - C. Keep roadways watered to prevent excessive dust.
- 1.06 Temporary Stairs, Scaffold and Runways:
- A. Provide all scaffolds, stairs, hoist plant, runways, platforms, and similar temporary construction as may be necessary for the performance of the contract. Such facilities shall be of type and arrangement as required for their specific use, substantially constructed throughout and strongly supported, well secured and complying with all applicable rules and regulations of the Industrial Accident Commission of the State of California and all local laws and ordinances.
 - B. Arrange for construction equipment access to areas which may be partly blocked by existing obstructions.
- 1.07 Temporary Water: Provide and maintain necessary water service, meters, temporary supply connections, piping, fittings, etc. as necessary for the project. Before final acceptance, remove all temporary connections and piping in a manner satisfactory to the Engineer. Monthly charges shall be paid for by the Contractor.
- 1.08 Provide and maintain temporary and complete toilet facilities in quantities as required to comply with Code and job requirements.
- 1.09 Temporary Electricity:
- A. Description of System:
 - 1. Service Required: Provide temporary electric power as required. Provide power for construction site offices and for other temporary storage and construction buildings.
 - 2. Capacity: Provide and maintain adequate electrical service for construction use by all trades during the construction period at the locations necessary.
 - 3. Power Source: Provide 120/240 volt, 1 phase, 3 wire power service.
 - 4. Power Costs: Pay all costs of temporary electrical power used during construction, as well as cost of setting and removing temporary service.

- B. Use of Permanent System: Operate any part of the permanent electrical system which is used for construction purposes in a manner so as to insure the safety of all personnel and to prevent interference with the orderly progress of the work.
- C. Materials:
 - 1. The materials may be new or used, but must be adequate in capacity for the purposes intended and must not create unsafe conditions or violate the requirement of applicable codes.
 - 2. At the Contractor's option, patented specialty materials may be used if UL approved.
- D. Equipment: Provide appropriate enclosures for the environment in which used in compliance with NEMA Standards.
- E. General:
 - 1. Install all work in a neat and orderly manner.
 - 2. Make system physically sound and secure throughout.
 - 3. Maintain to give continuous service and to provide safe working conditions.
 - 4. Modify system as job progress requires.
- F. Installation: Provide all required facilities, including transformers, conductors, poles, conduits, raceways, fuses, switches, fixtures, and lamps.
- G. Locate so that interference with cranes and materials-handling equipment, storage areas, traffic areas and work under other contracts is avoided.

1.10 Removal:

- A. Remove all temporary equipment and materials completely upon completion of construction.
- B. Repair any damage caused by the installation and restore the premises to a satisfactory condition as approved by the Engineer.

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01600 - MATERIALS, EQUIPMENT AND WORKMANSHIP

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as built and all other applicable requirements of Document 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Performance and quality of materials, equipment and workmanship as specified in the General Provisions, Section "Materials, Workmanship, Samples and As-Built Drawings."
- D. Material handling and storage.

1.02 Intent of Drawings and Specifications:

- A. The intent of these drawings and specifications is to provide the Contractor a complete set of project documents to allow him to perform with extreme care to properly complete this Contract.
- B. All the minute details of the work embodied in this Contract are not covered by these drawings and specifications. The correct installation of all subtrade materials necessitates installation by skilled workmen under the supervision of skilled foremen, and the juncture of one material or subtrade with another, supervised by a skilled superintendent.
- C. The drawings and specifications endeavor to show all details, in their proper relationships, one to another, and with adequate backing, spacing, etc., in order to achieve the design solution for the work. It is the responsibility of the Contractor to use skilled workmen, working under skilled experienced foremen and superintendents to make these things work.

- D. Any detail or condition indicated on the drawings and specifications that the Contractor deems inappropriate to the stated intent shall be brought to the Engineer's attention prior to commencing the work.
- E. The intent of all Contract Documents is to follow the rules, regulations and laws applicable to this project.

ARTICLE 2 - PRODUCTS

- 2.01 First quality, as specified in the various technical sections of these specifications.

ARTICLE 3 - EXECUTION

3.01 Material Handling and Storage:

- A. Deliver material to the site in original packages, each bearing manufacturer's name or trademark.
- B. Take all necessary measures to protect material from mechanical damage or deterioration of exposed parts or surfaces.
- C. Store materials in a manner accepted and approved by the Engineer.
- D. All materials must be kept clean, dry and properly protected.
- E. Handling shall be done with equipment of adequate size to perform its intended work safely.

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01630 - SUBSTITUTIONS

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as built and all other applicable requirements of Document 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Substitutions.

ARTICLE 2 - PRODUCTS

- 2.01 The term "product" includes materials, systems and equipment. Products shall be new, of the types specified, and furnished in ample quantities to facilitate proper and timely execution of the work.
- 2.02 Use products of one manufacturer for each specific purpose, insofar as practicable.
- 2.03 Contractor's Options:
- A. For products specified only by reference standards, select any product meeting standards, by any manufacturer.
 - B. For products specified by naming several products or manufacturers, select any product manufacturer named.
 - C. For products specified by naming one or more products, but indicating the option of selecting equivalent products by stating "or equal," "equal to," "or approved equal," "equivalent to," Contractor must submit request, as required for substitution, for any product not specifically named.
- 2.04 Substitutions:
- A. During bidding, Engineer will consider written requests from Contractor for substitutions received at least 16

days prior to bid date. Requests received after that time will not be considered except for the following conditions:

1. Production discontinued.
 2. Insufficient Quantity: Except the following will not establish cause for substitution: Failure to award subcontract in sufficient time; or failure to place orders for products so as to insure delivery without delaying work.
 3. Delays beyond Contractor's control, such as strikes, lockouts, storms, fires, or acts of God, which may preclude the procurement and delivery of products for purposes of the Project.
 4. Other reasons as the Engineer may deem justifying the Contractor in such action.
- B. Submit 6 copies of request for substitution. Include in request:
1. Complete data substantiating compliance of proposed substitution with Contract Documents.
 2. For Products:
 - a. Product identification, including manufacturer's name and address.
 - b. Manufacturer's literature, including product description, performance and test data, and reference standards.
 - c. Samples.
 - d. Name and address of similar projects on which product was used, and date of installation.
 3. For Construction Methods:
 - a. Detailed description of proposed method.
 - b. Drawings illustrating method.
 4. Itemized comparison of proposed substitution with product or method specified.
 5. Data relating to changes in construction schedule.

6. Accurate cost data on proposed substitution in comparison with product or method specified.
 7. Relation to separate Contracts, when applicable.
- C. In making request for substitution, Bidder/Contractor represents:
1. He has personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified.
 2. He will provide the same warranty for substitution as for product or method specified.
 3. He will coordinate installation of accepted substitution into work, making such changes as may be required for work to be complete in all respects.
 4. He waives all claims for additional costs related to substitution which consequently becomes apparent.
 5. Cost data is complete and includes all related costs under his Contract, and costs under separate contracts, when applicable.
- D. Substitutions will not be considered if:
1. They are indicated or implied on shop drawings or project data submittals without formal request submitted in accord with Article 2.04 of this Section.
 2. Acceptance will require substantial revision of Contract Documents.
- 2.05 Reimbursement to the District: The Contractor shall reimburse the District for costs of additional engineering services necessitated by substitutions during the construction period.

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01700 - PROJECT CLOSEOUT

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as built and all other applicable requirements of Document 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Project closeout.
- 1.02 Final Clean-Up: After the completion of the work, the Contractor shall remove all temporary structures and equipment built or furnished by him, all debris, and all surplus materials of all kinds, from the site of the work and storage areas, and shall dispose of them in a manner satisfactory to the Engineer. The Contractor shall perform the final clean-up of the Project with meticulous care. The installed equipment shall be thoroughly cleaned, dust-free and scratch-free prior to final acceptance of the work. Such clean-up includes, but is not limited to, all duct work, piping, conduits, cubicles, cabinets, control panels, switchboards, panelboards, lighting fixtures, motors, compressors, drive units, louvers, windows, furniture, rooms and enclosures. The catchbasins separators and the retention pond shall be cleaned, the street and sidewalks swept, and the landscaped areas shall be picked up and raked to a smooth appearance conforming to the paving and adjacent right-of-way fence.
- 1.03 Inspection, Testing and Start-Up:
- A. Inspection and Testing: Final inspection of the work by the Engineer will be made within 10 days after receipt of the Contractor's written request therefor. The work will be deemed complete as of the date of such inspection if, upon such inspection, the Engineer finds that no further work remains to be done. Before final payment will be made, any defects or omissions noted on this inspection must be made good by the Contractor without additional compensation.

B. Field Tests, Adjustments, and Start-Up:

1. All mechanical and electrical equipment, and machine tools, shall be tested by the Contractor to the satisfaction of the Engineer before any facility is put into operation. Tests shall be as specified herein and shall be made to determine whether the equipment has been properly assembled, aligned, adjusted and connected. Any changes, adjustments or replacements required to make the equipment operate as specified shall be carried out by the Contractor as part of the work.
2. At least 90 days before the time allowed in his construction schedule for commencing testing and start-up procedures, the Contractor shall submit to the Engineer, in duplicate, details of the procedures he proposes to adopt for testing and start-up of all equipment, excepting when such procedures have been covered in the Specifications.
3. The Contractor's testing and start-up procedures shall include detailed descriptions of all preoperation electrical, mechanical and instrumentation testing work. Each control device, item of mechanical, electrical and instrumentation equipment, and all control circuits shall be considered in testing procedures, which shall be designed in a stepwise, logical sequence to ensure that all equipment has been properly serviced, aligned, connected, calibrated and adjusted prior to operation. The Contractor is advised that failure to observe these precautions may place the acceptability of the subject equipment in question and he may either be required to demonstrate that the equipment has not been damaged, or replace it as determined by the Engineer. Testing procedures shall be designed to duplicate as nearly as possible all conditions of operation, and shall be carefully selected to ensure that the equipment is not damaged. Once the testing procedures have been accepted by the Engineer, the Contractor shall produce check-out, alignment and adjustment and calibration sign-off forms for each item of equipment, which shall be used in the field by the Contractor and the Engineer jointly to ensure that each item of electrical, mechanical and instrumentation equipment has been properly installed and tested.

SCRTD - DIVISION 1
Bus Maintenance Facility
and Yard Improvement

4. During the testing of the mechanical, instrumentation and electrical equipment, the Contractor shall make available, as necessary, representatives of the manufacturers of all the various pieces of equipment, or other qualified persons who shall instruct the District's personnel in the operation and care thereof. Instructions shall include written step-by-step operation and trouble-shooting procedures with a complete description of all necessary test equipment and all protective device settings.

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01720 - RECORD DOCUMENTS

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as built and all other applicable requirements of Document 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Maintenance, recordation and final documentation of construction as-built drawings for the purpose of future reference.
- D. Production of topographic survey.

1.02 Record Drawings:

- A. Upon request, the Contractor shall be furnished 1 set of blue-line prints for the purpose of maintaining an accurate record of construction that deviates from the Contract Documents.
- B. When supplementary or revised drawings are issued by addendum, change order or clarification, 1 copy of each such drawing will be provided for inclusion in the record drawings.
- C. This set of drawings shall be separately maintained. The Contractor shall suitably identify this set of drawings and they shall not be used for general reference, other than to verify previous work accomplished.
- D. Recordation:
 - 1. All work accomplished in variance from the Contract Documents shall be entered on the record drawings.
 - 2. All buried or concealed work shall be located on the record drawings. Their locations shall be indicated dimensionally from a fixed point or permanent

structure, and in case of buried elements, their depths shall be indicated.

3. The posting of this as-built information shall be accomplished on a minimum daily basis. Applications for payment will not be approved when record drawings are not up-to-date.

E. At the completion of construction activities, and when the record drawings are up-to-date, all said drawings shall be signed by the General Contractor and the applicable subcontractors.

1.03 Final Documentation:

A. After completion of the record drawings, the Engineer will review for general conformance with his log and record of the project. The Contractor shall not incorporate the Engineer's notations on the record drawings.

B. Upon request, the Contractor will be furnished 1 set of paper transparencies (sepias) of the Contract Documents for the purpose of final documentation of the record drawings.

C. The Contractor shall have the recorded conditions transferred to the transparencies by a competent drafts-person. The transparencies shall be noted "as-built" and signed as specified above for the record drawings.

D. All changes accomplished by addenda, change orders, supplementary drawings and revised drawings shall be incorporated into the final documentation on the transparencies.

E. The Contractor shall then cause the final distribution of the record drawings, as follows:

1. One set of blue-line prints made from the transparencies, the transparencies, and the original record drawings to the Engineer.

F. Final record drawings shall be acceptable to the Engineer, and the final payment is contingent upon this acceptance.

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DIVISION 2 - SITE WORK

SECTION 02050 - DEMOLITION

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Perform Demolition:
 - 1. Demolish and remove all existing buildings, structures, foundation systems, pavement and above ground and underground utility systems as indicated on the drawings.
 - 2. Remove existing underground tanks and related systems as indicated on the drawings.
 - 3. Remove contaminated soil encountered at existing tanks.
 - 4. Other clearing, grubbing demolition and removal work as shown on Drawings or as required to complete work of this Contract, or as directed by the Engineer.
 - 5. Obtain special permits for this work as required.

1.02 Related Work in Other Sections:

- A. Earthwork - refer to Section 02200.
- B. Excavation for footings, foundations, etc. - refer to Section 02200.

1.03 Requirements:

A. Description of Site:

- 1. The Contractor shall accept the site as it exists on the first day of work under this Contract.

2. Examine the site and the conditions pertaining thereto and determine the extent of work to be done. All existing conditions are not necessarily shown on the drawings or noted herein and can be determined only by examination of the premises by the Contractor.

B. Protection:

1. Contractor shall be responsible for all existing improvements within or outside working area including damages by him or by his subcontractors or agents. Repair or replace existing damaged improvements that are to remain with material of same kind, quality and size.
2. Provide barricades and fences with substantial gates and equipment with good locks. Keep working area locked when work is not in progress.
3. Provide signs to exclude unauthorized persons from entering working area.
4. Execute work to protect adjacent property, buildings, shrubs, trees and lawns from damage.

C. Utilities:

1. Notify Utility Companies and Owner of all utilities to be cut off, modified or relocated. Maintain active utilities and protect same.
2. Active Utilities: Protect and maintain existing active utilities indicated to remain throughout the construction period. Any utility which is damaged or broken shall be repaired at no cost to the Owner.
3. Inactive or Abandoned Utilities: Remove or cap in accordance with local governing regulations. In general, remove and cap all lines to at least 5' outside the limits of new construction.

- D. Examine the Contract Drawings to establish the extent of demolition work and extent of the building to remain. Where questions or discrepancies exist, obtain the Engineer's ruling on the extent or intent of such discrepancies before commencing work.

ARTICLE 2 - PRODUCTS

None required.

ARTICLE 3 - EXECUTION

3.01 Demolition:

- A. Drawings indicate general character, scope and extent of the demolition work to be accomplished.
- B. Cutting and Removing Concrete: Perform all cutting of concrete using concrete cutting saws with diamond or abrasive blades utilizing wet cut. Make cuts clean and even to permit perfect mating of new concrete elements where required.
- C. All portions of the building, utilities, pits, footings, asphalt concrete and concrete pavements, exposed or underground utility lines, buried railroad tracks, and all physical appurtenances, etc., unless specifically indicated to remain, shall be demolished and removed from the property and all debris from the demolition shall be cleaned up and also removed from the property.
- D. All underground tanks and related piping and systems shall be removed in complete conformance with state, county, city and fire department requirements. The Contractor shall be responsible for obtaining and paying for all required permits.
- E. The Contractor shall be responsible for removing any contaminated soils as determined by government agencies or by the Engineer. All contaminated soil shall be removed from the property and be disposed of in full compliance with the regulatory agency's requirements. The existence and quantity of contaminated soil is unknown. For this effort, when required, the Contractor will be compensated as extra work by Contract Change Orders.

3.02 Salvage Materials:

- A. All salvageable items not indicated to be relocated or retained by the Owner shall become the property of the Contractor and removed from the site.
- B. Remove unsalvageable items from the site as specified for debris.
- C. Disposition: All salvage, waste or debris shall be removed from the site and not allowed to accumulate.

3.03 Temporary Shoring and Bracing:

- A. Take precautions to guard against movement, settlement or collapse of any adjacent construction, buildings, services, sidewalks or utilities. Provide adequate bracing and shoring to safeguard the building and personnel.
- B. Take precautions to provide necessary bracing or shoring during the course of any demolition. If at any time the safety of personnel would appear to be endangered, cease operations and notify the Engineer. Do not resume operations until safe conditions have been re-established and permission has been granted to resume operations.
- C. Obtain and pay for any permits required for shoring or barricades.

3.04 Disposal and Cleanup:

- A. Burning combustible rubbish on site is prohibited.
- B. Haul rubbish, debris and rocks away from site promptly and dispose of legally.
- C. Dust Abatement: During entire period of demolition and during loading, keep area and material being loaded sprinkled to reduce dust in air and annoyance to premises. Maintain effective dust palliation and good housekeeping program to prevent contamination of adjoining buildings.

3.05 Dust Protection:

- A. Dust, dirt and debris cannot be tolerated in remainder of building. Partition off all dirt or dust producing operations from occupied space before beginning work. Design of dust barrier partitions shall be submitted to the Engineer for approval prior to installation.
- B. Provide and maintain suitable cleaning equipment, vacuum cleaners, chemically treated dust cloths, foot wipers, brooms, brushes, etc., as necessary for complete control of dust and dirt.

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DIVISION 2 - SITEWORK

SECTION 02200 - EARTHWORK

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Site earthwork includes site excavation of all material on-site and off-site to the depths indicated on the Drawings, or as directed by the Engineer, scarifying and compacting the upper 6" below the exposed bottom limit of excavation, and the filling and compacting of suitable on-site or imported soil material as shown on the Drawings or specified herein. However, nothing within these Specifications or indicated on the Drawings shall be interpreted to mean that all items requiring removal are shown or described. All materials resulting from earthwork, except as indicated or specified otherwise, shall become the property of the contractor upon receipt of Notice to Proceed. The District shall not be responsible for the condition, loss or damage to such property found on the site. In general, all work shall be performed in an orderly and careful manner, with due consideration for occupants of adjacent property, and the public. At no time shall Contractor perform work outside the limit or outside District property unless authorized in writing by the Engineer and the required Permits have been obtained from government regulatory agencies.
 - D. Structural excavation and backfilling for footings, foundations, grade beams, underground tank farms, etc.
 - E. Preparation of subgrade under pavement and slabs.
 - F. Provide surveyed cross sections for measurement and payment of site excavation and site compacted fill.
 - G. Information contained in the Foundation Investigation Report is attached herewith and is a part of the Contract.

1.02 Related work in Other Sections:

- A. Demolition - Refer to Section 02050.
- B. Removal of Contaminated Soils - Refer to Demolition Section 02050.
- C. Trenching, Backfilling and Compacting - Refer to Section 02221.
- D. Tests and Inspections - Refer to Section 01400.

1.03 Reference Specifications: Standard Specification (PWC):
"Standard Specifications for Public Works Construction," 1982 Edition.

1.04 Submittals:

- A. Submit proposed earthwork procedures for all phases of work to the Engineer for approval before work is started. The procedures shall provide for safe conduct of the work, careful removal, proper disposal, protection of property which is to remain undisturbed, coordination with other work in progress and timely disconnection of utility services (where applicable). The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

1.05 Protection:

- A. Protection of Existing Facilities: Before beginning work, the Contractor shall carefully survey the existing facilities and examine the Drawings and Specifications to determine the extent of the work. The Contractor shall take all necessary precautions to insure against damage to existing work to remain in place (including sub-surface utilities), and any damage to such work shall be repaired or replaced with new materials as necessary to restore damaged areas or surfaces to a condition equal to and matching that existing condition prior to damage or start of work on this Contract as approved by the Engineer at no additional cost to the District. The Contractor shall carefully coordinate the work of this section with all other work and construct and maintain shoring, bracing and supports, as required. The Contractor shall insure that structural elements are not over-loaded, be responsible for increasing structural supports or adding new supports as may be required, and

repair any damage as a result of any work performed under any part of this Contract at no additional cost to the District. Unshored banks shall not have a slope greater than 1 vertical to 1 horizontal.

- B. Fence and Barriers: Provide and maintain during work, all protection and fences required by Specifications and Drawings and the State Accident and Safety Commission and all other governmental agencies having jurisdiction over this work.
 - C. Environmental Protection: Comply with all applicable City, State, and Federal codes and assume responsibility for obtaining any permits that may be required.
- 1.06 Salvageable Materials: No materials other than those specifically identified on the Drawings shall be considered as salvageable. However, the Contractor shall take into account in the development of his lump sum price and unit price any materials such as piping, valves, fittings, tanks, railroad track material, and the like, indicated on the Drawings or otherwise identified, which he feels are salvageable. All such materials shall become the property of the contractor and shall be removed from the job site.
- 1.07 Historical or Archaeological Findings During Construction: There are no known historical or archaeological remains at the project site. Should any skeletons, artifacts, items of historical interest and the like be uncovered, the Contractor shall suspend operations at the site of discovery and continue operations in other areas. The Contractor shall notify the Engineer immediately of the discovery and shall include a written statement of the findings and a location sketch. Should the discovery site require archaeological studies resulting in delays and/or additional work, the contractor will be compensated by an equitable adjustment under the General Provisions of the Contract. All such historical and archaeological remains found at the site shall be the property of the District.
- 1.08 Verify Construction Limits: Verify all existing boundary lines and boundary points of the construction limits from control points shown on the Drawings.
- 1.09 Burning: The use of burning at the project site for the disposal of refuse and debris will not be permitted.
- 1.10 Use of Explosives: Use of explosives will not be permitted unless approved of in writing by the City of Los Angeles and the District.

1.11 Safety:

- A. General: Comply with all applicable City, State, and Federal regulations governing safety.
- B. Hazardous Openings: Holes, open basements, and other hazardous openings shall be clearly marked with warning signs prior to removal. Contractor shall be liable for any injuries resulting from inadequate protection around such areas.

1.12 Dust Control: From time to time as directed and as required by weather conditions and the condition of the ground surface, for the purpose of preventing objectionable and injurious dust conditions, the Contractor shall wet down such objectionable areas by means of hose or tank truck. Objectionable dust conditions shall be allayed at all times at no additional cost to the District.

1.13 Control of Surface and Ground Water:

- A. Allow no water to stand on or near construction areas at any time during period of Contract.
- B. Keep all excavations free from seepage, overflow, and standing water at all times, either by well points, pumps, natural drainage or whatever devices Contractor elects to provide to accomplish purpose. In no case shall fill, concrete or other materials be deposited or placed in any excavation unless such excavations are thoroughly free of water. Contractor shall provide, maintain and remove all necessary pumping equipment at no cost to the District.

1.14 General Requirements:

A. Soil Information:

- 1. Information on the Drawings or in the foundation investigation report does not constitute a guarantee of uniformity of soil conditions over the construction site. However, Contractor shall conform with the overall requirements of the foundation investigation report identified in Paragraph 1.14.B.
- 2. The foundation investigation report identified in Paragraph 1.14.B is included at the end of this section and has been made part of this specification.

B. Special Conditions:

1. All earthwork operations shall be performed in strict compliance with recommendations of the "Report of Foundation Investigation, Proposed Bus Maintenance and Yard Improvement, SCRTD Division 1", prepared by LeRoy Crandall and Associates, dated October 24, 1984 and conditions specified herein, whichever is more stringent.
2. Earthwork operations shall conform to the applicable portions of Section 300 of the "Standard Specifications" and to the special requirements set forth herein and upon the Drawings.

ARTICLE 2 - PRODUCTS

- 2.01 The on-site soils, except for any organic matter and large pieces of debris within the existing fill, may be reused as fill material for the entire project except where clean sand is called for as backfilling material. Inorganic materials, such as concrete and asphalt, can be used in fills if crushed or broken into small pieces (3" maximum in size) and uniformly mixed with soil so as to provide a dense mixture without nesting and voids. Obtain the Engineer's approval before placing.
- 2.02 All imported borrow, when required, shall be comparable to the clean, on-site soils and should consist of relatively non-expansive and predominantly granular soils. The expansion index of the material should be less than 35, and no more than 50% of the material should pass a No. 200 sieve. The material should contain sufficient fines (binder material) so as to result in a compacted fill which will not rut under construction traffic and which will be stable in shallow trenches.
- 2.03 For site compacted fill work and structural backfilling, the Contractor may use all suitable on-site soils or all imported borrow or combinations of the two fill materials, subject to the Engineer's prior approval.

ARTICLE 3 - EXECUTION

- 3.01 Site Excavation: (Refer to Clarification Diagram on Page 11)
 - A. Contractor shall excavate from exposed rough grade after demolition to the limits and dimensions indicated on the Drawings in accordance with Sub-section 300-2 of the Standard Specifications. All soil material to be re-used

as fill shall be stockpiled at a location within the area being built. All other unsuitable material and debris shall be disposed of as described in Paragraph 3.05 in this Section.

- B. Contractor shall remove all foreign material uncovered during excavation. These materials shall be disposed of as described in Paragraph 3.05 at no extra cost to the District.
- C. The site excavation limits and dimensions on the drawings are shown as limits of minimum required excavation. In actual site excavation, the Contractor shall comply with all provisions of the soils report, which may require him to excavate less than or in excess of the limits and dimensions shown in some areas, particularly beneath proposed buildings. Contractor shall be compensated for work actually performed based on his (per cubic yard) "site excavation" unit costs. This unit price shall not be applied to structural excavation.
- D. The bid quantity of site excavation has been identified in the Bid Form. Quantities of structural excavation are not included as part of this bid quantity.

3.02 Site Compacted Fill: (Refer to Clarification Diagram on Page 11)

- A. Scarifying and Compaction: The 6" below the limit of site excavation shall be scarified and compacted to 90% relative density prior to backfilling.
- B. Control: Place all fill to "Rough Grading" under the inspection of a Soils Engineer employed by the District. Prior to placing, all fill material, on-site soils or imported borrow, shall meet the approval of the Soils Engineer, who shall perform the necessary tests and inspections so that upon completion it can be certified as controlled, compacted fill. No fill shall be placed without the Soils Engineer being present. Cooperate with the Soils Engineer to the extent it is necessary for Soils Engineer to perform his duties.
- C. Compaction: Place all fill in loose layers not exceeding 8 inches in thickness, moisten as required and compact to specified density. Flooding or jetting will not be permitted.

- D. Density: Compact all fill to at least 90 percent of maximum density determined by ASTM, D1557-70 compaction test method (Standard Spec. Sec. 300-4). Moisture content shall not vary more than 2 percent above or below optimum moisture content.
- E. Rough Grading: Shall be to finished sub-grade or bottom of slab or pavement elevation indicated within one tenth of a foot. Grade areas to drain water away from proposed structures. Existing grades which are to remain but are disturbed by the Contractor's operations shall be graded as directed. Protect newly graded areas from traffic, erosion, and settlements that may occur.
- F. Contractor shall be compensated for compacted fill of site earthwork actually performed based on his (per cubic yard) "site compacted fill" unit costs. The bid quantity of site compacted fill has been identified in the Bid Form. Backfill required for structural excavation is not included as part of this bid quantity.

3.03 Structural Excavation and Backfilling:

- A. After site earthwork is completed, the Contractor shall examine the rough grading and correct all unsatisfactory conditions prior to structural excavation.
- B. Excavate to the dimensions and elevations indicated. If the excavation is made below the elevations shown on the drawings, fill the excavated portion with concrete of the strength and weight required for the structural concrete at no extra cost to the District.
- C. Should suitable bearing, as determined by the Soils Engineer, not be encountered at the depth indicated on the drawings for footings, foundations, or tank farm slabs, do not proceed further until instructions are given by the Engineer and the necessary measurements made for the purpose of establishing the additional volume of excavation. The Contractor will be compensated for any extra structural excavation and backfilling under the General Provisions of the contract.
- D. The bottoms of all structural excavations shall be level, be free of loose material and standing water, and be 90% compacted and approved by the Soils Engineer.

- E. Remove excavated materials not suitable for backfill from the site and dispose of without any additional cost to the District.
 - F. Provide any shoring necessary to maintain the banks of excavations and to prevent any sloughing or caving-in, and as necessary to prevent damage of any kind which may occur in connection with this work.
 - G. After the concrete has been placed, the forms removed and the concrete work approved, backfill and compact the excavations to the indicated grades. Before placing backfill, remove all rubbish, wood and debris from the excavations. Deposit backfill in loose 8" layers and compact to at least 90% of maximum density.
 - H. The structural excavations and compacted backfill are the responsibility of the Contractor and shall be considered as part of the overall project. The "unit cost" requirements for the site excavation and site compacted fill do not apply to this section of work.
- 3.04 Test: Submit copies of certified compaction test reports in accordance with Standard Specifications Sub-section 211-2 for each 200 cubic yards of fill material placed and for each 5000 sq. ft. of scarified and compacted soil. Tests and reports will be prepared by District employed Soils Engineer.
- 3.05 Disposal:
- A. Removal Items: All items called for removal shall be disposed of off District property. Such removals shall be on a daily basis and under no circumstance shall debris and rubbish be allowed to accumulate in building or on site.
 - B. Debris Control: Remove and transport debris in a manner as to prevent spillage on streets or adjacent areas.
 - C. Regulations: State and local regulations regarding hauling and disposal apply. All permits as required for clearing, grubbing, demolition, and disposal of off-site work are the responsibility of the Contractor.
- 3.06 Clean-Up: Remove all rubbish and debris from site at completion of work for each phase as specified herein.

ARTICLE 4 - MEASUREMENT AND PAYMENT (For Site Excavation and Site
Compacted Fill Only)

4.01 Description: This Section specifies the general requirements for measurement of quantities and the provisions for payment in addition to the requirements and provisions set forth in the General Provisions.

4.02 Procedures and Requirements:

A. Measurement: The work of this Contract will be measured as a unit and paid for on a unit price basis. The Unit Price shall include all labor, materials, and equipment necessary for the work, all overhead, profit, supervision, bonds, insurance, and other indirect costs required for the work for the following items:

1. Site Excavation shall be based on the actual volume, in cubic yards, of material removed off the site or stockpiled for re-use, to the limits and dimensions indicated on the Drawings and as otherwise directed by the Engineer. The Contractor shall, at no additional cost to the District, survey the existing ground after demolition but prior to start of this work and survey again after completion of the excavation. These surveys shall be performed at the stations shown on Drawings and results plotted on the cross sections. Submit four (4) copies of finished cross sections to the Engineer for approval. The excavated quantity to be paid shall be determined by the average end area method as the difference between the bottom of excavation and existing rough grade subsequent to demolition. Stockpiling, disposal of unsuitable or excess soils from the site and replacement and compaction of unauthorized over-excavation shall be considered incidental to site excavation and the cost thereof shall be included by the Contractor in his unit price. Refer to Paragraph 3.01 for scope of work and additional requirements.
2. Site Compacted fill shall be based on the actual volume, in cubic yards, of fill material compacted and in place. The Contractor, at his option, may use all imported borrow or combination of imported borrow with on-site suitable fill soil for the entire project and he shall supply one unit price for all site compacted fill. The Contractor shall, at no additional cost to the District, survey the grades of the finished surfaces of rough grading as defined in Paragraph 3.02.E at the completion of work. This

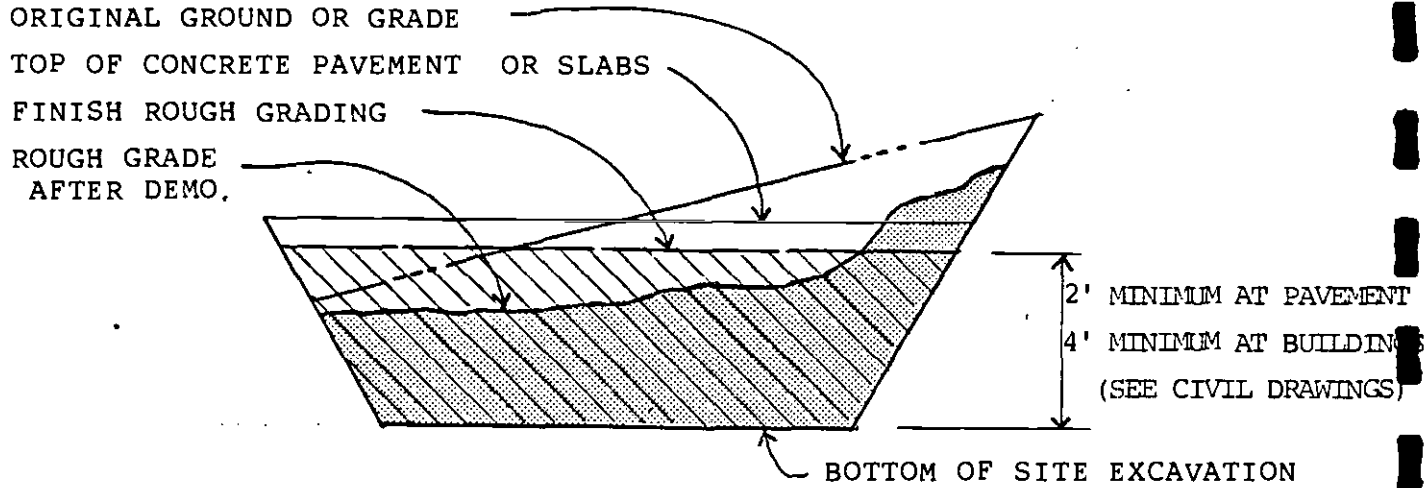
survey shall be performed at the stations as shown on the Drawings and results plotted on the cross sections. Submit four (4) copies of finished cross sections to the Engineer for approval. The site compacted fill quantity shall be determined by the average end area method, as the difference from the finished rough grading to the bottom of site excavation as determined per Paragraph 4.02.A.1. The clean-up of stockpiled soils and the removal and legal disposal of unsuitable material shall be considered incidental to site compacted fill and the cost thereof shall be included by the Contractor in his unit price. Refer also to Paragraph 3.02 for scope of work and additional requirements.

3. See clarification diagram on Page 02200-11.

- B. Payment: The unit price (per cubic yard) as bid by the Contractor in accordance with Paragraphs 3.01 and 3.01 shall be used as the basis for payment for the actual quantity of work performed by the Contractor. If the total quantity of work, either site excavation or site compacted fill, varies from the bid quantity, the unit price will be adjusted through negotiations as follows:
1. If the total earthwork quantity actually performed by the Contractor exceeds the bid quantity by more than 50 percent, the quantity in excess of 150 percent of the bid quantity will be paid for by a readjusted unit price.
 2. If the total earthwork quantity performed by the contractor is less than 50 percent of the bid quantity, the entire quantity of work will be paid for by a readjusted unit price. However, the total payment shall in no case exceed the payment which would be paid to the Contractor for performing 50 percent of the bid quantity at the original contract unit price.

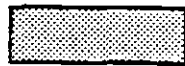
* * * *

CLARIFICATION DIAGRAM: THE FOLLOWING DIAGRAM IS FOR CLARIFICATION OF REQUIRED SURVEY DATA FOR DETERMINING PAY QUANTITIES.



CROSS SECTION

LEGEND:



PAY LIMITS FOR SITE EXCAVATION



PAY LIMITS OF SITE COMPACTED FILL

EACH CROSS SECTION SHALL BE SURVEYED THREE TIMES BY CONTRACTOR:

1. ROUGH GRADE AFTER DEMOLITION
2. BOTTOM OF SITE EXCAVATION
3. FINISHED ROUGH GRADING

REPORT OF FOUNDATION INVESTIGATION
PROPOSED BUS MAINTENANCE BUILDING
AND YARD IMPROVEMENT
DIVISION 1
6TH AND ALAMEDA STREETS
LOS ANGELES, CALIFORNIA
FOR THE
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

SCOPE

This report presents the results of a foundation investigation of the site of the subject proposed bus maintenance building and yard improvement. The locations of the proposed facilities and our exploration borings are shown on Plate 1, Plot Plan.

This investigation was authorized to determine the static characteristics of the soils beneath the site for design purposes and to provide recommendations for foundation design and floor slab support for the proposed buildings and recommendations for design of paving. The scope of this investigation did not include geologic and seismic studies for the site. Accordingly, our conclusions and recommendations are for static loading conditions only; however, this does not imply that there is a geologic or seismic hazard affecting the site. The results of the field explorations and laboratory tests, which form the basis of our recommendations, are presented in the attached Appendix.



Our professional services have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has been prepared for the Southern California Rapid Transit District and their design consultants to be used solely in the design of the proposed facilities. The report has not been prepared for use by other parties, and may not contain sufficient information for purposes of other parties or other uses.

STRUCTURAL CONSIDERATIONS

The proposed facilities are identified and shown in plan on Plate 1. The bus maintenance building will be part one story and part two stories in height; the other structures will be one story in height. The structures will be of steel frame construction with masonry walls. Maximum column loads, which will occur in the bus maintenance building, will be on the order of 75 kips.

The building floors will be established at approximately the existing grade. There will be pits within some of the buildings.

SITE CONDITIONS

The site is the existing Division 1 Bus Maintenance Facility. The site is occupied by buildings and paved areas; portions of the site were previously occupied by buildings which have been demolished. A review of old USGS topographic maps indicates that railroad tracks were on the site in the past. Although not encountered in our borings, there



may still be railroad tracks beneath the existing asphaltic paving. Evidence of prior construction (buried slabs, footings, walls, etc.) was encountered in our borings and such objects will be encountered during grading. The removal of the existing foundations and underground utilities will result in disturbance of the upper soils. Backfill will be required where underground construction is removed.

SOIL CONDITIONS

Existing fill soils were encountered in the exploration borings. Borings 1, 8 and 9 encountered concrete obstructions (believed to be slabs or footings) at depths of 3 to 5 feet; it was not possible to penetrate the concrete at these locations and the borings were terminated. Boring 4 encountered a concrete obstruction (believed to be a footing) at a depth of 5 to 6½ feet. Boring 6 encountered a concrete obstruction at a depth of 4 to 5½ feet; a coring bucket was used to penetrate the concrete at this location. The fill at the boring locations ranged from two to nine feet in thickness. The fill consists of silty sand and silt and contains varying amounts of debris. Deeper fill could occur between boring locations.

The natural soils beneath the site consist of silty sand and silt underlain by sand. The silty sand and silt are moderately firm. The underlying sand is firm and dense.

Water was not encountered within the 16-foot depth explored.



RECOMMENDATIONSFOUNDATIONSGeneral

The existing fill soils, which contain debris and are not uniformly well compacted, are not considered suitable for foundation or floor slab support. The underlying natural soils are moderately firm to firm.

We recommend that the existing fill soils and any disturbed natural soils be excavated. All existing buried footings, slabs, walls, railroad tracks, and other evidence of former construction should be removed from the site. If the excavated materials are replaced with properly compacted fill, and if any required additional fill is properly compacted, the proposed buildings may be supported on spread footings established in either the compacted fill or the underlying natural soils, and the building floor slabs may be supported on grade.

Recommendations for grading are presented in a following section. The excavation of the existing fill, the reworking of the natural soils, and the compaction of all required fill should be observed and tested by our firm.

Bearing Value

If the grading recommendations presented in a following section are followed, the proposed buildings may be supported on spread footings established in the resulting compacted fill (or the undisturbed natural soils). Exterior footings should extend at least two feet below the



adjacent final grade; interior footings may be established at a depth of two feet below the adjacent floor level. Footings at the recommended depth may be designed to impose a net dead plus live load pressure of 2,000 pounds per square foot. A one-third increase in the bearing value may be used for wind or seismic loads.

If desired, pit walls or low retaining walls may be supported on shallower footings. Footings for such light loads established in either properly compacted fill or undisturbed natural soils and extending at least one foot below the lowest adjacent grade may be designed to impose a pressure of 1,000 pounds per square foot.

The recommended bearing values are net values. In computing the downward foundation loads for footing design, the weight of the concrete within the footings may be taken as equal to 50 pounds per cubic foot, and the weight of soil backfill may be neglected.

The actual bearing value of the required compacted fill will depend on the quality of fill material and the degree of compaction achieved. The quoted bearing values should be applicable if the on-site soils or other comparable soils are used and are properly compacted. The bearing value of the compacted fill should be confirmed at the completion of the grading.

Settlement

The settlement of the proposed buildings, supported on spread footings in the manner recommended, will be less than one-half inch.



Lateral Loads

Lateral loads may be resisted by soil friction and by the passive resistance of the soils. A coefficient of friction of 0.5 may be used between footings or the floor slabs and the supporting soils. The passive resistance of properly compacted fill or natural soils against footings may be assumed to be equal to the pressure developed by a fluid with a density of 250 pounds per cubic foot. A one-third increase in the passive value may be used for wind or seismic loads. The frictional resistance and the passive resistance of the soils may be combined without reduction in determining the total lateral resistance.

Footing Observation

To verify the presence of satisfactory soils at design elevations, all footing excavations should be observed by personnel of our firm. Footings should be deepened as necessary to extend into satisfactory soils.

Backfill

All required footing backfill and utility trench backfill within the building areas should be mechanically compacted; flooding should not be permitted. The exterior grades should be sloped to drain away from the buildings to minimize ponding of water adjacent to foundations.



GRADING

To provide support for shallow spread footings and the floor slabs, all existing fill soils and any disturbed natural soils should be excavated and replaced with properly compacted fill. To provide good support for asphaltic paving and portland cement concrete paving, all of the existing fill should be excavated and replaced with properly compacted fill. However, in our opinion, if some settlement with associated cracking of the paved areas and greater than normal maintenance would be acceptable, excavation and compaction of only the upper fill soils would be required; the lower portion of the existing fill could be left in place.

After the site has been properly cleared, all existing fill soils and any disturbed natural soils within the building areas should be excavated. Removal of former construction (footings, floor slabs, walls, and railroad tracks) within these areas would also be necessary. The excavation should extend beyond the buildings in plan a distance equal to the depth of fill, or to a distance of ten feet, whichever is greater. Temporary excavations within the existing fill may be made at 1:1. Conventional earth-moving equipment should be sufficient for the majority of the excavation; however, special equipment may be necessary to facilitate excavation of large debris deposits. Within areas to be paved, the existing fill soils should be excavated to a depth of at least two feet below the existing grade or two feet below the planned subgrade level, whichever is deeper.



After excavating as recommended, the exposed soils should be carefully inspected to verify the removal of any deposits not suitable for foundation, floor slab, or paving support. Next, the exposed soils should be scarified to a depth of six inches and rolled with heavy compaction equipment. At least the upper six inches of exposed soils should be compacted to at least 90% of the maximum density obtainable by the ASTM Designation D1557-70 method of compaction.

After compacting the exposed soils, all required fill should be placed in loose lifts not more than eight inches in thickness and properly compacted to at least 90%. It is recommended that the moisture content of the soils at the time of compaction vary no more than 2% below or above optimum moisture content.

The on-site soils, except for any organic matter and large pieces of debris within the existing fill, may be used in required fills. Inorganic materials, such as concrete and asphalt, could be used in fills if crushed or broken into small pieces and mixed with soil so as to prevent voids. Any required imported fill should be comparable to the on-site soils and should consist of relatively non-expansive soils. The expansion index of the material should be less than 35. The material should contain sufficient fines (binder material) so as to result in a compacted fill which will not rut under construction traffic and which will be stable in shallow trenches.

The excavation of the existing fill soils and the compaction of all required fill should be observed and tested by our firm. Imported fill material should be approved for use prior to importing.



PIT WALLS

Pit walls should be designed to resist the lateral earth pressure developed by a fluid with a density of 30 pounds per cubic foot plus any adjacent surcharge loads. Backfill adjacent to the pit walls should be mechanically compacted to at least 90% of the maximum density obtainable by the ASTM Designation D1557-70 method of compaction.

FLOOR SLAB SUPPORT

If the subgrade is prepared as recommended, the floor slabs may be supported on grade. The required thickness and reinforcing of the concrete floor slabs will depend on the imposed loadings. Data for design of concrete paving are presented in the following section. If the slabs will be subject to heavy floor loads or wheel loads, joints in the slabs should be keyed or dowelled to prevent differential movements at the joints.

If vinyl or other moisture-sensitive floor covering is planned in any area of the buildings, we suggest that the floor slabs in such areas be supported on a four-inch-thick layer of gravel or on an impermeable membrane as a capillary break. A suggested gradation for the gravel layer would be as follows:

<u>Sieve-Size</u>	<u>Percent Passing</u>
3/4"	90 - 100
No. 4	0 - 10
No. 100	0 - 3



If a membrane is used, a low-slump concrete should be used to minimize possible curling of the slabs. The floor slabs should be allowed to cure properly before placing vinyl or other moisture-sensitive floor covering.

PAVING

General

Compaction of the subgrade to at least 90%, including trench backfills, will be important for paving support. The preparation of the parking area subgrade should be done immediately prior to the placement of the base course. Proper drainage of the paved areas should be provided since this will reduce moisture infiltration into the subgrade and increase the life of the paving. (As previously mentioned, some settlement and cracking may occur, and additional maintenance of paved areas will be required where the deeper existing fill soils are left in place.)

Asphaltic Paving

To provide data for design of asphaltic paving, a California Bearing Ratio test was performed on a sample of the upper soils. The test indicated a CBR value of 35 at 90% compaction. The results of the test are presented in the Appendix. The paving sections are based on the subgrade consisting of the on-site soils or similar imported soils with a CBR value of at least 10.

The required paving thickness and base thickness will depend on the anticipated wheel loads and volume of traffic (Traffic Index).



Assumed Traffic Indexes and the corresponding paving sections are presented below:

<u>Traffic Index</u>	<u>Paving Section</u>
4½	3" Asphaltic Paving on compacted subgrade
6½	3" Asphaltic Paving; 4" Base Course
7½	3" Asphaltic Paving; 6" Base Course

The Traffic Index of 4½ would be appropriate for employee parking areas not subject to bus or truck traffic.

Careful inspection is recommended to verify that the recommended thicknesses or greater are achieved and that proper construction procedures are used. We could provide alternate paving sections for different Traffic Index values if desired.

Portland Cement Concrete Paving

We have determined the required thickness of PCC paving for a maximum single-axle bus loading of 26,500 pounds. The recommended thickness of PCC paving for concrete strengths of 3,000, 4,000 and 5,000 pounds per square inch are presented below:

<u>Concrete Strength (psi)</u>	<u>Required Thickness of PCC Paving (inches)</u>
3,000	9
4,000	8
5,000	7

A modulus of subgrade reaction of 200 pounds per cubic inch was used for the subgrade in determining the above paving thicknesses. The thicknesses were determined for the condition where the paving is placed directly on the compacted subgrade without the use of a base course.



The use of base beneath the paving would have only a nominal effect on the paving thickness. If 12 inches of base course were used, the above paving thicknesses could be reduced by one-half inch.

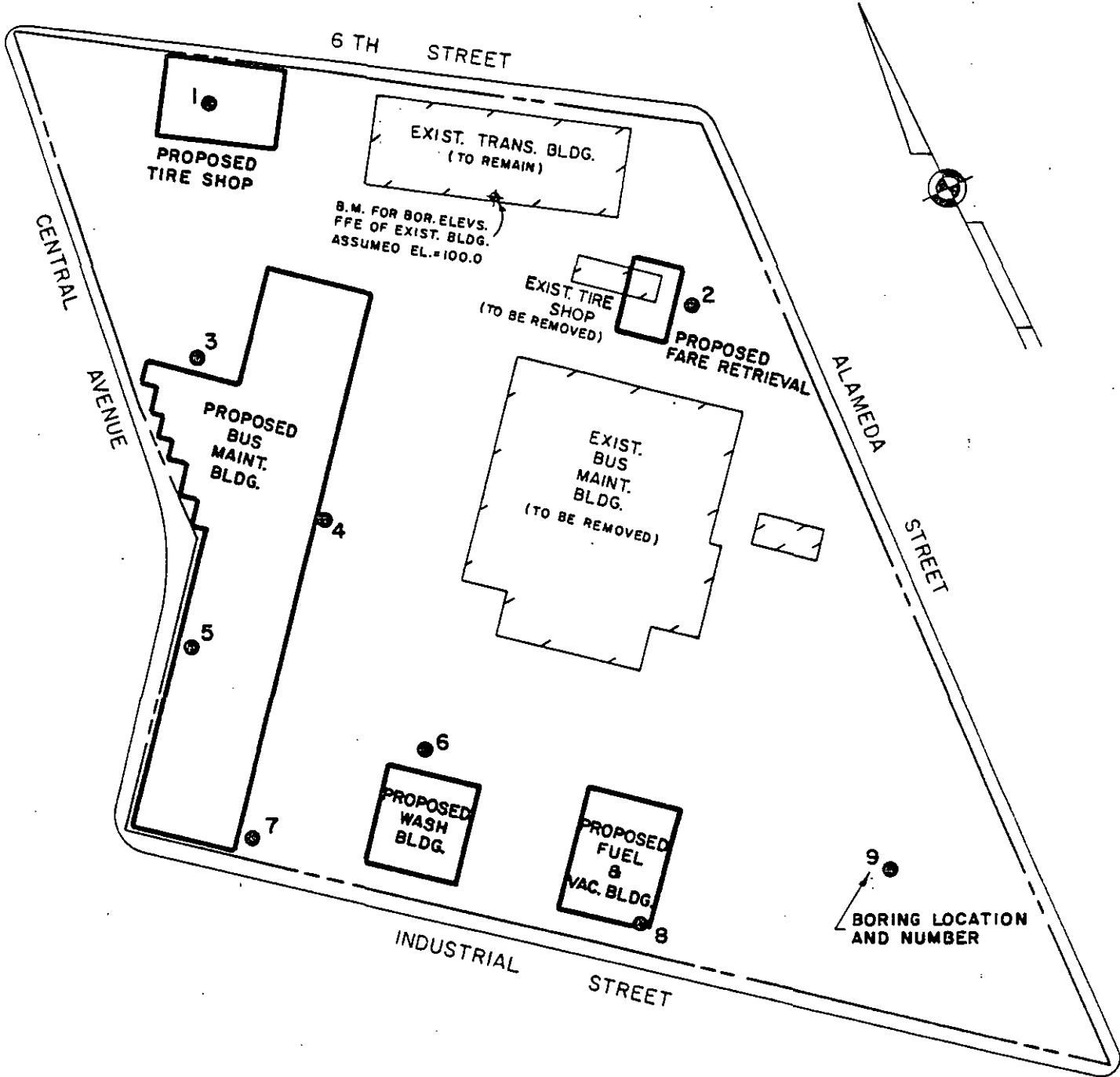
Base Course

The base course should meet the specifications for Class 2 Aggregate Base as defined in Section 26 of the State of California, Department of Transportation, Standard Specifications, dated January, 1981, or Crushed Aggregate Base as defined in Section 200-2.2, Standard Specifications for Public Works Construction, 1979 edition. The base course should be compacted to at least 95%.

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A Plot Plan and Appendix are attached and complete this report.





REFERENCE:
 SITE PLAN (REVISED) DATED OCT. 10, 1984
 BY ESCUDERO - FRIBOURG ASSOCIATES.

PLOT PLAN

SCALE 1" = 100'

LeROY CRANDALL AND ASSOCIATES

PLATE I

APPENDIX
EXPLORATIONS

The soil conditions beneath the site were explored by drilling nine borings at the locations shown on Plate 1. The borings were drilled to depths of 3 to 16 feet below the existing grade using 20- and 24-inch-diameter bucket-type drilling equipment. Borings 1, 8 and 9 encountered concrete obstructions at depths of 3 to 5 feet; it was not possible to penetrate the concrete at these locations and the borings were terminated. Borings 4 and 6 encountered concrete at a depth of four to five feet. Boring 4 was drilled past the obstruction, and it was possible to penetrate the concrete in Boring 6 with a coring bucket. Caving of the boring walls occurred during drilling in two of the borings as indicated on the boring logs; casing or drilling mud was not used to extend the borings to the depths drilled. Boring 7 was initially terminated at a depth of five feet because of caving, but was eventually drilled to a depth of 16 feet after moving to a different location and re-drilling.

The soils encountered were logged by our field technician, and undisturbed and loose samples were obtained for laboratory inspection and testing. The logs of the borings are presented on Plates A-1.1 through A-1.9; the depths at which undisturbed samples were obtained are indicated to the left of the boring logs. The energy required to drive the sampler twelve inches is indicated on the logs. The soils are classified in accordance with the Unified Soil Classification System described on Plate A-2.



LABORATORY TESTS

The field moisture content and dry density of the soils encountered were determined by performing tests on the undisturbed samples. The results of the tests are shown to the left of the boring logs.

Direct shear tests were performed on selected undisturbed samples to determine the strength of the soils. The samples were tested at field and increased moisture contents and at surcharge pressures equal to the weight of the existing overburden. The samples were also tested at increased surcharge pressures to provide more complete data. The yield-point values determined from the direct shear tests are presented on Plate A-3, Direct Shear Test Data.

Confined consolidation tests were performed on four undisturbed samples to determine the compressibility of the soils. Water was added to three of the samples during the tests to illustrate the effect of moisture on the compressibility. The results of the consolidation tests are presented on Plates A-4.1 and A-4.2, Consolidation Test Data.

The optimum moisture content and maximum dry density of the upper fill soils were determined by performing a compaction test on a sample from Boring 4. The test was performed in accordance with the ASTM Designation D1557-70 method of compaction. After completion of the compaction test, a California Bearing Ratio test was performed on the sample in accordance with the ASTM Designation D1883-73 method. The results of the tests are presented on Plate A-5, Compaction and C.B.R. Test Data.

-oOo-



BORING 1

DATE DRILLED: September 26, 1984
 EQUIPMENT USED: 20" & 24"-Diameter Bucket

ELEVATION 99.3*

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE	STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.
95	5	14.2	120	13			SM ML
		13.8	116	6			
90	10						
85	15						

6" Asphaltic Paving - 6" Base Course
 FILL - SILTY SAND and SANDY SILT - some gravel, pieces of brick, mottled greys
 Pieces of asphaltic paving and concrete
 CONCRETE OBSTRUCTION AT 5' (GAD AND CHOPPING BUCKET USED IN ATTEMPT TO PENETRATE - NO PROGRESS. MOVED 15' SOUTH AND REDRILLED. ENCOUNTERED CONCRETE OBSTRUCTION AT 5'. ATTEMPTED TO PENETRATE WITH CORING BUCKET - NO PROGRESS - BORING TERMINATED)

NOTE: Water not encountered. No caving.

*Elevations refer to assumed datum; see Plate 1 for location and elevation of bench mark.

LOG OF BORING

BORING 2

DATE DRILLED: September 28, 1984
 EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 97.8

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE	STD. PEN. TEST MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.
95			6.7	103	3	SM ML
	5		14.4	99	2	SM
			18.0	104	2	
90			12.3	109	8	
	10					SP
			5.4	116	11	
85						
	15		6.6	97	16	
80						
20						

6" Asphaltic Paving
 FILL - SILTY SAND and SANDY SILT - pieces of brick and concrete, greyish-brown
 SILTY SAND - fine, greyish-brown

SAND - fine to medium, few gravel, light brownish-grey

Light grey

NOTE: Water not encountered. No caving.

LOG OF BORING

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING 3

DATE DRILLED: September 26, 1984

EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE	STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.
98.4							
95	5	9.6	114	5			SM
		12.6	107	3			ML
		11.5	118	3			
90	10	14.6	98	2			SM
		10.7	93	3			
85	15	3.1	108	13			SP
80							
20							

ELEVATION 98.4

6" Asphaltic Paving

FILL - SILTY SAND and SANDY SILT - pieces of brick and asphaltic paving, grey

Greyish-brown

SILTY SAND - fine, greyish-brown

SAND - fine to medium, light grey

NOTE: Water not encountered. No caving.

LOG OF BORING

BORING 4

DATE DRILLED: September 26, 1984
 EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 98.1

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE	STD. PEN. TEST MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.
95		9.3	111	14		SM ML
	5	6.5	100	2		
90		16.6	104	3		ML SM
	10	11.7	110	3		
85		10.6	115	13		
	15	6.2	121	19		SP
80						
20						

1" Asphaltic Paving-3" Concrete Slab -
 4" Asphaltic Paving-4" Base Course

FILL - SILTY SAND and SANDY SILT - some Clay, pieces of brick and asphaltic paving, mottled greys

CONCRETE OBSTRUCTION FROM 5' to 6½' ON SOUTH SIDE OF BORING. (MOVED 2' NORTH AND REDRILLED)

SANDY SILT - grey

SILTY SAND - fine, light greyish-brown

Lens of Sand

SAND - fine to medium, light grey

NOTE: Water not encountered. No caving.

LOG OF BORING

BORING 5

DATE DRILLED: September 27, 1984
 EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 97.5

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE	STD. PEN. TEST	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.	
95		8.4	111	3			SM	4" Asphaltic Paving - 6" Base Course FILL-SILTY SAND - fine, pieces of brick, greyish-brown
	5	9.0	97	2				
		11.5	103	3			SM	SILTY SAND - fine, brownish-grey
90		5.5	97	6			SP	SAND - fine, light grey and light brown
	10							Fine to medium, light grey
		3.4	111	10				Few gravel
85								
	15	5.4	101	10				

NOTE: Water not encountered. No caving.

LOG OF BORING

BORING 6

DATE DRILLED: September 27 & 28, 1984

EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 97.8

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE	STD. PEN. TEST MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.	DESCRIPTION
97.8	0						6" Asphaltic Paving
95	2.8	24.6	99	11		SM ML	FILL - SILTY SAND and SANDY SILT - some Clay, large amount of gravel, pieces of brick, dark grey and brown
	5						CONCRETE OBSTRUCTION FROM 4' TO 5½' (CORING BUCKET USED TO PENETRATE)
90	7.8	14.7	105	5		SM	SILTY SAND - fine, greyish-brown
	10	2.0	105	8		SP	SAND - fine to coarse, few gravel, light grey
	12	2.5	108	8			Fine to medium
85	12.8						
	15	2.7	103	11			
80	17.8						
20	77.8						

NOTE: Water not encountered. No caving.

LOG OF BORING

BORING 7

DATE DRILLED: September 27, 1984
 EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 96.7

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE	STD. PEN. TEST MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.
95		7.2	109	10		SM
	5	7.1	111	6		ML
90						
	10	13.6	110	6		SM
85		4.3	99	10		SF
	15					
80		4.8	103	8		
	20					

5" Asphaltic Paving
 FILL - SILTY SAND and SANDY SILT - large amount of gravel, pieces of concrete and brick, grey
 (BORING TERMINATED AT 5' DEPTH DUE TO HEAVY CAVING. MOVED 8' SOUTH AND REDRILLED)

SILTY SAND - fine, greyish-brown

SAND - fine to medium, light grey

Few gravel

NOTE: Water not encountered. Heavy caving throughout (to 5' in diameter).

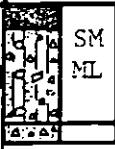
LOG OF BORING

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING 8

DATE DRILLED: September 27 & 28, 1984

EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE	STD. PEN. TEST MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-lbs/ft.)	SAMPLE LOC.
95			5.2	108	22	
	5					
90						
	10					
85						
	15					

ELEVATION 96.2

6" Asphaltic Paving

FILL - SILTY SAND and SANDY SILT - some gravel, about 50% pieces of brick, concrete and asphaltic paving, dark brown to black
 CONCPETE OBSTRUCTION AT 3' (GAD USED TO PENETRATE - NO PROGRESS. MOVED 6' SOUTH AND REDRILLED. ENCOUNTERED CONCPETE OBSTRUCTION AT 3'. ATTEMPTED TO PENETRATE WITH CORING BUCKET - NO PROGRESS - BORING TERMINATED)

NOTE: Water not encountered. Caving throughout (to 3' in diameter).

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

BORING 9

DATE DRILLED: September 28, 1984
 EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 96.8

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

ELEVATION (ft.)	DEPTH (ft.)	"N" VALUE	STD. PEN. TEST MOISTURE (% of dry wt.)	DRY DENSITY (lb _s /cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.
95			10.0	113	8	SM ML
	5					
90						
	10					
85						
	15					

6" Asphaltic Paving
 FILL. - SILTY SAND and SANDY SILT - some gravel, about 50% pieces of brick and concrete, grey

CONCRETE OBSTRUCTION AT 3' (BORING TERMINATED)

NOTE: Water not encountered. No caving.

LOG OF BORING

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.	
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.	
		GRAVELS WITH FINES (Appreciable amt. of fines)	GM	Silty gravels, gravel-sand-silt mixtures.	
			GC	Clayey gravels, gravel-sand-clay mixtures.	
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.	
			SP	Poorly graded sands or gravelly sands, little or no fines.	
		SANDS WITH FINES (Appreciable amt. of fines)	SM	Silty sands, sand-silt mixtures.	
			SC	Clayey sands, sand-clay mixtures.	
			SILTS AND CLAYS (Liquid limit LESS than 50)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
OL	Organic silts and organic silty clays of low plasticity.				
SILTS AND CLAYS (Liquid limit GREATER than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.			
	CH	Inorganic clays of high plasticity, fat clays.			
	OH	Organic clays of medium to high plasticity, organic silts.			
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.	

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

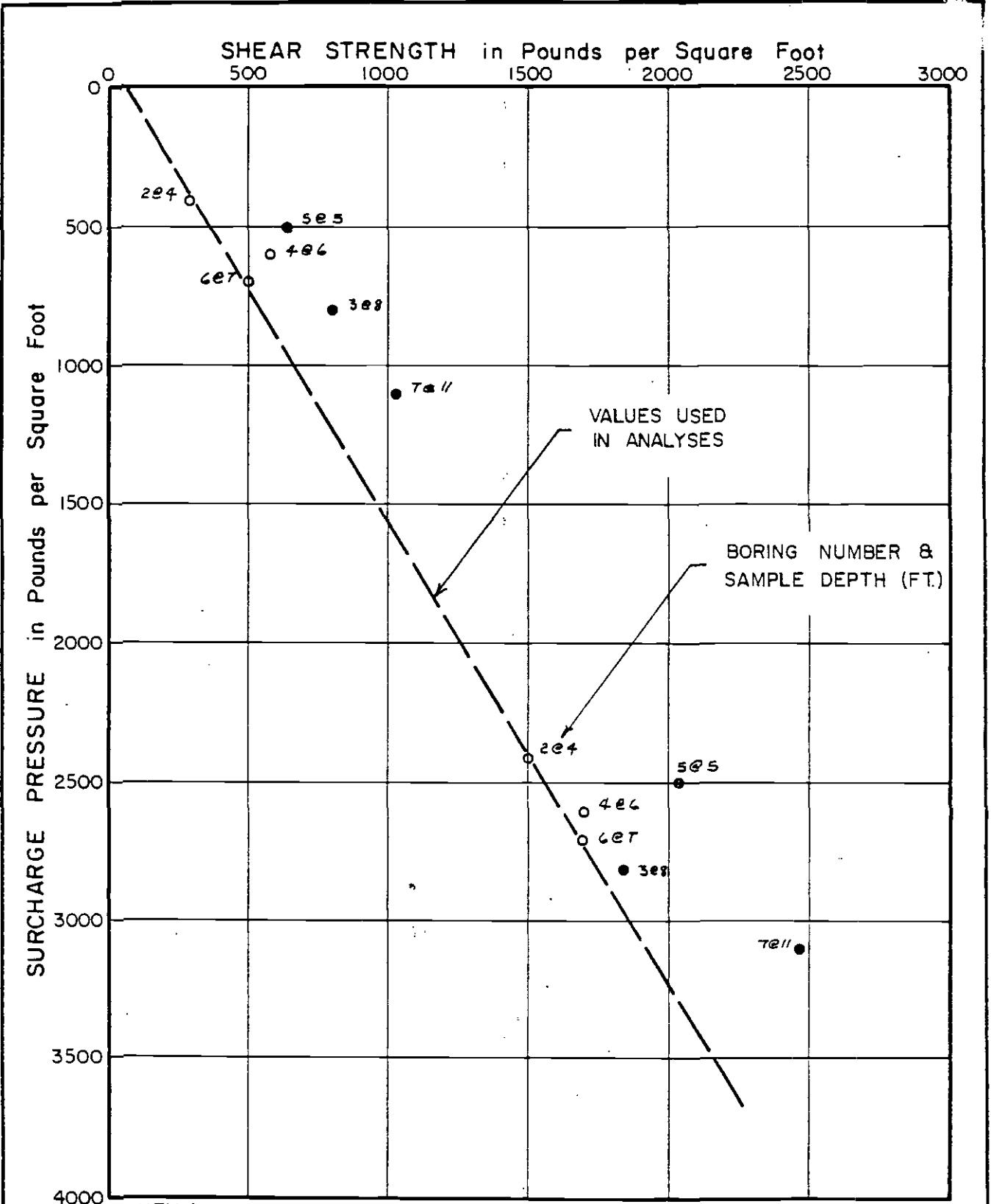
PARTICLE SIZE LIMITS

SILT OR CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		
	NO. 200	NO. 40	NO. 10	NO. 4	3/4 in.	3 in.	(12 in.)
	U. S. STANDARD SIEVE SIZE						

UNIFIED SOIL CLASSIFICATION SYSTEM

Reference:
 The Unified Soil Classification System, Corps of Engineers, U. S. Army Technical Memorandum No. 3-357, Vol. I, March, 1953. (Revised April, 1960)

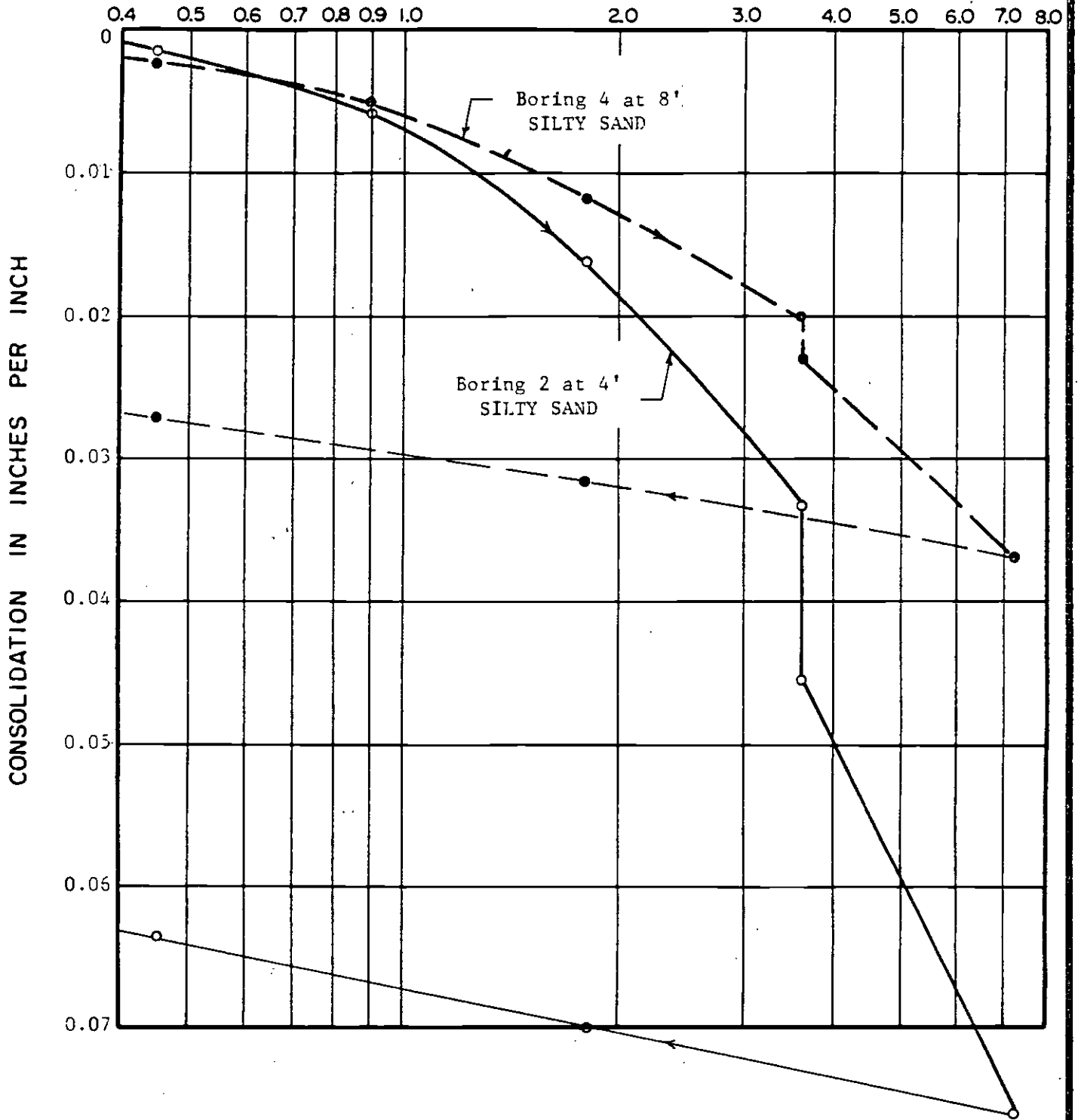
LEROY CRANDALL AND ASSOCIATES



DIRECT SHEAR TEST DATA

LERoy CRANDALL & ASSOCIATES

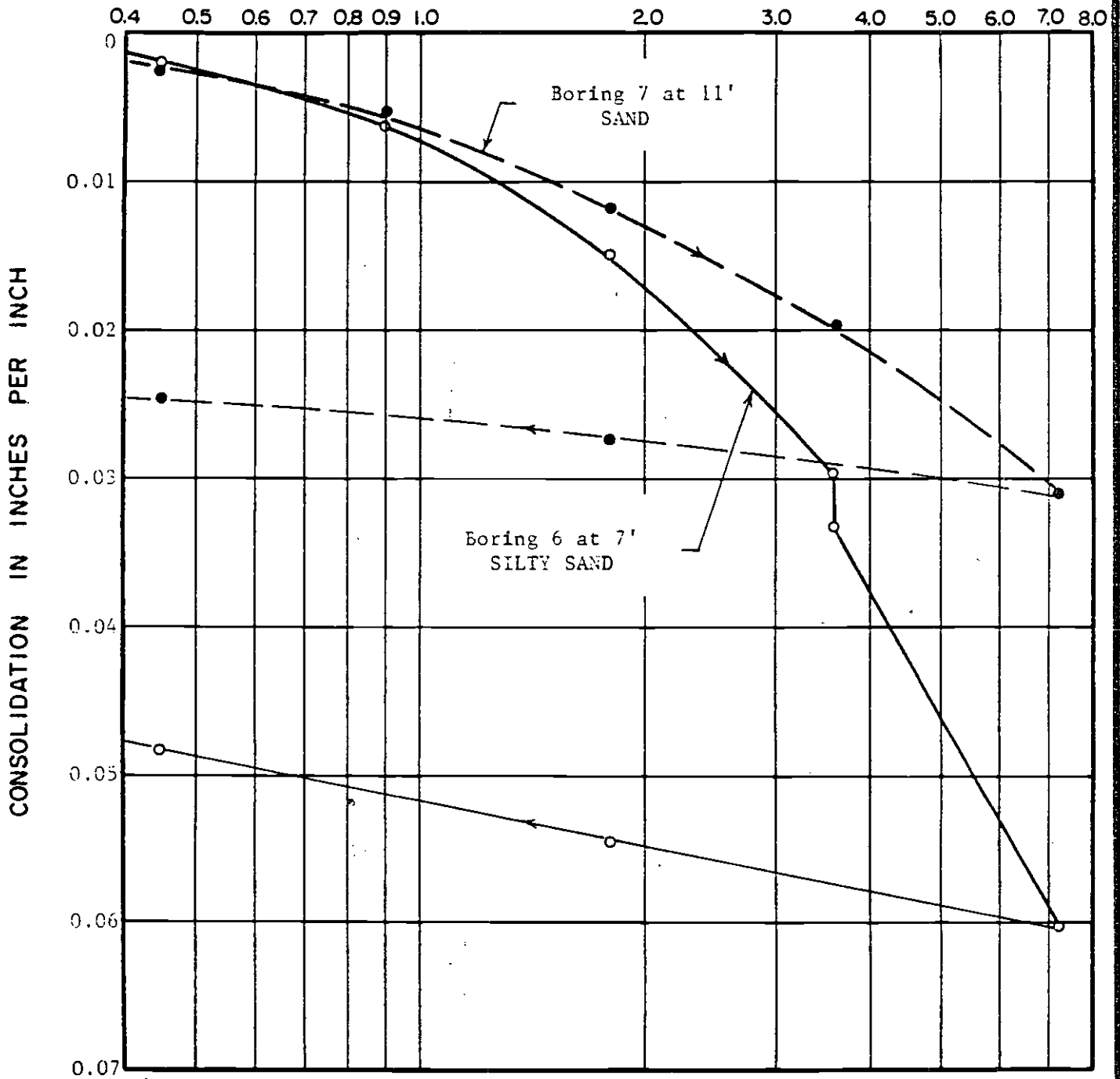
LOAD IN KIPS PER SQUARE FOOT



NOTE: Water added to samples after consolidation under a load of 3.6 kips per square foot.

CONSOLIDATION TEST DATA

LOAD IN KIPS PER SQUARE FOOT



NOTE: Water added to sample from Boring 6 after consolidation under a load of 3.6 kips per square foot. The other sample tested at field moisture content.

CONSOLIDATION TEST DATA

BORING NUMBER
AND SAMPLE DEPTH: 4 at 1' to 2'

SOIL TYPE: FILL - SILTY SAND
and
SANDY SILT

MAXIMUM DRY DENSITY * : 131
(LBS./CU. FT.)

OPTIMUM MOISTURE CONTENT * : 8
(% OF DRY WT.)

EXPANSION (%) : 0.1
(FROM OPTIMUM TO SATURATED
MOISTURE CONTENT)

C.B.R. **
(% OF STANDARD)

AT 90% COMPACTION : 35

AT 95% COMPACTION : 74

* TEST METHOD: ASTM DESIGNATION D1557-70.

** TEST METHOD: ASTM DESIGNATION D1883-73.

COMPACTION AND C. B. R. TEST DATA

DIVISION 2 - SITEWORK

SECTION 02221 - TRENCHING, BACKFILLING AND COMPACTING

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Excavation for underground utilities.
 - B. Excavation for appurtenant structures.
 - C. Bedding.
 - D. Backfilling and Compacting.
- 1.02 Related Work in Other Sections:
- A. Section 01400: Tests and Inspections.
 - B. Section 02200: Earthwork.
 - C. Section 02210: Finish Grading.
 - D. Section 02500: Storm Drain Lines.
 - E. Section 02560: Sanitary Sewer Lines.
 - F. Section 02611: Crushed Aggregate Base.
- 1.03 Reference Specifications: "Standard Specifications for Public Works Construction," 1982 edition.
- 1.04 Soils Inspection and Testing: Inspection and testing of the work of this section will be performed by a testing agency in accordance with Section 01400.
- 1.05 Safety Measures:
- A. Maintain at the job site a copy of all applicable portions of the "OSHA" regulations and any other special regulations as may be required by the Engineer.

- B. Before commencing any excavation 5 feet or more in depth, submit a detailed plan (including drawings if necessary) to the Engineer for approval. Excavation shall not commence prior to receipt, in writing, of approval from the Engineer.
- C. The Contractor shall pay for performing all work necessary to provide safety measures, including required engineering services and permits.

1.06 Contractor Submittals: Submit a workers' protection plan as set forth in Subsection 1.05B herein.

ARTICLE 2 - PRODUCTS

2.01 Bedding Materials: Sand or Crushed Aggregate; Standard Specification Subsection 306-1.2.1.

2.02 Backfill Materials:

- A. Classification: ASTM D2487, Group SW, SP, SM, SC, or CL.
- B. Percent by Weight Passing No. 200 Sieve: 20 percent maximum when tested in accordance with ASTM D1140.
- C. Rock Sizes:
 - 1. 6 inches maximum between 1 foot above top of pipe and 1 foot below pavement subgrade.
 - 2. 3 inches maximum within 1 foot of pavement subgrade.
- D. Plasticity Index: 10 Maximum when tested in accordance with ASTM D423.
- E. Liquid Limit: 30 maximum when tested in accordance with ASTM D423.

ARTICLE 3 - EXECUTION

3.01 Preparation and Layout:

- A. Establish extent of trench excavation by area and elevation; designate and identify datum elevation.
- B. Set required lines and levels.
- C. Maintain bench marks, monuments, and other reference points.

- 3.02 Existing Utilities: Protect all existing utilities not designated for removal.
- 3.03 Trenching: Excavate in accordance with Standard Specification Subsection 306-1.1.
- 3.04 Bedding:
 - A. Place bedding in accordance with Standard Specification Subsection 306-1.2.
 - B. Compact sand or crushed aggregate bedding to not less than 95 percent.
- 3.05 Backfilling and Compaction:
 - A. Backfill and compact in accordance with Standard Specification Subsection 306-1.3.
 - B. Compact backfill starting 1 foot above pipe to 6 inches below pavement subgrade to not less than 90 percent.
 - C. Compact backfill 6 inches below pavement subgrade to not less than 90 percent.

* * * * *

DIVISION 2 - SITE WORK

SECTION 02260 - LANDSCAPE FINISH GRADING

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Weeding: Before and during finish grading, all weeds and grasses shall be dug out by the root and disposed of off the site.
- D. Finish Grading: Finish grading shall consist of finishing surfaces by raking smoothly and evenly.
- E. Moisture Content: The soil shall not be worked when the moisture content is so great that excessive compaction will occur; nor when it is so dry that a dust will form in the air or that clods will not break readily. Water shall be applied, if necessary, to provide ideal moisture content for tilling and for planting herein specified.

1.02 Related Work in Other Sections:

- A. Landscape irrigation as specified in Section 02441.
- B. Landscape planting as specified in Section 02480.
- C. Plant establishment and maintenance - Section 02499.
- D. Tests and inspections - refer to Section 01400.

1.03 Job Conditions:

A. Verification of Existing Conditions:

- 1. Visit the site to determine existing conditions, including access to the site and the nature and extent of existing improvements upon adjacent public and private property, and the nature of materials to be encountered and other factors that may affect the work of this section.

B. Protection:

1. Protect the Owner's property from damage. All damage to existing property (buildings, utilities, etc.) or planting (trees, shrubs, lawn or ground cover) caused by the Contractor during his operation or as a result of malfunction of installed work during the guarantee period shall be repaired at Contractor's expense.
2. Cause minimum interference with workmen, materials, or other equipment of other trades on the project.

ARTICLE 2 - PRODUCTS - None.

ARTICLE 3 - EXECUTION

3.01 Surface Condition:

A. Inspection:

1. Prior to commencing work required by this section, inspect the work of other trades and verify that such work has been properly completed and installed to allow for proper installation of all materials and methods required of this section.
2. All landscape finish grading shall be installed in accordance with the requirements of all governing authorities, the original design, and the referenced standards.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the engineer.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 Performance:

A. Finish Grading:

1. General: When preliminary grading and weeding has been completed and the soil has dried sufficiently to be readily worked, all planting areas shall be graded to elevations indicated on the drawings. Grades not otherwise indicated shall be uniform levels or slopes between points where elevations are

given. Minor adjustments of finish grades shall be made at the direction of the Engineer if required. Finish grade shall be smooth, even, and uniform plane with no abrupt change of surface. Soil areas adjacent to building, shall slope away from the buildings to allow a natural run-off of water, and the surface drainage shall be directed as indicated on the drawings by remodeling surfaces to facilitate the natural run-off water. Low spots and pockets shall be graded to drain properly.

2. Shrubs and Ground Cover: The finish grade of all shrubbery and ground cover areas shall be 3" below top of adjacent planter walls. An exception to the above requirements shall be made wherever drainage conditions may require flush grades as directed by the engineer.
3. Drainage: Contractor is to finish grade with proper slope to drains. All flow lines, designated or not, shall be graded and maintained to allow free flow of surface water, and shall conform to the intent of all plans and sections after thorough settlement and compactment of the soil.

B. Inspections:

1. All inspections herein specified shall be made by the Engineer. Request inspections at least 24 hours in advance of the time inspection is desired. Inspection is required as follows:
 - a. When finish grading is completed.
2. No inspections will commence without as-built drawings. In the event the Contractor calls for an inspection without as-built drawings, without completing previously noted corrections, or without preparing the work for inspection, he shall be responsible for reimbursing the Engineer at the rate of 2-1/2 times the normal office hourly rate per hour portal-to-portal (plus transportation for the inconvenience. No further inspection will be scheduled until this charge has been paid.

* * * * *

DIVISION 2 - SITE WORK

SECTION 02441 - LANDSCAPE IRRIGATION

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of general provisions and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Landscape irrigation.
- 1.02 Related Work in Other Sections:
- A. Landscape planting.
 - B. Landscape finish grading.
 - C. Electrical.
 - D. Plumbing.
 - E. Plant establishment and maintenance.
 - F. Tests and inspections - refer to Section 01400.
- 1.03 Quality Assurance:
- A. Manufacturer's Directions: Follow manufacturer's printed directions and detailed drawings in all cases where the manufacturer's of articles used in the work furnish directions covering points not shown in the drawings or described in the specifications.
 - B. Requirements of Regulatory Agencies:
 - 1. Perform all work in full accordance with the latest rules and regulations of the National Electric Code; the Uniform Plumbing Code; and other applicable State or local laws or regulations. Nothing in these drawings or specifications is to be construed to permit work not conforming to these codes.

2. When the specifications call for materials or construction of a better quality or larger size than required by the above mentioned codes and regulations, the provision of the specifications shall take precedence over the requirements of the said rules and regulations.
3. The Contractor shall furnish without any extra charge any additional material and labor when required by the compliance with these rules and regulations, though the work is not mentioned in these particular specifications or shown on the drawings.
4. The Contractor shall erect and maintain barricades, guards, warning signs, and lights as necessary or required by California OSHA regulations for the protection of the public or workmen.
5. Pay for all permits, fees and licenses required.

C. Explanation of Drawings:

1. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves and other components which may be required. Carefully investigate the structural and finished conditions affecting the work and plan work accordingly. Furnish such fittings and components as may be required to meet such conditions.
2. Drawings are generally diagrammatic and indicative of the work to be installed. Install the work in such a manner as to avoid conflicts between irrigation systems, planting, and architectural features. Equipment shown in paved areas is for design clarification only. Install such equipment within planted areas wherever possible.
3. Do not willfully install the irrigation system as shown on the drawings when it is obvious in the field that unknown obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Engineer. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary.

1.04 Submittals:

A. Material List:

Landscape Irrigation

1. Furnish the articles, equipment, materials, and processes specified in the drawings and described herein. No substitution will be allowed without the prior written approval of the Engineer.
2. Submit a complete material list prior to performing any work. Include the manufacturer, model number and description of all materials and equipment to be used.
3. Do not install equipment or materials without prior approval of the Engineer. Equipment or materials installed or furnished without prior approval of the Architect may be rejected and the Contractor required to remove such materials at his own expense.
4. Approval of any item, alternate or substitute indicates only that the product or products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.
5. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

B. Record and As-Built Drawings:

1. Provide and keep up to date a complete "as built" record set of blue line ozalid prints which shall be corrected to show changes from the original drawings and specifications and the exact "as built" locations, sizes, and kinds of equipment. Prints for this purpose may be obtained from the Engineer. Keep this set of drawings on the site and use only as a record set.
2. Use these drawings as work progress sheets. Make neat and legible annotations thereon as the work proceeds, showing the work as actually installed. Keep these drawings available at all times for inspection and in a location designated by the Engineer.
3. Before the date of the final inspection, transfer all information from the "as built" prints to an ozalid sepia, procured from the Engineer. Make work neat, in ink, and subject to approval of the Engineer.
4. Dimension from two permanent points of reference such as building corners, sidewalks or road intersections, the location of:

- a. Connection to existing water lines.
 - b. Connection to existing electrical power.
 - c. Gate valves.
 - d. Routing of sprinkler pressure lines and control wiring.
 - e. Electric control valves.
 - f. Quick coupling valves.
 - g. Other related equipment as directed by Engineer.
5. On or before the date of final inspection, deliver the corrected and completed sepias to the Engineer. Delivery of the sepias will not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the prints.

C. Controller Charts:

1. Have "as built" drawings approved by Engineer before controller charts are prepared.
2. Provide a controller chart for each controller supplied.
3. Show the area controlled by the automatic controller.
4. The chart is to be a reduced drawing of the actual "as built" system. Make controller sequence legible when reduced.
5. Use a different color to indicate the area of coverage for each station.
6. When completed and approved, hermetically seal the controller chart between two pieces of min. 10 mil plastic.
7. These charts shall be completed and approved prior to final inspection of the irrigation system.

D. Operation and Maintenance Manuals:

1. Prepare and deliver to the Engineer prior to completion of construction, two hard cover binders with three rings containing the following information:
 - a. Index sheet stating Contractor's address and telephone number.

- b. List of equipment with name and addresses of local manufacturers representatives.
 - c. Catalog and parts sheets on every material and equipment installed.
 - d. Guarantee statement.
 - e. Complete operating and maintenance instructions and all major equipment.
2. In addition to the above mentioned maintenance manuals, provide the Resident Engineer with instructions for major equipment.
- E. Equipment to be Furnished:
1. Two sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve supplied.
 2. Two five foot valve keys for operation of gate valves.
 3. Two keys for each automatic controller.
 4. Six quick coupler keys and matching hose swivels for each type of quick coupling valve installed.

1.05 Job Conditions:

A. Verification of Existing Conditions:

1. Visit the site to determine existing conditions, including access to the site and the nature and extent of existing improvements upon adjacent public and private property, and the nature of materials to be encountered and other factors that may affect the work of this section.
2. Additional compensation resulting from the alleged ignorance of local conditions, and their effect upon the cost of the work will not subsequently be approved.

B. Protection:

1. Protect the Owner's property from damage. All damage to existing property (buildings, utilities, etc.) or planting (trees, shrubs, lawn or ground

cover) caused by the Contractor during his operation or as a result of malfunction of installed work during the guarantee period shall be repaired at Contractor's expense.

2. Cause minimum interference with workmen, materials, or other equipment of other trades on the project.
- C. Irrigation work shall not begin until all construction adjacent to the areas has been completed unless otherwise directed.
- D. Contractor shall apply for and secure all required permits.

1.06 Product Delivery, Storage and Handling:

- A. Handling of PVC Pipe and Fittings: The Contractor is cautioned to exercise care in handling, loading, unloading, and storing of PVC pipe and fittings. All PVC pipe shall be transported in a vehicle which allows the length of pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded and, if installed, shall be replaced with new piping.

1.07 Guarantee:

- A. The guarantee for the sprinkler irrigation system shall be made in accordance with the attached form. The General Conditions and Supplementary Conditions of these specifications shall be filed with the Owner or his representative prior to acceptance of the irrigation system.
- B. A copy of the guarantee form shall be included in the operations and maintenance manual.
- C. The guarantee form shall be re-typed onto the Contractor's letterhead and contain the following information:

"We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and

specifications, ordinary wear and tear and unusual abuse, or neglect excepted. We agree to repair or replace any defects in material or workmanship which may develop during the period of one (1) year from date of acceptance, and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefor upon demand.

Project _____

Location _____

Signed _____

Address _____

Phone _____

Date of Acceptance _____"

ARTICLE 2 - PRODUCTS

2.01 General: Use only new materials of brands and types as noted on the drawings and as specified.

2.02 PVC Pressure Main Line Pipe and Fittings:

- A. Pressure main line piping for sizes 2" and larger shall be PVC Schedule 80 with solvent welded joints.
- B. Pipe shall be made from an NSF approved Type I, Grade I, PVC compound conforming to ASTM resin specification D1784. All pipe must meet requirements as set forth in Federal Specification PS-22-70, with an appropriate standard dimension (S.D.R.). (Solvent-weld pipe.)

- C. Pressure main line piping for sizes 1-1/2" and smaller shall be PVC Schedule 40 with solvent welded joints.
 - D. Pipe shall be made from NSF approved Type I, Grade I, PVC compound conforming to ASTM resin specification D1785. All pipe must meet requirements as set forth in Federal Specification PS-21-70. (Solvent-weld pipe.)
 - E. PVC solvent-weld fittings shall be Schedule 40, 1-2, II-I NSF approved, conforming to ASTM test procedure D2466.
 - F. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.
 - G. All PVC pipe must bear the following markings:
 - 1. Manufacturer's name;
 - 2. Nominal pipe size;
 - 3. Schedule or class;
 - 4. Pressure rating in PSI;
 - 5. NSF (National Sanitation Foundation) approval;
 - 6. Date of extrusion.
 - H. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.S. schedule and NSF seal of approval.
- 2.03 PVC Non-Pressure Lateral Line Piping:
- A. Non-pressure buried lateral line piping shall be PVC Schedule 40 with solvent-weld joints.
 - B. Pipe shall be made from NSF approved, Type I, Grade II, PVC compound conforming to ASTM resin specification D1784. All pipe must meet requirements as set forth in Federal Specification PS-22-70 with an appropriate standard dimension ratio.
 - C. Except as noted in Paragraphs A and B. of Section 2.03, all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure main line pipe and fittings as set forth in Section 2.02 of these specifications.

2.04 Galvanized Pipe Fittings:

- A. Where indicated on the drawings, use galvanized steel pipe as a Schedule 40 mild steel screwed pipe.
- B. Fittings shall be medium galvanized screwed beaded malleable iron. Galvanized couplings may be merchant coupling.
- C. All galvanized pipe and fittings installed below grade shall be painted with 2 coats of Koppers #50 bitumastic.

2.05 Brass Pipe and Fittings:

- A. Red brass screwed pipe conforming to Federal Specification WW-P-351.
- B. Red brass fittings conforming to Federal Specification WW-P-460.

2.06 Gate Valves and Valve Boxes:

- A. Use gate valves of the same size as the pipe lines in which they are installed.
- B. Gate Valves 2-1/2" and Larger:
 - 1. Shall be 125 lb. SWP bronze gate valve with screw-in bonnet, non-rising stem and solid wedge disc.
 - 2. Shall have threaded ends and shall be equipped with a bronze handwheel.
 - 3. Shall be similar to those manufactured by Nibco or approved equal.
- C. For Sizes 2" and Smaller: 125 lb. saturated steam rated; brass body - ASTM B 62; screwed joints; non-rising stem; screwed bonnet; solid disc; malleable iron "tee" handle or handwheel.
- D. All gate valves shall be installed per installation detail.

2.07 Backflow Preventer:

- A. Use type as indicated on the drawings.
- B. UYE strainer at backflow preventioned units shall have a 125 lb. flanged cast iron with 100 mesh monal screen and shall be similar to Bailey #100A or approved equal.
- C. Use piping materials between point of connection and backflow preventer of type as required by local code.

2.08 Quick Coupling Valves, Couplers and Hose Swivels:

- A. Valves of brass or bronze construction with built in flow control and self-closing. Locking top.
- B. Quick coupling valves shall be installed from 6" to 12" from nearest paving area.

2.09 Check Valves:

- A. Swing check valves 2" and smaller shall be 200 lb. WOG bronze construction with replaceable composition, neoprene or rubber disc and shall meet or exceed Federal Specification WW-V-51D, Class A, Type IV.
- B. Anti-drain valves shall be of heavy duty virgin PVC construction with F.I.P. thread inlet and outlet. Internal parts shall be stainless steel and neoprene. Anti-drain valve shall be field adjustable against drawout from 5' to 40' of head. Anti-drain valve shall be similar to the Valcon "ADV" or approved equal.

2.10 Automatic Controllers:

- A. Automatic controllers shall be of size and type shown on the plans.
- B. Final location of automatic controllers shall be approved by the Engineer.
- C. Unless otherwise stated on the plans, the 120 volt electrical power to the automatic controller location shall be furnished by others. The final electrical hook-up shall be the responsibility of the Irrigation Contractor.

2.11 Trickle Drip Emitters and Emitter Tubing:

- A. Emitter body shall be manufactured of 20% glass-filled polypropylene and have an inlet barb. Flow shall be regulated through a silicone flapped diaphragm with a flow path of 1/4". The emitter shall pressure compensate for rated flow +10% over a pressure variant of 10 to 50 psi. It shall be similar to those manufactured by Global Water Systems, Inc., 7341 Whittier Boulevard, Whittier, California, (213) 945-2287. Refer to Irrigation Drawings for emitter size and type.
- B. Tubing for emitter systems shall be virgin polyethylene extruded from Union Carbide Bakelite Resin #60-80 or #75-10. The 1/2" tubing shall have an I.D. of .580" and an O.D. of .690". The 1/8" tubing shall have an I.D. of .125" and an O.D. of .195". Tubing shall be similar to that manufactured by Global Water Systems, Inc.

- C. Fittings for emitter tubing shall be molded from specially formulated ultra-high heat resistant polypropylene plastic material. Fitting for emitter tubing shall be similar to Agricultural Products, Inc. "Compression Line Fittings." Use AG Products #CA adapter and #CAA adhesive when connecting emitter tubing to 1/2" PVC slip pocket fittings.

2.12 Electric Control Valves:

- A. All electric control valves shall be of the same manufacture as the automatic controllers.
- B. All electric control valves shall have a manual flow adjustment.
- C. Provide and install one control valve box for each electric control valve.

2.13 Control Wiring:

- A. Use direct burial copper wire AWG-U.F. 600 volt for connections between the automatic controller and the electric control valves. No wire size less than #14. Use black color wire for pilot, white for common.
- B. Install wiring along same route as pressure supply or lateral lines wherever possible. Install in pre-hung conduit when routed through garage.
- C. Where more than 1 wire is placed in a trench, tape wiring together at 10' intervals.
- D. Provide an expansion curl within 3' of each wire connection.
- E. Make splices with Scotch-Lok #3577 Connector Sealing Packs or Pen-Tite wire connectors. Use one splice per connector sealing pack. Do not make field splices.

2.14 Sprinkler Heads:

- A. Use sprinkler heads of the same size, type, and same rate of precipitation with the diameter (or radius) of throw, pressure, and discharge as shown on the drawings.
- B. All sprinkler heads of the same type to be of the same manufacturer.
- C. Riser units shall be fabricated in accordance with the details shown on plans.

- D. Riser nipples for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.

2.15 Control Valve Boxes:

- A. Use 10" round valve box with extension and bolt down cover for all gate valves, Carson Industries 910-12B or approved equal.
- B. Use 9-1/2" x 16" x 11" rectangular box for all electrical control valves, Carson Industries 1419-12B or approved equal.

ARTICLE 3 - EXECUTION

3.01 Inspection:

- A. All scaled dimensions are approximate. Verify all size dimensions and receive Engineer's approval prior to proceeding with work under this section.
- B. Exercise extreme care in excavating and working near existing utilities. Check existing utilities drawings for existing utility locations.
- C. Coordinate installation of sprinkler irrigation materials, including pipe, so there is NO interference with utilities, other construction, or difficulty in planting trees, shrubs, and ground covers.
- D. The Contractor shall carefully check all grades to satisfy himself that he may safely proceed before starting work on the sprinkler irrigation system.

3.02 Preparation:

- A. Water Supply: System designed is based on minimum operating pressure shown at each point of connection. Maximum GPM demand specified. Verify all pressures on site prior to construction.
- B. Electrical Supply: 120 volt electrical power outlet for automatic controller furnished under Electrical Section. Verify location.
- C. Physical Layout: Layout irrigation system as shown on the drawings for approval by Engineer before construction is started. Any changes, deletions or additions shall be determined at this check.

3.03 Installation:

A. Trenching:

1. Excavate trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Follow layout as indicated on the drawings and as noted.
2. Provide for a minimum of 24" cover, when possible, for all pressure supply lines.
3. Provide for a minimum of 24" cover, when possible, for all control wiring.
4. Provide for a minimum of 12" cover for all non-pressure lateral line piping.

B. Backfill:

1. Do not backfill trenches until all required tests are performed.
2. Carefully backfill trenches with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand or other approved materials free from large clods of earth or stones.
3. Mechanically compact backfill in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Make backfill conform to adjacent grades without dips, sunken areas, humps, or other surface irregularities.

C. Assemblies:

1. Routing of sprinkler irrigation lines as indicated on the drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform with the details per plans.
2. Do not install multiple assemblies on plastic lines. Provide each assembly with its own outlet.
3. Install all assemblies specified herein in accordance with respective detail. In absence of detail drawings or specifications pertaining to specific items required to complete work, perform such work in accordance with best standard practice with prior approval of Engineer.

4. Thoroughly clean PVC pipe and fittings before installation. Use installation and solvent welding methods as recommended by the pipe and fitting manufacturer.
 5. On PVC to metal connections, work the metal connections first. Use teflon tape on all threaded joints. Screw hand tight and 1/2 turn by wrench. Where threaded PVC connections are required, use threaded PVC adapters into which the pipe may be welded.
- D. Line Clearance: Minimum 6" from each other and from lines from other trades. Do not install parallel lines directly over one another.
- E. High Voltage Wiring for Automatic Controller:
1. 120 volt power connection to the automatic controller shall be provided by the Irrigation Contractor.
 2. All electrical work shall conform to local codes, ordinances, and union authorities having jurisdiction.
- F. Automatic Controller:
1. Final location of automatic controller shall be determined by the Engineer.
 2. Install automatic controller in conformance with detailed drawings and manufacturer's written instructions.
 3. Connect remote control electrical valves to controller in numerical sequence as shown on the drawings.
- G. Electric Control Valves:
1. Install valves as shown on detail drawings. When grouped together, allow at least 12" between valves.
 2. Install each valve in a separate valve box.
- H. Flushing of System:
1. After all new sprinkler pipe lines and risers are in place and connected, all necessary diversion work completed, and prior to installation of sprinkler heads, open control valves and flush out system with a full head of water.

2. Install sprinkler heads only after flushing of system has been accomplished.

I. Sprinkler Heads:

1. Install the sprinkler heads as designated on the drawings.
2. Do not exceed maximum spacing of heads indicated on the drawings and in no case exceed the maximum recommended by the manufacturer.

3.04 Temporary Repairs: The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

3.05 Field Quality Control:

A. Adjustment of the System:

1. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible.
2. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required.
3. Lowering raised sprinkler heads by the Contractor shall be accomplished within 10 days after notification by the Engineer.
4. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans.

B. Testing of Irrigation System:

1. The Contractor shall request the presence of the Engineer in writing at least 48 hours in advance of testing.
2. Test all pressure lines under hydrostatic pressure of 150 lbs. per square inch, and prove watertight.

NOTE: Testing of pressure main lines shall occur prior to installation of electric control valves.

3. Sustain pressure in lines for not less than 2 hours. If leaks develop, replace joints and repeat test until entire system is proven watertight.
4. All hydrostatic tests shall be made only in the presence of the Engineer. No pipe shall be back-filled until it has been inspected, tested and approved in writing.
5. Furnish necessary force pump and all other test equipment.
6. When the sprinkler irrigation system is completed, perform a coverage test in the presence of the Engineer, to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans, or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate, without bringing this to the attention of the Engineer. This test shall be accomplished before any ground cover is planted.
7. Upon completion of each phase of work, entire system shall be tested and adjusted to meet site requirements.

3.06 Maintenance:

- A. The entire sprinkler irrigation system shall be under full automatic operation for a period of 7 days prior to any planting, and for 60 days after inspection to begin maintenance period.
- B. The Engineer reserves the right to waive or shorten the operation period.

3.07 Clean-Up: Clean-up shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from the site; all walks and paving shall be broomed or washed down; and any damage sustained on the work of others shall be repaired to original conditions.

3.08 Final Inspection Prior to Acceptance:

- A. The Contractor shall operate each system in its entirety for the Engineer at time of final inspection. Any items deemed not acceptable by the Inspector shall be reworked to the complete satisfaction of the Engineer.
- B. The Contractor shall provide the Engineer with all accessories, charts, record drawings, and equipment as required before final inspection can occur.

3.09 Inspection Schedule:

- A. Contractor shall be responsible for notifying the Engineer in advance for the following inspections, according to the time indicated:
 - 1. Pre-job conference: 7 days.
 - 2. Pressure supply line installation and testing: 48 hours.
 - 3. Coverage test: 48 hours.
 - 4. Inspection to begin maintenance period: 7 days.
 - 5. Final inspection: 7 days.
- B. All inspections shall be conducted by no others than the Engineer.
- C. No inspection will commence without as-built drawings. In the event the Contractor calls for an inspection without as-built drawings, without completing previously noted corrections, or without preparing the system for inspection, he shall be responsible for reimbursing the Engineer at the rate of 2-1/2 times the normal office hourly rate per hour portal-to-portal (plus transportation costs) for the inconvenience. No further inspections will be scheduled until this charge has been paid.

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DIVISION 2 - SITEWORK

SECTION 02480 - LANDSCAPE PLANTING

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0, Division 1 and Section 16010 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Landscape planting.
- 1.02 Related Work in Other Sections:
- A. Landscape finish grading.
 - B. Landscape irrigation system.
 - C. Plant establishment and maintenance.
 - D. Tests and inspections - refer to Section 01400.
- 1.03 Quality Assurance:
- A. Furnish plant materials certified by State or Federal Department of Agriculture to be free from hazardous insects or apparent disease.
 - B. Furnish plant materials inspected by Engineer at the growing site and tagged or otherwise approved for delivery.
 - C. Inspection at growing site does not preclude right of rejection at construction site.
- 1.04 Submittals: The Owner will request inspection of delivery slips for materials to verify specified quantities of bulk deliveries of soil amendments and fertilizers.

1.05 Product Delivery, Storage, and Handling:

- A. Deliver fertilizer to site in original unopened containers bearing manufacturer's guaranteed chemical analysis, name, trade mark, and conformance to state law.
- B. Deliver plant material with legible identification labels.
- C. Protect plant material during delivery to prevent damage to root ball or dessication of leaves.
- D. Notify Engineer of delivery schedule in advance so that plant material may be inspected upon arrival at job site.
- E. Remove unacceptable plant material immediately from job site.

1.06 Alternates - Substitutions: Substitute plant material for the indicated plant material will not be permitted unless specifically approved in writing by the Engineer.

1.07 Soil Suitability and Fertility Analyses Report:

- A. A soils analysis of the custom lightweight soil mix and redwood sawdust shall be required prior to installation.
- B. The testing laboratory shall be one approved by the Engineer and tests shall be paid for by the Contractor.

1.08 Job Conditions:

A. Verification of Existing Conditions:

- 1. Visit the site to determine existing conditions, including access to the site and the nature and extent of existing improvements upon adjacent public and private property, and the nature of materials to be encountered and other factors that may affect the work of this section.
- 2. Additional compensation resulting from the alleged ignorance of local conditions, and their effect upon the cost of the work will not subsequently be approved.

B. Protection:

- 1. Protect the Owner's property from damage. All damage to existing property (buildings, utilities,

etc.) or planting (trees, shrubs, lawn or ground cover) caused by the Contractor during his operation or as a result of malfunction of installed work during the guarantee period shall be repaired at Contractor's expense.

2. Cause minimum interference with workmen, materials, or other equipment of other trades on the project.
- C. Landscape work shall not begin until all construction adjacent to the planting areas has been completed and until the irrigation systems have been installed and approved by the Engineer.
- D. Contractor shall apply for and secure all required permits.

ARTICLE 2 - PRODUCTS

2.01 It is the intent of this specification that all materials herein specified and shown on the drawings shall be of the highest quality available and meeting the requirements specified.

2.02 Soil Materials:

A. Redwood sawdust shall be standard quality impregnated with 1% nitrogen.

1. Particle size, dry weight basis:

<u>% Passing</u>	<u>Sieve Size</u>
95-100	6.35 MM (1/4")
80-100	2.38 MM (No. 8, 8 mesh)
0-30	500 Micrdn (No. 35, 32 mesh)

2. Organic content as determined by ash analysis:
Minimum 94% based on dry weight.

3. Chemistry:

- a. Minimum 0.8% nitrogen based on dry weight.
- b. Minimum 0.08% dilute acid soluble iron based on dry weight.
- c. Salinity shall not exceed 3.5 millimhos per centimeter as measured in the saturation extract.

4. Samples of the redwood sawdust shall be submitted to the Engineer for analysis prior to backfilling.
 5. A soils analysis will be performed before and after installation.
- B. Peat moss shall be Sphagnum Peat Moss, Canadian or European variety, free from alkali.
 - C. Commercial fertilizers shall be 21-0-0 complete fertilizers.
 - D. Ferrous iron sulphate shall be first quality commercial grade.
 - E. Calcium carbonate lime shall be first quality commercial grade.
 - F. Dolomite lime shall be first quality commercial grade.
 - G. Potassium nitrate shall be first quality commercial grade.
 - H. Single superphosphate shall be first quality commercial grade.
 - I. Perlite shall be first quality commercial grade.
 - J. Fine sand (Form 416) shall be first quality commercial grade.
 - K. Root hormone shall be Super Thrive or Hormex or approved equal.
 - L. Ammonium nitrate shall be first quality commercial grade.
 - M. Phosphoric acid shall be first quality commercial grade.
- 2.03 Guying Materials (Raised Planters):
- A. Guy wires shall be galvanized twisted clothesline wire, gauge #9, as approved.
 - B. Anchor for holding guys shall be 1" O.D. galvanized eye bolt with lead expansion shield.
 - C. Hose for covering wires shall be 3/4" reinforced black rubber garden hose.
 - D. Turnbuckle shall be 5/16" x 6" long galvanized steel.

2.04 Drainage Materials:

- A. Drainage in fiberglass planters shall be clean, coarse 3/8" to 3/4" diameter gravel, 3" deep layer unless otherwise noted on details.
- B. Synthetic filter membrane cover over drainage course shall be Lumite Saran Shade Cloth No. 5181202, as manufactured by Chicopee Manufacturing Co., and available at Jacobs Bros., 8928 Sepulveda Boulevard, Sepulveda, California.

2.05 Plant Materials:

- A. Plant materials shall be furnished by the Contractor in quantities and/or spacing as indicated or noted for each location and shall be of species, types, sizes, etc., as symbolized and described in the plant list.
- B. Plants shall be protected in transit and after delivery to the project site. Plants in broken containers will not be accepted, and plants with broken branches or injured trunks will be rejected.
- C. Plants that are specified by container size shall be first class material equal to the size of similar material in local retail nurseries.
- D. All plant materials shall be healthy, vigorous, with a good root system, and shall be free from pests or disease. All plant material shall have been inspected and released by the County Agricultural Inspector prior to delivery to the job.
- E. All ground cover plants shall be well rooted in flats or containers.
- F. Plant material shall be inspected and approved by the Engineer prior to its placement for planting. Materials not up to specifications will be rejected.

3.01 Prepared Lightweight Soil Mix:

- A. Prepared lightweight soil mix for roof deck planters shall be the following per cubic foot:
 - 1. 0.1 cu.yd. coarse perlite.
 - 2. 0.3 cu.yd. fine sand (Form 416).

3. 0.6 cu.yd. nitrogen stabilized fine redwood bark (Form 414).
 4. 4 lbs. calcium carbonate lime per cu.yd.
 5. 6 lbs. dolomite lime per cu.yd.
 6. 1.5 lbs. potassium nitrate per cu.yd.
 7. 2.5 lbs. single superphosphate per cu.yd.
 8. 2 bck. iron sulfate or GU-49 per cu.yd.
- B. On receipt of soils analysis report, a bulletin to these specifications will be issued if revision to the soil treatment is necessary.

3.02 General Planting:

- A. Finish grade shall be as specified in Section 02260.
- B. The Engineer shall approve all planting areas prior to the installation of any materials. Placement of plant materials shall be approved before holes are dug. Stake plant locations and secure approval from Landscape Architect before excavating pits, making necessary adjustments as directed.
- C. Specimen trees shall be located prior to installation of irrigation system as directed by Engineer.
- D. All plants shall be planted immediately after containers are cut and containers shall be regularly removed so as not to present a hazard to those persons using the areas.
- E. Set plants in center of pits, in a vertical position so that the crown of the plant will bear the same relationship to the finish grades that it did to soil surface in place of growth, allowing for watering and settling of soil.
- F. Plants shall be watered as they are planted and basins shall be built around each plant to retain water. Remove basins prior to planting ground cover.
- G. Grade areas around plants to finish grades and dispose of excess soil.
- H. Any plant material damaged in planting operation shall be replaced at once.

- I. Prune plants according to standard horticultural practice as directed by Engineer.
- J. Upon completion of all planting operations and again as a requirement just prior to final inspection, all soil between plants shall be lightly cultivated, weeded, and neatly raked.

3.03 Planting Trees:

- A. Trees shall be backfilled to the bottom of the root ball with lightweight soil and thoroughly water settled.
- B. Place the tree and backfill with lightweight soil mix as specified. Thoroughly water settle.
- C. Guy trees as detailed on the drawings.
- D. Keep guy wires out of general pedestrian traffic areas whenever possible.
- E. All trees shall be set 2" minimum above finish grades.
- F. Apply root hormone to each tree as follows:
 - 1. Construct tree basins at rim or outer edges of tree ball so that applied water will remain on the top of the ball.
- G. Apply root hormone at the rate as recommended by the manufacturer.
 - 1. Tree balls shall be set before application of root hormone, and shall be mulched in conformance with specifications immediately after completion of root hormone and its irrigation into the ball.
- H. Street trees plant per City of Los Angeles street tree requirements. Stake with 1 each 2" galvanized pipe. Tie tree to pipe as required by City of Los Angeles Street Tree Division.

3.04 Planting Shrubs and Vines: Planting procedures and practices shall be the same as those indicated under "Planting Trees."

3.05 Ground Cover and Annual Planting:

- A. Grade ground cover areas to finish grades specified under Section 02260. Finish grades shall meet approval of the Engineer.

- B. Plant rooted cutting, pots, or flats in areas and at spacing indicated on plans.
- C. Smooth soil about plants and leave areas in neat and clean condition. Do not pile soil around crown of any plants.

3.06 Fertilizing after Planting:

A. All Planting Areas:

- 1. All planting areas shall receive an application of 21-0-0 ammonium sulphate at the rate of 5 lbs. per 1,000 sq. ft. 30 days after planting.
- 2. Fertilizer application shall be repeated at 30-day intervals until the end of the maintenance period.

B. All Acid Loving Plants (includes Azaleas, Camellias, Gardenias, etc.):

- 1. All plant material that requires acidity shall be fertilized with the following:
 - a. 3 lbs. amonium nitrate/1000 gal.
 - b. 4-1/2 lbs. potassium nitrate/1000 gal.
 - c. 16 fl. oz. phosphoric acid/1000 gal.
- 2. Refer to planting plan for specified plant material to receive above fertilizers.
- 3. Application Rate: Once every 2 weeks.

3.07 Maintenance:

- A. Continuously maintain all areas included under this section during the progress of the work, the maintenance period, and until final acceptance of this work.
- B. If plantings are not acceptable at the completion of this work for entire work, due to defective maintenance, maintenance shall be continued until all work meets specifications and can be approved.
- C. Maintenance shall include continuous operations of watering, weeding, trimming, cultivation, fertilizing, spraying insect and pest control, reseeding, replacement and/or any other operations necessary to assure good normal growth.

- D. All planted areas shall be kept free of debris and shall be cultivated and weeded at no more than 10-day intervals.
 - E. During installation period and during maintenance period, the Contractor shall be responsible for maintaining adequate protection of all areas. Any damaged plantings shall be repaired at Contractor's expense.
 - F. At termination of maintenance period, all plant materials shall be live, healthy, undamaged and free of infestations. Inferior planting shall be replaced and brought to a satisfactory condition before final acceptance of work will be made. All areas shall be neatly raked and free of weeds.
 - G. Replacements: Immediately replace any and all plant materials and grass that die or are damaged. Replacements shall be made to same specifications as required for original plant.
 - H. Two inspections shall be made that affect the maintenance period. The first after all planting has been completely installed in order to approve the beginning of the maintenance period of not less than 90 calendar days; and the second at the end of the 90-day maintenance period. If plantings are not acceptable at the end of the 90-day period, due to defective maintenance, then maintenance shall be continued by the Contractor until all work meets with the specifications and can be approved. Written notice requesting inspections shall be submitted by the Contractor at least 7 calendar days before anticipated date of inspection.
- 3.08 Inspections: All inspections herein specified shall be made by the Engineer. The Contractor shall request inspection at least 24 hours in advance of the time inspection is desired. Inspections are required as follows:
- A. When finish grading is completed as specified in Section 02260.
 - B. When fine grading is completed.
 - C. When plant material has been delivered to the site.
 - D. When plant material has been spotted for planting but before planting pits are excavated.

- E. The Contractor shall be required to have a complete inspection and approval of all landscape construction items at the end of the landscape construction period, to establish the time for beginning of the 90-day maintenance period. Notify Engineer at least 7 days in advance of inspection.
 - F. At the completion of the 90-day maintenance period, an inspection shall be required by the Contractor to obtain final approval. Notify the Engineer at least 7 days in advance of inspection.
 - G. In the event the Contractor calls for an inspection without completing previously noted corrections, or without preparing the work for inspection, he shall be responsible for reimbursing the Engineer at the rate of 2-1/2 times the normal office hourly rate per hour portal-to-portal (plus transportation costs) for the inconvenience. No further inspections will be scheduled until this charge has been paid.
- 3.09 Guarantee and Replacement: Submit a written guarantee in approved form in compliance with the related requirements of Division 0 guaranteeing the work of the section against any defective materials and workmanship in compliance with the following terms, agreeing to replace any defective materials and/or workmanship at no additional cost to the Owner.
- A. Trees shall be guaranteed for a period of 1 year, and shrubs, vines and ground cover shall be guaranteed for a period of 6 months after final approval and acceptance.
 - B. Any plant material which dies or which is not healthy or vigorous when it has received normal care and maintenance shall be replaced within or at the end of the guarantee period.
 - C. Any trees or other plant materials that die-back and lose the form and size as originally specified shall be replaced even though they have taken root and are growing after the die-back.
 - D. The Contractor, when notified by the Engineer, shall remove and replace all guaranteed plant materials which for any reason fail to meet the requirements of the guarantee. Replacement of material and plants shall be made to the same specifications as required for original

planting, and all replacements shall be guaranteed as specified for original materials.

- 3.10 Clean-Up: Upon completion of construction and before final acceptance, remove rubbish, trash and debris resulting from operation. The site shall be left in a neat and acceptable condition such as to meet approval of the Engineer.

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DIVISION 2 - SITEWORK

SECTION 02499 - PLANT ESTABLISHMENT AND MAINTENANCE

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Plant establishment and maintenance.
- 1.02 Related Work in Other Sections:
- A. Landscape irrigation system - Section 02441.
 - B. Landscape planting - Section 02480.
 - C. Tests and inspections - Section 01400.
- 1.03 Quality Assurance:
- A. Qualifications: Contractor's representative shall be experienced in landscape maintenance and preferably should have educational experience in ornamental horticulture.
 - B. Materials: All materials used shall conform to either the bid specifications or shall otherwise be acceptable to the Engineer. The Engineer shall be given a monthly record of all herbicides, insecticides and disease control chemicals used.

ARTICLE 2 - PRODUCTS

- 2.01 All ground cover areas use ammonium phosphate 16-20-0.
- 2.02 In addition to these documents, comply with the recommendations of the Soils Suitability and Fertility Analysis Report.

ARTICLE 3 - EXECUTION

3.01 Plant Establishment:

- A. The plant establishment period shall be for a minimum period of 90 calendar days and shall be completed before the Engineer's acceptance of the Construction.
- B. Plant establishment period will be extended beyond the specified period when plantings have not reached establishment in accordance with the specifications. Any decisions regarding adequacy of plant establishment shall be determined by the Engineer, and the Engineer's decision shall be final.
- C. Ground covers planted from flats and rooted cuttings shall not exhibit die-back at the completion of the establishment period.
- D. Trees and shrubs at completion of the establishment period shall not show evidence of die-back.
- E. Shrubs and trees which are dead or show evidence of die-back shall be replaced with new, vigorous, and healthy plants by the Contractor.

3.02 Maintenance:

A. General:

- 1. The contractual maintenance period shall extend for a minimum of 90 calendar days from the date of acceptance of the Construction Contract by the Owner. Also refer to Section 02480, paragraph 3.07 H.
- 2. During the specified maintenance period the project will be made available for the Owner's use. The Contractor shall conduct his maintenance operations in such a manner as to minimize inconvenience to the Owner.
- 3. It is the intent of this section to provide a level of maintenance that will present a pleasing and desirable appearance at all times. The Engineer shall be the judge as to adequacy of maintenance.

B. Shrub and Ground Cover Maintenance:

- 1. Control rodents, snails, and other pests and diseases as required.

2. Irrigate as required to maintain a reasonable appearance.
3. Fertilize with ammonium phosphate 16-20-0 at 6-7 lbs. per 1,000 square feet monthly.
4. Maintain shrubs and ground cover in a weed-free condition.
5. Prune shrubs under direction of the Engineer.

C. Tree Maintenance:

1. Control pests and diseases including rodents and snails as required.
2. Remove damaged branches back to point of growth. Treat cuts over 2 inches in diameter with an approved tree wound dressing.
3. Check all guys and ties frequently and adjust to avoid chaffing and girdling.
4. Irrigate as required to maintain adequate growth rate and appearance.
5. Prune trees under the direction of the Engineer.

D. Irrigation System Maintenance:

1. Maintain the complete irrigation system in an operable manner.
2. Repair and adjust all sprinkler heads to maintain proper coverage, including adjusting of heads to proper height.
3. Adjust water application to compensate for changes in weather. Contractor will be responsible for damages occurring due to underwatering or over-watering.
4. All replacements shall be made with original type material or alternates approved by the Engineer.
5. Repair or replacement of equipment damaged as a result of Contractor's negligence shall be replaced at the Contractor's expense within one watering period.

6. Damage not resulting from Contractor's negligence shall be reported promptly to the Engineer, together with an estimate of costs for correction of the condition. Contractor will be reimbursed the wholesale cost of vandalized materials and parts upon presentation of properly itemized list of damaged materials or equipment.
7. All systems shall be operationally checked by the Contractor a minimum of once per week.
8. Irrigation shall be accomplished between 10 p.m. and 7 a.m. Irrigation scheduled at other times shall be subject to approval by the Engineer.

E. General Maintenance:

1. Vegetation, either new or previously existing, shall be pruned or trimmed to prevent overhanging sidewalks at less than 7' in height or at roadways at less than 14' in height.
2. All operations shall be conducted so as to provide maximum safety for the public.
3. Leaves, paper, weeds and any other debris shall be removed from landscaped areas and disposed of off site by the Contractor.
4. Contractor will clean sidewalks, roadways, and any other areas affected by his maintenance operations.
5. Notification of all "specialty type" maintenance operations shall be given to the Owner 48 hours prior to each of the operations by the Contractor. "Speciality Type" maintenance operations are defined as: Fertilization, pre-emergent applications of herbicides, turf aerification, turf dethatching, preventive application of turf fungicide, and annual type bedding plant replacements.
6. Contractor shall maintain an office and provide the office with phone service during normal working hours. If a telephone answering service is utilized, the answering service shall be capable of contacting Contractor by radio or pager.
7. Contractor is required to provide Owner with an emergency number for contact outside normal working hours.

8. Whenever herbicides are used, Contractor shall apply them when air currents are still, to prevent herbicide drift onto adjoining property and non-target planting and to prevent any toxic exposure to persons whether or not they are in or on the grounds.
9. Contractor shall provide uniforms that identify the name of the Contractor or subcontractor, and name badges for all field personnel.
10. Contractor shall prune plant materials adjacent to roadway intersections to provide adequate sight distance for vehicles entering the intersection.
11. Contractor shall prune plant materials so that all traffic control signs are clearly visible to approaching drivers.
12. Contractor shall compile and maintain "as-built" drawings of all work including irrigation systems and including accurate locations and serial numbers of all major components. A complete set of "as built" drawn in ink on a reproducible medium shall be delivered to the Engineer before acceptance of the project. "As built" shall be complete and accurate to the satisfaction of the Engineer.
13. During the contract period for construction and maintenance, the Contractor shall pay the cost of all water and electricity. Required permits for water and electricity shall be held in the name of the Contractor during the construction and maintenance period. At completion of the maintenance period, utility billings shall be transferred to the name of the Owner and any proportionate monthly utility billings shall be prorated, based on meter readings.

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DIVISION 2 - SITEWORK

SECTION 02500 - STORM DRAIN LINES

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Reinforced concrete pipe storm drains.
 - D. Polyvinyl chloride (PVC) pipe and fittings.
 - E. Reinforced concrete drainage structures.
- 1.02 Related Work in Other Sections:
- A. Section 02221: Trenching, Backfilling and Compacting.
 - B. Section 02625: Site Work Concrete.
 - C. Section 01400: Tests and Inspections.
- 1.03 Reference Specifications: "Standard Specifications for Public Works Construction", 1982 edition.
- 1.04 Quality Assurance:
- A. The District will provide inspection and testing services by a testing agency which meets the requirements of ASTM Designation E329 and which conforms to the requirements of the "Standard Specification for Public Works Construction", 1982 Edition.
 - B. After inspection of all materials including pipe and fitting at the project site, set aside and remove from the site any material showing defects.
 - C. Provide certified statement of compliance for all materials and products.

1.05 Quality Assurance:

A. Design Criteria:

1. Use only one type and class of pipe in any continuous line of storm drain between structures, unless otherwise indicated on the Drawings.

B. Source Quality Control:

1. Shop Tests: Factory test pipe materials listed in the following. Each pipe manufacturer must have facilities to perform listed tests. The Engineer reserves the right to require the manufacturer to perform such additional number of tests as the Engineer may deem necessary to establish the quality of the material offered for use.

	<u>Material</u>	<u>Test Method</u>	<u>Number of Tests</u>
a.	Reinforced Concrete Pipe	D-load Bearing Strength Test as specified in Standard Specification Section 207-2	As Specified in Standard Specification Section 207-2
b.	Polyvinyl Chloride Pipe	ASTM D 3034	As Specified in ASTM D 3034
c.	Manhole Frame and Covers, Grating	ASTM A 48	As Specified in A 48
d.	Precast Reinforced Manhole Section	ASTM C 478	As Specified in C 478.

C. Reference Standards:

1. American Society for Testing and Materials:
 - a. ASTM A 48, Gray Iron Castings.
 - b. ASTM C 478, Precast Reinforced Concrete Manhole Sections, Spec. for.
 - c. ASTM D 3034, Type PSM poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings, Spec. for.

2. Standard Specifications for Public Works Construction, current edition; herein referred to as "Standard Specifications". The references pertain only to materials, construction equipment, methods and labor. The payment provisions do not apply to work to be performed under this Contract.

ARTICLE 2 - PRODUCTS

- 2.01 Reinforced Concrete Pipe: (RCP) Standard Specification Subsection 207-2.
- 2.02 Polyvinyl Chloride (PVC) Pipe: Pipe and Fittings conforming to ASTM D-3034-SDR 35.
- 2.03 Manhole Frame and Covers, Grating, and Metal Appurtenances: Conforming to City of Los Angeles Standard Plans indicated on drawings and applicable requirements of the Standard Specifications, Section 206.
- 2.04 Cleanout Structures: Furnish and install cleanout ferrules made of cast iron and brass as indicated on drawings.

ARTICLE 3 - EXECUTION

- 3.01 Pipe Laying: Lay RCP and PVC pipe in accordance with Standard Specification Subsection 306-1.2.2.
- 3.02 Field Jointing of Pipes: Make filed joints of reinforced concrete pipe in accordance with Standard Specifications Subsection 306-1.2.4.9b, 8(C).
- 3.03 Drainage Structures:
 - A. Construct reinforced concrete structures in accordance with Section 02625.
 - B. Construct cleanout structures to grades and dimensions indicated on drawings.
- 3.04 Field Quality Control
 - A. General Requirements: Conduct tests specified herein so that each pipe line installed in the Project is tested to the Engineer's satisfaction.
 1. Provide tools, materials, apparatus and instruments necessary for pipe line testing.

2. Conduct tests of every kind in the presence of and to the satisfaction of the Engineer.
 3. Conduct pipe line tests in conformance with Standard Specifications Subsection 306 - 1.4.
- B. Water Exfiltration Test: If required by the Engineer, conforming to Standard Specifications Subsection 306 - 1.4.2.
- C. Water Infiltration Test: If required by the Engineer, conforming to Standard Specifications Subsection 306 - 1.4.3.
- D. Mandrel Test of PVC Pipe: Conforming to Standard Specifications subsection 306 - 1.4.6.
- E. Repair and Retest: When section or sections of sewer fails to meet test requirements specified previously:
1. Determine source or sources of leakage.
 2. Repair or replace defective material, and if a result of improper workmanship, correct such.
 3. Take up and relay pipe sewer line section that has more than the maximum allowable deflection.
 4. Conduct additional tests required to demonstrate that sewer line meets specified test requirements.

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DIVISION 2 - SITEWORK

SECTION 02552 - DOMESTIC WATER DISTRIBUTION SYSTEM

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Furnish and install pipes, fittings, valves, and specialties as indicated on the Drawings and as required to complete the Work. This section concerns work to within 5'-0" outside of the buildings.

1.02 Related Work Specified in Other Sections:

- A. Trenching, Backfilling and Compacting: Section 02221.
- B. Site Work Concrete: Section 02625.
- C. Tests and Inspections: Section 01400.

1.03 Submittals

- A. General: Comply with provisions of Division 1.
- B. The submittal data to be furnished shall include, but not be limited to, the following:
 - 1. Pipe and fittings
 - 2. Valves
 - 3. Specialties
 - 4. Backflow preventor

1.04 Product Handling

- A. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary and at no additional cost to the Owner.

ARTICLE 2 - PRODUCTS

2.01 Pipe and Fittings - Symbol CW.

A. Polyvinylchloride (PVC) Pressure Pipe:

1. All polyvinyl pipe shall be manufactured in accordance with AWWA Standard C900, "Polyvinyl Chloride (PVC) Class 150 Pressure Pipe". Permastran fiberglass composite pipe or equal installed as specified by manufacturer and submitted for prior approval will be accepted as a substitute for PVC pressure pipe.
2. Joint type:
 - a. Pipe joints shall be made using an integral bell with an elastomeric gasket push-on joint or using machined couplings of a sleeve type with rubber ring gaskets and machined pipe ends to form a push-on type joint.
 - b. Solvent cement joints are strictly prohibited.
 - c. One coupling complete with one gasket each shall be factory assembled to each length of standard length pipe furnished.
 - d. The companion gasket for each coupling shall be packaged separately for shipment. Couplings shall be the same class as the pipe. Manufacturer shall furnish gasket lubricant for each quantity of pipe furnished. When additional couplings are furnished as separate items, two gaskets shall be furnished and installed in the gasket recess of each coupling.
 - e. Class and type: All sizes of pipe shall be Class 200 (DR 14).
 - f. Pipe length: Each length of pipe shall be a standard laying length of 20'-0". Random lengths shall be acceptable where required for proper installation of the fittings.

2.02 Gate Valves

- A. Buried gate valves shall conform to AWWA C500 for 200 PSI cold water working pressure. Valves shall be cast iron body double disc bronze trim, non-rising stem, "O" ring seals. All valves shall open counter-clockwise. Buried gate valves shall be as manufactured by Mueller Co. Catalog #A-2380. Valves manufactured by Crane or Kennedy will be acceptable if they comply with the Specifications. All bolts related to valves installed underground (as stuffing box or mechanical joint bolts) shall be coated with protective paint or tar after installation and before backfilling.
- B. Valves installed above ground shall conform to AWWA C500 for 200 PSI cold water working pressure. Valves shall be cast iron body, double disc bronze trim, OS&Y, and with flanged ends for sizes 3" and larger and screwed ends for sizes 2-1/2" and smaller. Valves shall be as manufactured by Mueller Co. Catalog #A-2483. Valves manufactured by Crane or Kennedy will be acceptable if they comply with the specifications.
- C. Valve boxes: Valve boxes shall be provided for all buried valves and shall consist of an adjustable concrete body and a cast iron traffic cover marked "WATER". Valve boxes shall be installed flush with final grade or paving elevation. Show field location of valves as indicated on the Drawings. Provide extension stem to bring operating nut within two feet of valve box top. Provide a total of four valve keys, four feet long, and locate as directed by the Engineer.

2.03 Backflow Preventer

- A. Furnish and install where indicated on the Drawings a reduced pressure backflow preventer, epoxy coated, UL listed, maximum working pressure 150 PSI, as manufactured by "CLA-VAL CO.", Newport Beach, California, complete with two OS&Y gate valves.
- B. Provide support(s) as required for installation of backflow preventer as indicated on the Drawings.
- C. Piping used for installation of backflow preventer as indicated on Drawings, shall be galvanized steel Schedule 40 with cast iron flanged fittings.
- D. All exposed piping, including equipment, valves, fittings, etc. shall be cleaned and painted with rust-oleum, two coats of quick-drying red primer and two coats of paint, color as indicated by the Engineer.

2.04 Thrust Blocks

- A. Thrust blocks shall be installed wherever the pipe line changes direction (tees, bends), changes size (tees, crosses), stops (dead ends), and at shut-off valves. Also thrust blocks shall be installed at every 200 (two hundred) feet of straight line.
- B. Dimension and installation details of thrust blocks shall be as indicated on the Drawings. Concrete used for thrust blocks shall have a minimum 4000 PSI compressive strength at 28 days.

ARTICLE 3 - EXECUTION

- 3.01 A. Install piping at elevation indicated with bedding as recommended by the manufacturer.
- B. All work shall be done to the elevations, and grades shown on the Contract Drawings.
- C. Include all drayage, hauling, hoisting, and placement of piping, appurtenances, and equipment specified herein.
- D. Maintain adequate protection of work from damage and protect the District's property from injury or loss arising in connection with this Contract. Protect adjacent property as provided by law and the Contract Documents.
- E. Construct and maintain all necessary temporary drainage and do all pumping necessary to keep excavation, pits and trenches free of water.
- F. Provide protection against rain, wind, storms, or heat so as to maintain all work, materials, apparatus and fixtures free from injury or damage. At the end of each day's work all new work likely to be damaged shall be protected.
- G. Take all necessary precautions for the safety of employees and comply with all applicable provisions of Federal, State and Municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the work is being performed.

3.02 Test

- A. The District will provide the required tests. The Contractor shall provide all facilities, personnel, etc., necessary for testing as specified.
- B. Perform hydrostatic and leakage tests conforming to AWWA C603 to insure that the line will withstand normal working pressure (plus reasonable excess that may occur) and that the system is water-tight. Testing shall be done in segments between two valves, or test plugs. Furnish and install at no additional cost to the District test plugs, anchors and other devices that may be necessary for the test. The Contractor shall be responsible for any damage to public or private property caused by failure of any portion of the system.
- C. Hydrostatic pressure test: Each segment of line to be tested shall be complete with fittings, valves, thrust blocks, anchors, and required test plugs prior to testing. The line shall be filled with water 24 hours before testing. Testing shall be performed after partial backfilling, maintaining all joints and fittings open for inspection. Remove air from line. Hydrostatic test shall be performed at not less than 200 PSIG for 30 minutes.
- D. Leakage Test: After hydrostatic pressure test is performed and accepted, perform the leakage test to verify the water-tightness of pipe. Test shall be performed at 150 PSIG for two hours. The test shall be judged acceptable when leakage does not exceed that determined by the following formula:

$$L = \frac{2 PN}{100}$$

L= maximum permissible leakage in gallons

P= leakage allowance in gallons per 100 couplings per hour

4" pipe P = 1.42
6" pipe P = 2.12

N= Actual number of couplings

After location of leaks and repairs of defects, the District will repeat test as many times as necessary, at all cost to the Contractor, until satisfactory performance of test has been completed and accepted. Water for the test and for disinfection shall be paid for by the Contractor.

3.03 Disinfection

- A. Disinfection shall conform with the latest revision of AWWA C601 Standard for disinfecting water mains. Disinfection shall include flushing pipe with clean potable water until no dirty water appears at the points of outlet, chlorination with a minimum initial dosage of 50 ppm chlorine, and final flushing. Water used in conjunction with chlorination and flushing shall be disposed of without damage to public or private property. Repeat disinfection process until satisfactory results are obtained.
- B. Provide sampling and bacteriologic test for water collected on two days, 24 hours apart and taken to a laboratory approved by the State. Submit to the Engineer (6) six copies of certified reports for each segment of pipe tested and disinfected.
- C. Under no circumstances shall the Contractor permit the use of any portion of water main for potable water usage until properly disinfected, flushed and certified by laboratory test.

3.04 Connection to Water Main

- A. Water meter and water service from CITY main to the meter will be furnished by Department of Water and Power and will be paid by the District separately from this Contract.
- B. Contractor shall coordinate installation of water service, water meter and his work, and shall make final connection to water meter.
- C. Connection of new water distribution piping to water meter shall be performed after distribution piping is tested and disinfected as specified.

3.05 Excavation and Backfill

- A. Comply with the requirements for trenching, backfilling and compaction as specified in Section 02221.

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DIVISION 2 - SITEWORK

SECTION 02553 - FIRE PROTECTION WATER DISTRIBUTION SYSTEM

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as built and all other applicable requirements of Document 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Furnish and install pipes, fittings, valves, hydrants and specialties in sizes, strength classes, and types as specified as indicated on the Drawings and as required to complete the Work. This Section concerns work to within 5'-0" outside of the buildings.
- 1.02 Related Work Specified in Other Sections:
- A. Trenching, Backfilling and Compacting: Section 02221.
 - B. Site Work Concrete: Section 02625.
 - C. Tests and Inspections: Section 01400.
- 1.03 Submittals
- A. General: Comply with provisions of Division 1.
 - B. The submittal data to be furnished shall include, but not be limited to, the following:
 - 1. Pipe and fittings
 - 2. Valves
 - 3. Hydrants
 - 4. Indicator post
- 1.04 Product Handling
- A. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades.
 - B. Replacements: In the event of damage, immediately make all repairs and replacements necessary and at no additional cost to the District.

ARTICLE 2 - PRODUCTS

2.01 Pipe and Fittings - Symbol F.

A. Polyvinylchloride (PVC) Pressure Pipe

1. All polyvinyl pipe shall be manufactured in accordance with AWWA Standard C900, "Polyvinyl Chloride (PVC) Class 150 Pressure Pipe". Permastran fiberglass composite pipe or equal installed as specified by manufacturer and submitted for prior approval will be accepted as a substitute for PVC pressure pipe.
2. Joint type:
 - a. Pipe joints shall be made using an integral bell with an elastomeric gasket push-on joint or using machined couplings of a sleeve type with rubber ring gaskets and machined pipe ends to form a push-on type joint.
 - b. Solvent cement joints are strictly prohibited.
 - c. One coupling complete with one gasket each shall be factory assembled to each length of standard length pipe furnished.
 - d. The companion gasket for each coupling shall be packaged separately for shipment. Couplings shall be the same class as the pipe. Manufacturer shall furnish gasket lubricant for each quantity of pipe furnished. When additional couplings are furnished as separate items, two gaskets shall be furnished and installed in the gasket recess of each coupling.
 - e. Class and type: All sizes of pipe shall be Class 200 (DR 14).
 - f. Pipe length: Each length of pipe shall be a standard laying length of 20'-0". Random lengths shall be acceptable where required for proper installation of the fittings.

2.02 Gate Valves

- A. Gate valves shall be Underwriters' Laboratories listed for Class 200.

- B. Valves shall be cast iron body double disc, bronze mounted, non-rising stem, "O" ring seals, and shall be designed for connecting to asbestos cement ring-tite pipe.
 - C. Install thrust blocks as indicated on the Drawings.
 - D. All valves shall open counterclockwise and shall have slot type indicators.
 - E. Gate valves shall be manufactured by "Mueller" # A-2072-24, or "Kennedy" #73X.
 - F. All bolts related to the valve installed underground shall be coated with protective paint or tar after installation and before backfilling.
 - G. Valve boxes: Valve boxes shall be provided for all buried valves and shall consist of an adjustable pipe shaft and a cover marked "FIRE". Valve boxes shall be installed flush with final grade or paving elevation. Show field location of valves as indicated on the Drawings. Provide extension stem to bring operating nut within two feet of four (4) valve keys, four feet long, and deliver to the District.
- 2.03 Fire Hydrant: Fire Hydrant shall be as manufactured by Long Beach Iron Works, No. 702 "Lido" or James Jones No. J3700 fluted barrel, with one 2-1/2" outlet and one 4" pumper outlet installed where indicated on the Drawings. All fire hydrants shall have 6" connection to the main. Provide thrust block as indicated on the Drawings. Hydrants shall be complete and ready for service and approved for use by the City of Los Angeles Fire department.
- 2.04 Post Indicator with Valves: Furnish and install where indicated on the Drawings a gate valve UL listed for Class 200 asbestos cement pipe. Valves shall be cast iron body, double disc, bronze mounted, non-rising stem, "O" ring seals. Provide an indicator post installed above finished grade as indicated on the Drawings. Complete assembly of valve and indicator post shall be anchored as indicated on the Drawings and shall be manufactured by Mueller, Kennedy or Traverse City Iron Works. All bolts related to the valve installed underground shall be coated with protective paint or tar after installation and before backfilling.
- 2.05 Thrust Blocks:
- A. Thrust blocks shall be installed wherever the pipe line changes direction (tees, bends), changes size (tees,

crosses), stops (dead ends), and at shut-off valves. Also thrust blocks shall be installed at every 200 (two hundred) feet of straight line.

- B. Dimension and installation details of thrust blocks shall be as indicated on the Drawings. Concrete used for thrust blocks shall have a minimum 4000 psi compressive strength at 28 days.

ARTICLE 3 - EXECUTION

3.01 Piping:

- A. Install piping at elevation indicated with bedding as recommended by the manufacturer.
- B. All work shall be done to the lines, elevations, and grades shown on the Contract Drawings.
- C. Include all drayage, hauling, hoisting, and placement of piping, appurtenances, and equipment specified herein.
- D. Maintain adequate protection of work from damage and protect the District's property from injury or loss arising in connection with this Contract. Protect adjacent property as provided by law and the Contract Documents.
- E. Construct and maintain all necessary temporary drainage and do all pumping necessary to keep excavation, pits and trenches free of water.
- F. Provide protection against rain, wind, storms, or heat so as to maintain all work, materials, apparatus and fixtures free from injury or damage. At the end of each day's work all new work likely to be damaged shall be protected.
- G. Take all necessary precautions for the safety of employees and comply with all applicable provisions of Federal, State and Municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the work is being performed.

3.02 Test

- A. The District will provide the required tests. The Contractor shall provide all facilities, personnel, etc., necessary for testing as specified.

- B. Perform hydrostatic and leakage tests conforming to AWWA C603 to insure that the line will withstand normal working pressure (plus reasonable excess that may occur) and that the system is water-tight. Testing shall be done in segments between two valves, or test plugs. Furnish and install at no additional cost to the District test plugs, anchors and other devices that may be necessary for the test. The Contractor shall be responsible for any damage to public or private property caused by failure of any portion of the system.
- C. Hydrostatic pressure test: Each segment of line to be tested shall be complete with fittings, valves, thrust blocks, anchors, and required test plugs prior to testing. The line shall be filled with water 24 hours before testing. Testing shall be performed after partial backfilling, maintaining all joints and fittings open for inspection. Remove air from line. Hydrostatic test shall be performed at not less than 200 PSIG for 30 minutes.
- D. Leakage test After hydrostatic pressure test is performed and accepted, perform the leakage test to verify the water-tightness of pipe. Test shall be performed at 150 PSIG for two hours. The test shall be judged acceptable when leakage does not exceed that determined by the following formula:

$$L = \frac{2PN}{100}$$

L= Maximum permissible leakage in gallons

P= Leakage allowance in gallons per 100 couplings per hour

4" pipe:

P = 1.42

6" pipe:

P = 2.12

8" pipe:

P = 2.84

10" pipe:

P = 3.54

N= Actual number of couplings

After location of leaks and repairs of defects, the District will repeat test as many times as necessary, at all cost to the Contractor, until satisfactory performance

of test has been completed and accepted. Water for the test and for disinfection shall be paid for by the Contractor.

3.03 Cleaning

- A. After test, perform flushing of pipe with clean potable water until no dirty water appears at the points of outlet. Water used in conjunction with cleaning shall be disposed of without damage to public or private property.

3.04 Connection to Water Main

- A. Detector check water meter and water service from CITY main to the meter will be provided by the Department of Water and Power and will be paid by the District, separately from this Contract.
- B. Contractor shall coordinate installation of water service for fire protection with his work and shall make final connection to water meter.
- C. Connection of new fire protection water distribution piping to the meter shall be performed after distribution piping was tested, and flushed as specified.

3.05 Excavation and Backfill

- A. Comply with the requirements for trenching, backfilling and compaction as specified in Section 02221.

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DIVISION 2 - SITEWORK

SECTION 02554 - GAS DISTRIBUTION SYSTEM

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Furnish and install pipes, fittings and specials in sizes, classes and types as specified, as indicated on the Drawings and as required to complete the work. Distribution pipe shall be designed and sized for natural gas system with a pressure of 3 PSIG, carrying gas of 0.65 specific gravity. This Section covers work to within 5'-0" outside of the building.

1.02 Related Work Specified in Other Sections:

- A. Trenching, Backfilling and Compacting: Section 02221.
- B. Site Work Concrete: Section 02525.
- C. Tests and Inspections: Section 01400.

1.03 Submittals

- A. General: Comply with provisions of Division 1.
- B. The submittal data to be furnished shall include, but not be limited to, the following:
 - 1. Pipe and fittings
 - 2. Valves
 - 3. Specialties

1.04 Product Handling

- A. Protection: Use all means necessary to protect the materials of this section before, during and after installation and to protect the work and materials of all other trades.

- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary and at no additional cost to the District.

ARTICLE 2 - PRODUCTS

2.01 Gas Piping - Symbol MPG

- A. Pipe, valves, and fittings shall conform to requirements of 150 psig working pressure.
- B. Piping shall be black steel as manufactured by "National Tube", "Lone Star", "Republic", "LTV", or approved equal. The materials shall be seamless or electric resistance welded ASTM A-120 carbon steel. Electric resistance welded pipe shall be fully normalized after welding. Pipe thickness shall be Schedule 40 in accordance with ANSI B36.10, current edition.
- C. Piping systems shall be of butt welded construction in strict accordance with ANSI B31.1.0, except in locations where flanges shall be required for servicing and/or removal of equipment for repair, etc. Flanged joints shall be accessible for repair.
- D. Pipe fittings for 150 psig working pressure systems, shall be "Tube-Turn", "Ladish", or approved equal, welded fittings, ANSI B16.9 with wall thickness identical to pipe in which installed. Welded fittings shall be factory made and shall be used full line size, except as otherwise specified herein, with reducers after the fittings, if required. No branch shall be made by burning a hole in the main and welding in the branch line or by using a "saddle" type fitting.
- E. Flanges, where specified and/or required, shall be Crane or approved equal, Class 150 ANSI B16.5, raised face, forged steel, welding neck type. Flanges shall have matching flat faces or raised faces. When 150 lb. steel flanges are connected to 125 lb. cast iron flanged valves or fittings, the steel flange shall be flat face medium finish.
- F. Gasket material shall be as specified herein and shall be suitable for the service and pressure class intended.

1. Gaskets for cast iron flanges shall be 1/16 inch thick full face rubber gaskets for Class 125 flanges and flat ring rubber gaskets for Class 250 flanges with punched bolt holes, Crane "C", Garlock or J. M. Manufacturing.
 2. Gaskets for steel flanges shall be 1/16 inch thick flat ring rubber gaskets for all pipe sizes 10 inches and smaller and 1/8 inch thick flat ring rubber gaskets for all pipe sizes 12 inches and larger. Gaskets shall be Crane "CC", Garlock, or J. M. Manufacturing, with punched bolt holes and pipe opening.
- G. Bolting materials for flanges shall be carbon steel ASTM A-307 Grade B hexagon head bolts and nuts. Flange bolt thread lubricant shall be Crane Anti Seize Thread Compound or approved equal.

2.02 Wrapping of Pipe:

- A. Prior to delivery to the job site wrap buried pipe with corrosion protection wrap of pressure sensitive polyvinyl chloride or polyethylene tape applied after pipe has been thoroughly cleaned. Tape shall be nominal thickness of 20 mils consisting of one layer of 20 mil tape or two separate layers of 10 mil tape. Apply with suitable primer adhesive recommended by manufacturer.
- B. Tightly apply tapes with 1/2 inch minimum uniform lap, free from wrinkles and voids. Use approved wrapping machines and experienced operators.
- C. Tapes: "Chasekote" No. 775, Plicoflex No. 340-25, Polyker 922 and 923, "Scotchwrap" No. 51 or equal. Apply tape after pipe is cleaned as recommended by tape manufacturer.
- D. Cover filed joints and fittings by wrapping polyethylene or polyvinyl tape specified for wrapping pipe, except use two layers of 10 mil thick tape. Wrap joints to provide two full thicknesses of tape over joint and extend minimum of six-inches over adjacent pipe covering. Where fittings are wrapped, width of tape shall not exceed two inches. Apply adequate tension so tape will conform tightly to contours of fittings. Use putty, tape insulation compounds such as "Scotchfil", or fill voids and provide smooth even surface for application of tape wrap.

- E. Alternate: In lieu of tape wrap, factory applied plastic coating on steel pipe will be specified. Use tapes for field joints, fittings, and valves.
- F. Test wrapped or coated pipe, fittings, and field joints on job site, after assembly, with approved high voltage holiday detector "Tinker and Rasor", or equal, with positive signaling device to indicate any flaws, holes, or breaks in wrapping. Set peak voltage to 10,000 volts. If Scotchkote 202 is used set peak voltage to 1,000 volts. Place piping on temporary blocks to allow testing to run along underside of pipe. Repair defects before covering. Conduct testing in presence of Engineer.

2.03 Valves

- A. Gate Valves shall be non-rising stem, ferrosteeel body, bronze trim wedge disc, flanged rated for 200 PSI working pressure. Valves shall be as manufactured by "Crane or Mueller".
- B. Valve Boxes shall be provided for all buried valves and shall consist of an adjustable pipe shaft and a cover marked "Gas". Valve boxes shall be installed at final grade or paving elevation. Show field location of valve boxes. Provide extension stem to bring operating nut within two feet of valve box top. Provide a total of two valve keys, four feet long@ to be located as indicated by the Engineer.

ARTICLE 3 - EXECUTION

3.01 Piping

- A. Install piping at elevation indicated with bedding as recommended by the manufacturer.
- B. All work shall be done to the lines, elevations, and grades shown on the Contract Drawings.
- C. Include all drayage, hauling, hoisting, and placement of piping, appurtenances, and equipment specified herein.
- D. Maintain adequate protection of work from damage and protect the District s property from injury or loss arising in connection with this Contract. Protect adjacent property as provided by law and the Contract Documents.

- E. Construct and maintain all necessary temporary drainage and do all pumping necessary to keep excavation pits and trenches free of water.
- F. Provide protection against rain, wind, storms, or heat so as to maintain all work, materials, apparatus and fixtures free from injury or damage. At the end of each day's work all new work likely to be damaged shall be protected.
- G. Take all necessary precautions for the safety of employees and comply with all applicable provisions of Federal, State and Municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the work is being performed.
- H. All joints shall be welded using either electric arc fusion or oxyacetylene welds and welding rod of analysis to match the pipe. All welding shall be done in accordance with ANSI codes for pressure pipe.
- I. Only certified welders holding a less than two-year old Form Q-1G from a recognized testing laboratory certifying compliance with Section IX, "Welding Qualifications" of the ASME Boiler and Pressure Vessel Code, may be employed.

3.02 Test

- A. Provide all facilities, personnel, test equipment, gauges, etc., necessary for testing as specified.
- B. Test shall be performed before backfilling.
- C. Inspection and test of gas piping shall comply with requirements of City of Los Angeles and shall include an air pressure test at not less than 60 PSI and shall hold this pressure for not less than one (1) hour with no perceptible drop in pressure.
- D. Pressure test shall be performed in presence of an authorized representative. Repeat pressure test until satisfactory results are obtained.
- E. Submit to the Engineer six (6) copies of certified reports for each segment of pipe inspected and tested.

3.03 Connection to Existing Utilities:

- A. Provide all necessary work and materials for connection to gas meter. Extension of high pressure gas main, installation of main pressure regulator and gas meter will be performed by Southern California Gas Company and will be paid for by the District. Verify in the field the exact location of gas meter. Connection of new pipe to the meter shall be done after new pipe is tested and accepted as specified.
- B. Provide concrete pad for installation of gas meter and main pressure regulator as required by the Southern California Gas Co.

3.04 Excavation and Backfill:

- A. Comply with the requirements for trenching, backfilling and compaction as specified in Section 02221.

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DIVISION 2 - SITEWORK

SECTION 02555 - COMPRESSED AIR DISTRIBUTION SYSTEM

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts, and all other applicable requirements of Document 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Furnish and install pipes, fittings and specials in sizes, classes and types as specified, as indicated on the Drawings and as required to complete the work. Distribution pipe shall be designed and sized for compressed air system with a working pressure of 150 psig. This section concerns work to within 5'-0" outside of the buildings.
- 1.02 Related Work Specified in Other Sections:
- A. Trenching, Backfilling and Compacting: Section 02221.
 - B. Site Work Concrete: Section 02625.
 - C. Tests and Inspections: Section 01400.
- 1.03 Submittals:
- A. General: Comply with provisions of Division 1.
 - B. The submittal data to be furnished shall include, but not be limited to, the following:
 - 1. Pipe and fittings
 - 2. Valves
 - 3. Specialties
- 1.04 Product Handling:
- A. Protection: Use all means necessary to protect the materials of this section before, during and after installation and to protect the work and materials of all other trades.
 - B. Replacements: In the event of damage, immediately make all repairs and replacements necessary and at no additional cost to the District.

ARTICLE 2 - PRODUCTS

2.01 Compressed Air Piping - Symbol CA.

- A. Pipe, valves, and fittings shall conform to requirements of 150 psig working pressure.
- B. Piping shall be galvanized steel as manufactured by "National Tube", "Lone Star", "Republic", "LTV" or approved equal. The materials shall be steamless or electric resistance welded ASTM A-120 carbon steel. Electric resistance welded pipe shall be fully normalized after welding. Pipe thickness shall be Schedule 40 in accordance with ANSI B36.10, current edition. Pipe shall be galvanized inside and outside after fabrication.
- C. Pipe fittings for 150 psig working pressure systems, shall be maleable iron, threaded, hot dipped galvanized fittings. Fittings shall be used full line size with reducers after the fittings, if required.
- D. Flanges, where specified and/or required, shall be Crane or approved equal, Class 150 ANSI B16.5, raised face, forged steel, threaded type. Flanges shall have matching flat faces or raised faces. When 150 lb. steel flanges are connected to 125 lb. cast iron flanged valves or fittings, the steel flange shall be flat face medium finish.
- E. Gasket material shall be as specified herein and shall be suitable for the service and pressure class intended.
 - 1. Gaskets for cast iron flanges shall be 1/16 inch thick full face rubber gaskets for Class 125 flanges and flat ring rubber gaskets for Class 250 flanges with punched bolt holes, Crane "CC", Garlock, or J. M. Manufacturing with punched bolt holes and pipe opening.
- F. Bolting materials for flanges shall be carbon steel ASTM A-307 Grade B hexagon head bolts and nuts. Flange bolt thread lubricant shall be Crane Anti Seize Thread Compound or approved equal.

2.02 Wrapping of Pipe

- A. Prior to delivery to the job site wrap buried pipe with corrosion protection wrap of pressure sensitive polyvinyl chloride or polyethylene tape applied after pipe has been thoroughly cleaned. Tape shall be nominal thickness of 20 mils consisting of one layer of 20 mil tape or two separate layers of 10 mil tape. Apply with suitable primer adhesive recommended by manufacturer.

- B. Tightly apply tapes with 1/2 inch minimum uniform lap, free from wrinkles and voids. Use approved wrapping machines and experienced operators.
- C. Tapes: "Chasekote" No. 775, Plicoflex No. 340-25, Polyker 922 and 923, "Scotchwrap" No. 51 or equal. Apply tape after pipe is cleaned as recommended by tape manufacturer.
- D. Cover filed joints and fittings by wrapping polyethylene or polyvinyl tape specified for wrapping pipe, except use two layers of 10 mil thick tape. Wrap joints to provide two full thicknesses of tape over joint and extend minimum of six-inches over adjacent pipe covering. Where fittings are wrapped, width of tape shall not exceed two inches. Apply adequate tension so tape will conform tightly to contours of fittings. Use putty, tape insulation compounds such as "Scotchfil", or equal, to fill voids and provide smooth even surface for application of tape wrap.
- E. Alternate: In lieu of tape wrap, factory applied plastic coating on steel pipe will be acceptable. Use tapes for field joints, fittings, and valves same as specified above. Pipe Coating: "X-Tru-Coat" (20 mil thick) as manufactured by 3 M Company, or equal, with "X-Tru-Tape", or equal, for joints, fittings, and valves.
- F. Test wrapped or coated pipe, fittings, and field joints on job site, after assembly, with approved high voltage holiday detector "Tinker and Razor", or equal, with positive signaling device to indicate any flaws, holes, or breaks in wrapping. Set peak voltage to 10,000 volts. If Scotchkote 202 is used set peak voltage to 1,000 volts. Place piping on temporary blocks to allow testing to run along underside of pipe. Repair defects before covering. Conduct testing in presence of Engineer.

2.03 Valves

- A. Gate Valves shall be non-rising stem, ferrosteeel body, bronze trim wedge disc, flanged rated for 200 PSI working pressure. Valves shall be as manufactured by "Crane" or "Mueller".
- B. Valve Boxes shall be provided for all buried valves and shall consist of an adjustable pipe shaft and a cover marked "AIR". Valve boxes shall be installed at final

grade or paving elevation. Show field location of valve boxes. Provide extension stem to bring operating nut within two feet of valve box top. Provide a total of two valve keys, four feet long, to be located as indicated by the Architect.

ARTICLE 3 - EXECUTION

3.01 Piping

- A. Install piping at elevation indicated with bedding as recommended by the manufacturer.
- B. All work shall be done to the lines, elevations, and grades shown on the Contract Drawings.
- C. Install all drayage, hauling, hoisting, and placement of piping, appurtenances, and equipment specified herein.
- D. Maintain adequate protection of work from damage and protect the District's property from injury or loss arising in connection with this Contract. Protect adjacent property as provided by law and the Contract Documents.
- E. Construct and maintain all necessary temporary drainage and do all pumping necessary to keep excavation pits and trenches free of water.
- F. Provide protection against rain, wind, storms, or heat so as to maintain all work, materials, apparatus and fixtures free from injury or damage. At the end of each day's work all new work likely to be damaged shall be protected.
- G. Take all necessary precautions for the safety of employees and comply with all applicable provisions of Federal, State and Municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the work is being performed.

3.02 Test

- A. The District will provide the required tests. The Contractor shall provide all facilities, personnel, etc., necessary for testing as specified.
- B. Test shall be performed before backfilling.

- C. Inspection and test of piping shall include an air pressure test at not less than 225 psi and shall hold this pressure for not less than one (1) hour with no perceptible drop in pressure.
- D. Pressure test shall be performed in presence of the Engineer. Repeat pressure test until satisfactory results are obtained. Cost of re-tests for failure of passing the initial tests shall be paid for by the Contractor.
- E. Test pipe wrapping as specified herein before.
- F. Submit to the Engineer six (6) copies of certified reports for each segment of pipe inspected and tested.

3.03 Excavation and Backfill:

- A. Comply with the requirements for trenching, backfilling and compaction as specified in Section 02221.

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DIVISION 2 - SITEWORK

SECTION 02560 - SANITARY SEWER LINES

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Vitrified clay pipe gravity sewer.
- 1.02 Related Work in Other Sections:
- A. Section 02221: Trenching, Backfilling and Compacting.
 - B. Section 02625: Site Work Concrete.
 - C. Section 01400: Tests and Inspections.
- 1.03 Reference Specifications: "Standard Specifications for Public Works Construction", 1982 edition.
- 1.04 Quality Assurance:
- A. The District will provide inspection and testing services by a testing agency which meets the requirements of ASTM Designation E329 and which conforms to the requirements of the "Standard Specifications for Public Works Construction", 1982 Edition.
 - B. After inspection of all materials including pipe and fitting at the project site, set aside and remove from the site any material showing defects.
 - C. Provide certified statement of compliance for all materials and products.

ARTICLE 2 - PRODUCTS

- 2.01 Vitrified Clay Pipe and Fittings: ASTM C700, extra strength.
- 2.02 Compression Joints: ASTM C425.

- 2.03 Manhole Frames and Covers: Confirming to City of Los Angeles Standard Plans as indicated on plans.

ARTICLE 3 - EXECUTION

- 3.01 Installation of Pipe: Install vitrified clay pipe in accordance with Standard Specification Subsections 306-1.2.2 and 306-1.2.3.(g).
- 3.02 Installation of Manhole Frame and Cover: Install manhole frame and cover in accordance with Subparagraph 301-1.6 of 302-5.7 of the Standard Specifications.
- 3.03 Hydraulic Testing: Test vitrified clay pipe for leakage by water exfiltration test in accordance with Standard Specification Subsection 306-1.4.2. The Contractor shall pay for all required re-tests until satisfactory performance of test has been completed and accepted by the Engineer.

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DIVISION 2 - SITE WORK

SECTION 02580 - PARKING STRIPING

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Provide parking stall divider lines.
 - D. Provide pavement markings, arrows, numbers and lettering as shown on Drawings.
 - E. Provide layout of markings and product to be used in form of shop drawing.
- 1.02 Related Work in Other Sections:
- A. Painting except as specified herein - refer to Section 09900.
- 1.03 Submittals: Submit shop drawings, manufacturer's technical data and material specifications, as applicable.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.
- 2.02 Materials:
- A. Line marking and arrow paint shall be a white traffic paint, Sinclair No. 160, Dunn-Edwards W-801, or equal.
 - B. Handicap signs and lettering shall be blue paint conforming with above specification.

- C. Pedestrian walk cross hatching and boundary lines shall be yellow paint conforming with above specifications.
- D. Where above colors conflict with Cal Trans Standards, follow Cal Trans color requirements.

ARTICLE 3 - EXECUTION

- 3.01 Line markings and arrows shall be in accordance with the drawings. Stall dividing lines shall be 4" wide.
- 3.02 Surfaces to be painted shall be clean and free from dirt or dust. Striping shall be done when the weather conditions permit proper application, and in accordance with manufacturer's directions. Lines shall be machine painted at such rate as to cover not more than 100 sq. ft. of surface per gallon of paint or as required to be completely opaque.

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DIVISION 2 - SITEWORK

SECTION 02611 - CRUSHED AGGREGATE BASE

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Crushed aggregate base.
- 1.02 Related Work in Other Sections:
- A. Section 02615: Portland Cement Concrete Pavement.
 - B. Section 02200: Earthwork.
 - C. Section 01400: Tests and Inspections.
- 1.03 Reference Specifications: Standard Specification, "Standard Specifications for Public Works Construction", 1982 edition.

ARTICLE 2 - PRODUCTS

- 2.01 Crushed Aggregate Base: Standard Specification subsection 200-2.2.

ARTICLE 3 - EXECUTION

- 3.01 Subgrade Preparation and Placement of Base Materials:
- A. Prepare subgrade as required or as directed by the Engineer, in accordance with Standard Specification Subsection 301-1. The Contractor shall be responsible and pay for the cost of this work.
 - B. Spread and compact crushed aggregate base in accordance with Standard Specification Subsections 301-2.2 and 301-2.3. Place to compacted thickness shown on Drawings. Place over areas to receive portland cement concrete pavement.

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DIVISION 2 - SITEWORK

SECTION 02612 - ASPHALT CONCRETE PAVEMENT

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Asphalt concrete pavement as may be required for pavements.
- 1.02 Related Work in Other Sections:
- A. Section 02200: Earthwork.
 - B. Section 01400: Tests and Inspections.
- 1.03 Referency Specifications: "Standard Specifications for Public Works Construction", 1982 edition.
- 1.04 Quality Assurance: Provide certified statement that asphalt concrete complies with the requirements of the Specification.

ARTICLE 2 - PRODUCTS

- 2.01 Asphalt Concrete for Streets:
- A. General: Type C1-AR-8000 conforming to Standard Specification Subsection 203-6.
 - B. Asphalt: Paving asphalt AR-8000 conforming to Standard Specification Subsection 203-1.
 - C. Aggregate: Standard Specification Subsection 203-6.2.2.
 - D. Mineral Filler: Standard Specification Subsection 203-6.2.3.

ARTICLE 3 - EXECUTION

3.01 Asphalt Concrete Pavement:

- A. Prepare subgrade in accordance with Standard Specification subsection 301-1 as shown in Section 02611 3.01.A.
- B. Distribute, spread and compact in accordance with Standard Specification Subsection 302-5.4 and 302-5.5.
 - 1. Place over areas to lines and grades indicated on the Drawings.
- C. Provide a tack coat where abutting other materials, such as concrete.

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DIVISION 2 - SITEWORK

SECTION 02615 - PORTLAND CEMENT CONCRETE PAVEMENT

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Portland cement concrete pavement.

1.02 Related Work in Other Sections:

- A. Section 02611: Crushed Aggregate Base.
- B. Section 01400: Tests and Inspections.
- C. Section 02200: Earthwork.

1.03 Quality Assurance:

- A. Standard Specifications for Public Works Construction, current edition; herein referred to as, "Standard Specifications". The references pertain only to materials, construction equipment, methods and labor. The payment provisions do not apply to work to be performed under this Contract.
- B. Source Quality Control:
 - 1. Laboratory Tests: Materials stated herein require advance examination or testing according to methods referenced, or as required by the Engineer.
 - 2. Compression Test Cylinders: For laboratory trial batches, make in accordance with American Concrete Institute ACI 301 Method 1. Test to consist of four compression test cylinders for each class of concrete with two broken at seven days and two broken at 28 days; ASTM C 39.

C. Referenced Standards:

1. American Concrete Institute: ACI 301, Specifications for Structural Concrete for Buildings.
2. American Society for Testing and Materials:
 - a. ASTM A 663, Merchant Quality Hot-Rolled Carbon Steel Bars Subject to Mechanical Property Requirements, Spec. for.
 - b. ASTM C 31, Making and Curing Concrete Test Specimens in the Field.
 - c. ASTM C 42, Drilled cores and Sawed Beams of Concrete, Obtaining and Testing.
 - d. ASTM C 39, Compressive Strength of Cylindrical Concrete Specimens, Test for.
 - e. ASTM C 143, Slump of Portland Cement Concrete, Test for.

D. Tolerances: Conforming to requirements specified in Standard Specifications Section 302-6.3.

1.04 Submittals:

- A. Certificates of Compliance: Submit certificates of compliance for all materials and products, except those requiring a laboratory or mill test report.
 1. Concrete Test Reports: Submit two copies of laboratory trial mix design proposed in accordance with Method 1 of ACI 301 or one copy each of 30 consecutive test results and mix design used from a record of past performance in accordance with ACI 301 Method 2.
 2. Design Mix: Prior to production of concrete, submit for approval a design mix indicating materials proportions and water-cement ratio. Use materials in such proposed design mix as specified herein. Make such adjustments in the proposed design mix as directed by the Engineer. Make such adjustments at no increase in Contract Price.

3. Certificates: Furnish the Engineer and local authorities requiring same, certificates originated by the batch mixing plant certifying ready mixed concrete as manufactured and delivered to be in conformance with ASTM C 94.
4. Delivery Tickets: A delivery ticket shall accompany each load of concrete from the batch plant.
 - a. Tickets must be signed by the Engineer, noted as to time and place of pour, and kept in a record at the site. Make such records available for inspection upon request by the Engineer.
 - b. Information presented on the ticket shall include the tabulation covered by ASTM C 94, 15.1.1 through 15.2.8, as well as any additional information the local codes may require.
5. Reinforcing Steel Mill Test Reports: Submit mill test reports for each heat and size of reinforcing steel, showing physical and chemical analyses.

ARTICLE 2 - PRODUCTS

2.01 Materials:

- A. Crushed Aggregate Base: Conforming to requirements specified in Section 02611.
- B. Portland Cement Concrete: Conforming to requirements specified in Section 201-1 of the Standard Specifications for f'c = 4000 psi, 3" slump.
- C. Forms: Use wood or steel forms for longitudinal construction joints, at Contractor's option.
- D. Joint Sealer: Conforming to the requirements specified in Standard Specification Section 201-3.6, Type C.
- E. Joint Filler: Conforming to the requirements specified in Standard Specification Section 201-3.2.
- F. Concrete Curing Compound: Conforming to the requirements specified in Standard Specification Section 201-4.1 for Type 2, white pigmented.
- G. Admixture for Color Conditioned Concrete: All concrete designated as colored in plans or specifications shall contain the proper proportion of Master Builders "Color-cron" Charcoal color, and shall be cured with Master

Builders "Master Kure" and caulked in the matching color. All batching, placing, finishing, curing, and caulking shall be in accordance with Master Builders specification data.

ARTICLE 3 - EXECUTION

3.01 Preparation:

- A. Prepare subgrade of crushed aggregate base as specified in Section 02611.

3.02 Concrete Pavement:

- A. Construct concrete pavement in accordance with requirements of the Standard Specification Section 302-6, except the joints must conform to the details shown on the Drawings. Portions of concrete pavement to be color conditioned using admixture specified in 2.01 G.
- B. The surface of the colored concrete pavement shall have a light broom finish. The final finishing of other pavement slabs shall be burlap drag finish in accordance with Section 302.6 of the Standard Specifications.

3.03 Curing:

- A. If the selected curing method does not promote the proper curing and protection against cracking, the damaged pavement will be removed and replaced, and another curing method shall be employed as directed by the Engineer.
- B. Respray (when spray curing compounds are selected) areas where the curing compound is damaged by subsequent construction operations within the curing period.

3.04 Repair of Defective Pavement Slabs:

- A. Broken slabs, random cracks, nonworking contraction joints near cracks, and spalls along joints and cracks shall be replaced or repaired as specified below. The Engineer will be responsible for determining, by means of a structural evaluation, whether defective pavement shall be repaired as specified below or replaced as specified in Paragraph 3.05.
- B. Broken slabs and random cracks shall be repaired by pressure epoxy-grout injection as specified hereinafter at no additional cost to the District.

C. Epoxy Injection:

1. Preparation of Crack Area: Remove all surface contamination by wire brushing, scraping or light sandblasting and remove dust in crack with light air jet. After approval of the preparation operation, the Contractor shall apply a seal of the surface of the crack, leaving ports for injection of epoxy material in accordance with the manufacturer's recommendations. Prior to epoxy injection, the Contractor shall deepen the adjacent sawed joint to at least 1/3 the pavement thickness.
 2. Epoxy Injection Placement: The Contractor shall perform the necessary drilling and grouting at all random cracks which develop. The epoxy material shall be proportioned and injected as recommended by the manufacturer of the material for the intended use. The concrete cracks shall be mapped and the injection shall be on center-to-center spacing as necessary to perform structural bonding to the full depth of the crack. Epoxy injection of cracks shall not be started until the concrete has cured for a minimum of 7 days and the injection shall be completed within 14 days after placement.
- 3.05 Removal and Replacement of Defective Pavement Areas: Defective pavement shall be removed and replaced as specified herein with pavements of the thickness and quality required by these specifications at no additional cost to the Owner. In no case shall concrete removal and replacement result in a slab less than the full paving lane width or a joint less than 10 feet from a regularly scheduled transverse joint. When a portion of the unfractured slab is replaced, a saw cut three inches deep shall be made transversely across the slab in the required location, and the concrete shall be removed to provide an essentially vertical face in the remaining portion of the slab. Just prior to placement of concrete, the slab face shall be cleaned of debris and loose concrete, dust removed with light air jet, and then thoroughly coated with a thixotropic epoxy-resin adhesive manufactured specifically for bonding fresh portland cement concrete to existing hardened concrete. Longitudinal construction joints and transverse contraction joints shall not be coated with epoxy-resin adhesive. Asphaltic emulsion or other approved bond-breaking medium shall be painted on vertical construction and contraction joint faces. Longitudinal and transverse joints of the replaced slab or portion thereof shall be constructed as indicated. The joints shall be sealed as specified in paragraph 3.05 C. The Contractor shall be fully responsible for this work and no additional payment will be made for the defective pavements removed nor for the cost of replacement of the defective pavements.

- A. Concrete Saw: A self-propelled power saw with water-cooled diamond or abrasive saw blades shall be provided for cleaning sawed joints, removing filler embedded in the joints or adhering to the joint faces, and cutting joints to the widths and depths specified.
- B. Sandblasting Equipment: Sandblasting equipment will include an air compressor, hose, and long-wearing, 1/4-inch venturi-type nozzle of proper size, shape, and opening. The air compressor shall be portable and shall be capable of furnishing not less than 150 cfm of air and maintaining a line pressure of not less than 90 psi at the nozzle while in use. Compressor capability to meet the performance requirements of the specifications under job conditions shall be demonstrated prior to commencement of joint cleaning or sealing operations. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water. The nozzle or nozzles shall have an adjustable guide that will hold the nozzles aligned with the joint approximately 1 inch above the pavement surface. The height, angle of inclination, and size of the nozzles shall be adjusted as necessary to secure satisfactory results.
- C. Preparation of Joints: Immediately before installation of the preformed joint seal, the joint shall be thoroughly cleaned until all laitance, curing compound, filler, and protrusions of hardened concrete are removed from the sides and upper edges of the joint space to be sealed. Any irregularity in the joint seal and the joint face shall be corrected prior to installation of the joint seal. The following sequence of operations shall be used to clean the joint.
 - 1. A power-driven concrete saw blade shall be used to saw through all sawed and filler-type joints to loosen and remove material until the joint groove is clear and open to full specified width and depth.
 - 2. If the joint has opened 1/16 inch or more as measured at the slab edge at the time of final sawing, the sawed width shall be increased so that the net width will meet the prescribed tolerances when the joint is closed.
 - 3. All loosened material shall be blown from the joint by compressed air.

4. The exposed concrete joint faces and the pavement surfaces extending at least 1/2 inch from the edges of joints shall then be sandblasted using a multi-pass technique until the surfaces are free of dust, dirt, curing compound, filler, and any other material that might prevent ready insertion and bonding of the joint seal to the concrete.
 5. Sand of proper size and quality shall be used in the sandblasting operation.
 6. A minimum 150 cfm of air at a nozzle pressure of 90 psi shall be used for sandblasting and for final cleaning of the joints.
 7. After final cleaning and immediately prior to filling, the joints shall be blown out with compressed air and shall be dry and free of sand.
- D. Time of Installation: Joints shall be sealed immediately following the concrete-curing period or as soon thereafter as weather conditions permit. The concrete inside the joint shall be surface dry, and atmospheric and pavement temperatures shall be above 40 degrees F at the time of installation of the joint seal. Open joints that cannot be sealed under conditions specified herein shall be provided with an approved temporary seal to prevent infiltration of foreign material. When rain interrupts sealing operations, joints shall be recleaned prior to installing the joint seal.
- E. Sequence of Installation: Longitudinal joints shall be sealed first, followed by transverse contraction joints, and then all other joints.

3.07 Field Quality Control:

- A. Concrete Testing (Also Refer to Section 01400-2.03):
1. Concrete tests shall be made as work progresses.
 2. Standard 6 x 12 cylinders shall be used in concrete tests. Identify each test by number, mix, amount of admixture, origin of sample in the project the date test specimen was made, the date test specimen was tested, the amount slump determined, and the compressive strength test results.

3. Make one group of four (4) test cylinders for each 100 cubic yards of concrete poured or not less than four (4) test cylinders for any amount of concrete less than 100 cubic yards poured in one days work. The test requirements specified herein apply for each class of concrete poured.
4. Mold and cure four test specimens for each strength test in accordance with ASTM C 31.
5. Test specimens in accordance with ASTM C 39. Test two specimens at 7 days for information and two at 28 days for acceptance.
6. Make slump tests for each strength test and whenever consistency of concrete appears to vary in accordance with ASTM C 143.
7. The District will arrange and pay for concrete tests. The Contractor shall cooperate and coordinate with the Engineer for this work.

B. Evaluation and Acceptance:

1. The strength level of the concrete will be considered satisfactory if 90% of the strength test results and the averages of all sets of three consecutive strength test results equal to exceed specified strength and no individual test result is below specified strength by more than 500 psi.
2. If the strength of cylinders falls below specified compressive strengths, the Engineer shall have the right to order a change in the mix proportions for the remaining concrete being poured.
3. If required by the Engineer, obtain and test core specimens from hardened concrete in accordance with ASTM C 42.

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DIVISION 2 - SITEWORK

SECTION 02625 - SITE WORK CONCRETE

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Curb, driveways, and sidewalks.
- D. Manholes, catch basins, concrete collars, and sanitary sewer and drainage structures.
- E. Pipe bedding and encasement.

1.02 Related Work in Other Sections:

- A. Section 02221: Trenching, Backfilling and Compacting.
- B. Section 02500: Storm Drain Lines.
- C. Section 02560: Sanitary Sewer Lines.
- D. Section 03200: Reinforcing Steel.
- E. Section 01400: Tests and Inspections.

1.03 Reference Specifications: "Standard Specifications for Public Works Construction," 1982 edition.

1.04 Inspection and Testing:

- A. Inspection and testing services will be provided by a testing agency which meets the requirements of Section 01400.
- B. Concrete Testing During Construction: Sample and test in accordance with Standard Specification Subsection 201-1.1.4 for each 150 cubic yards or fraction thereof of concrete placed in any 1 day, sample and test as follows:

1. Obtain 4 samples for compressive strength test.
2. Obtain 2 samples for slump and air content tests.
3. Determine ultimate compressive strength by making 2 tests at 7 days and 2 tests at 28 days.
4. Determine slump by making 1 test.
5. Determine air content by making 1 test.

1.05 Contractor Submittals:

- A. Certificates of Compliance: Submit certificates of compliance for all materials and products, except those requiring a laboratory or mill test report.
- B. Mill Test Reports: Submit mill test reports for each heat and size of reinforcing steel, showing physical and chemical analyses.
- C. Laboratory Test Reports: Submit laboratory test reports of all testing.
- D. All submittals in accordance with the Special Provisions.

ARTICLE 2 - PRODUCTS

2.01 Materials:

- A. Portland Cement: ASTM Designation C 150, Type II.
- B. Coarse Aggregate: Standard Specification Subsection 200-1.4.
- C. Fine Aggregate: Standard Specification Subsections 200-1.5.1 to 200-1.5.5, inclusive.
- D. Water: Standard Specification Subsection 201-1.2.3.

2.02 Portland Cement Concrete:

- A. Concrete curbs, driveways and sidewalks in accordance with Standard Specification Subsection 201-1, class 520-C-2500, 4-inch maximum slump.
- B. Pipe collars, pre-cast manhole components, catch basins, and sanitary sewer and drainage structures in accordance with Standard Specification Subsection 201-1, class 560-C- 3250, 5-inch maximum slump.

- C. Pipe bedding and encasement in accordance with Standard Specification Subsection 201-1, class 420-C-2000, 4-inch maximum slump.

ARTICLE 3 - EXECUTION

3.01 Curbs, Walks and Driveways:

- A. Construct curbs, walks, and gutters in accordance with Standard Specification Subsection 303-5.

3.02 Site Work Concrete Structures:

- A. Construct all other site work concrete structures in accordance with Standard Specification Subsection 303-1.

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DIVISION 2 - SITE WORK

SECTION 02830 - TEMPORARY CHAIN LINK FENCING

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. All chain link mesh, posts, tie wires, swing and sliding gates, and movable concrete post foundations.
- 1.02 Related Work in Other Sections:
- A. Demolition - refer to Section 02050.
 - B. Permanent chain link fence - refer to Section 02831.
- 1.03 Reference Specifications:
- A. Standard Specifications: "Standard Specifications for Public Works Construction", 1982 Edition.

ARTICLE 2 - PRODUCTS

- 2.01 All chain link mesh, posts, top and bottom rails, gates, post foundations and tie wire in accordance with Paragraph 206-6 (including all applicable subparagraphs) of the Standard Specifications.

ARTICLE 3 - EXECUTION

- 3.01 Install 6' high chain link fence at locations indicated on Drawings.
- 3.02 Fence may be installed using movable concrete post foundations.

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DIVISION 2 - SITE WORK

SECTION 02831 - CHAIN LINK FENCING

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Provide permanent chain link fencing at Tire Repair, Tool Lock-Up and Record Storage.

1.02 Related Work in Other Sections:

- A. Miscellaneous metal other than specified herein - refer to Section 05500.
- B. Temporary chain link fencing - refer to Section 02830.
- C. Concrete - refer to Section 03300.

1.03 Submittals:

- A. Submit shop drawings, manufacturer's technical data and material specifications, and samples, as applicable.
- B. Design: Shop drawings shall include complete engineering drawings and calculations for posts and footing sizes. If required, provide heavier members than specified, but no lighter than specified.

ARTICLE 2 - PRODUCTS

2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture. If specified models are discontinued, the Contractor shall furnish the manufacturers' updated model at no additional cost to the Owner.

2.02 Materials:

- A. Fabric shall be 1-3/4" nominal, hot dipped galvanized after weaving, and shall conform with ASTM A392. Fabric shall be 9 gauge wire, with twisted and barbed selvage at top and bottom.
- B. Posts, rails and diagonal bracing at corners shall be standard pipe, as per ASTM A120. Terminal posts and corner posts shall be 3" O.D. Top and bottom line posts and corner bracing shall be 2-1/4" O.D.
- C. Tie wire for tying fabric to rails and intermediate posts shall be galvanized wire as per ASTM A112, same gauge as fabric. Ties for securing fabric to tension wire shall be 10 gauge galvanized hog rings. Ties shall be spaced approximately 18" on center.
- D. Fabric bands for securing fabric to terminal posts shall be galvanized 14 gauge x 5/8" wide, spaced vertically at 14" on center.
- E. Fittings, including post tops, couplings, clamps, and stretcher bars shall be heavy malleable iron, or pressed steel, hot dipped galvanized.
- F. Gates shall have same fabric as fence, with 3" O.D. pipe frame. Provide hinges and latch suitable for padlock at swing gates. Provide rollers, track and latch suitable for padlock at rolling gates.

ARTICLE 3 - EXECUTION

- 3.01 Field welds shall be cleaned off of any flux and spatter, all damaged galvanizing removed, and then coated with dry galvanizing.
- 3.02 All posts shall be set in concrete for a full depth of 24" in a 30" deep hole. Exposed surface of concrete shall be rounded to shed water.
- 3.03 Line posts shall be spaced at 10' or less on center.

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DIVISION 2 - SITE WORK

SECTION 02835 - SECURITY GATES

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Provide automatic sliding gates.
- 1.02 Related Work in Other Sections.
- A. Conduit, wiring and junction boxes to gate controls - refer to Division 16.
 - B. Conduit from control unit to operators - refer to Division 16.
 - C. Miscellaneous metal - refer to Section 05500.
- 1.03 Submittals: Submit shop drawing, manufacturer's technical data and material specifications, and samples, as applicable.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture. Where model numbers are indicated, if the specified models are discontinued, the Contractor shall furnish the manufacturer's updated model at no additional cost to the Owner.
- 2.02 Sliding Gates:
- A. Manufacture: Products specified herein shall be manufactured by Gate Controls, Inc., Los Angeles, California; Customline Company, Azusa, California; or equal.
 - B. Provide sliding gates, matching panels, pedestrian gates, operators, top/bottom track, rollers, wheels, hardware and controls.

- C. Gates: Frames to be 3" x 3" sq. steel 11 gauge tubes. Pickets to be 3/4" x 3/4" sq. bars 16 gauge. All welds complete (no spot welds) and ground smooth. Gates shall be degreased and primed rust resistant black.
- D. Hardware - Heavy Duty:
1. Gate head and gate stop shall be as detailed.
 2. Top guide rollers rubber tired 2-1/2" diameter wheels for quiet and smooth operation.
 3. Bottom track to be 1-1/2" x 1-1/2" structural angle by 1/4" welded to a 1/4" thick steel plate 4" wide for maximum rigidity as detailed.
 4. Bottom wheels to be not less than 6" diameter Delrin for quiet operation with ball bearings.
- E. Electric Operator - Shall Be Heavy Duty as Follows:
1. Solid State Controller: No relays, solenoids or other mechanical components.
 2. Adjustable variable opening and closing speeds up to 2 ft. travel per second.
 3. Worm gear power transmission. No belts or pulleys.
 4. Magnetic position sensors for positive gate braking. No limit switches or mechanical brakes.
 5. Disconnect lever externally mounted for easy access. Lever is secured against unauthorized usage.
 6. D.C. reversing motor drive. Continuous duty cycle rate.
 7. Sturdy enclosure of 13 gauge steel framing to ensure the machine integrity.
 8. Space saving size: 10-1/2" wide, 28" long, 19" high.
 9. 1/2 HP, 120 VAC, 60 HZ, 1 PH., 7.5 amp.
- F. Controls: Control switch at office as directed by RTD.

ARTICLE 3 - EXECUTION

- 3.01 Products of this section shall be installed in accordance with the drawings and shop drawings and installed by installers approved by the manufacturer.

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DIVISION 3 - CONCRETE

SECTION 03200 - REINFORCING STEEL

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of General Provisions and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Furnishing all reinforcing steel.
- D. Furnishing wire mesh for concrete.
- E. Placement of reinforcing steel and mesh in concrete work including dowels in concrete for masonry work.

1.02 Related Work in Other Sections:

- A. Tests and inspections - refer to Section 01400.
- B. Placement of reinforcing steel in masonry - refer to Section 04200.

1.03 Requirements:

- A. Submittals: Submit shop drawings, manufacturer's technical data and material specifications, as applicable.
- B. Storage of Materials: Store reinforcing steel at site to permit easy access for proper inspection and identification of each shipment. Separate material of each shipment for size and shape.
- C. All concrete shall be reinforced, except paving and certain minor items of a nonstructural nature. For conditions not specifically shown or detailed, framing and reinforcement shall be provided in a manner consistent with other similar details or conditions shown on the drawings.

ARTICLE 2 - PRODUCTS

2.01 General:

- A. All materials shall conform with the following requirements and shall be of new stock of the highest grade

available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.

- B. All reinforcing shall be clean, new stock, conforming to ASTM Designation A615. All steel shall be tested and reported or identified and certified as specified in Section 01400.

2.02 Materials:

- A. Bars: Conform to ASTM A615-81, Grade 40 and 60.
- B. Mesh: Conform to ASTM A185.
- C. Tie Wire: Annealed copper-bearing steel wire of at least 16 gauge.
- D. Chairs, Spacers, Supports and Other Accessories: Except as herein otherwise specified, these items shall be of standard manufacture conforming to ACI-315, approved steel typed and sizes. Where reinforcing is to be placed on grade, use suitable sized dense precast concrete supports with embedded wire ties. All accessories shall be galvanized or have other approved corrosion-resisting coating.

ARTICLE 3 - EXECUTION

3.01 Placing Reinforcing Steel:

- A. General: Provide reinforcing steel in sizes, gauges, lengths and bent to shape as indicated on the drawings. Reinforcing shall be thoroughly cleaned of loose mill scale, rust, oil and all coatings that will destroy or reduce the bond before placing and again before concrete is placed. Reinforcing shall be accurately positioned and secured in place. Fabricate in accordance with CRSI Manual of Standard Practice.
- B. Support: Use dense concrete blocks with embedded wire ties to hold reinforcement above earth at proper distance. Use wire chairs or bolsters for support reinforcement in forms in conformance with applicable requirements of CRSI. No aluminum will be permitted. Provide approved corrosion-resisting coating for accessories used on exposed concrete surfaces.
- C. Installation: Conform to ACI 318 and as follows: Reinforcement shall be wired together at all points where bars cross, and shall be lapped as shown or specified. Stagger splices in general so that adjacent

splices will be 4'-0" apart. Care shall be taken to maintain proper clearance, 1-1/2" minimum between parallel bars. Make lapped splices in a manner to provide laps required by structural drawings. Secure dowels and bars extending through construction joints against displacement before concrete is placed, and clean concrete adhering thereto immediately after pour, while incrustations are soft.

- D. Protection: Protect reinforcement by thickness of concrete as indicated on drawings, or according to ACI-318.
- E. Tolerances: Fabrication tolerances shall conform to requirements of CRSI "Recommended Practice for Placing Reinforcing Bars".

3.02 Welding of Reinforcing Steel:

- A. Welding shall be done by certified welders in accordance with AWS Standard Code D1.4, using low hydrogen coated electrodes E70 series. All welding of reinforcing steel shall be done under continuous inspection, supervision of a qualified Registered Deputy Laboratory employed Inspector as specified in section "Tests and Inspections."
- B. Welded Bars: Reinforcement to be welded shall be indicated on the approved plans and the welding procedure to be used shall be specified. The specifications shall contain requirements in conformity with AWS D1.4.
- C. The carbon equivalent (C.E.) of reinforcing bars or splice material shall be calculated from the chemical composition as shown in the mill report by the following formula:
$$\text{C.E.} = \%C + \%Mn/6 + \%Cu/40 + \%Ni/20 + \%Cr/10 - \%Mo/50 - \%V/10$$
- D. If mill test reports are not available, chemical analysis shall be made of bars representative of the bars to be welded. ASTM A706 bars may be assumed to have a C.E. - 0.55. Bars with a C.E. above 0.75 shall not be welded. No welds shall be made at bends in reinforcing bars.

- 3.03 Mesh Fabric: Roll out, straighten, cut to required size, and lay out flat in place. Lap one full mesh at sides and 12-inch at ends and wire to each other reinforcement. Stagger end laps. At edges of slab and joints, extend mesh to within one inch of pour. As concrete is poured, lift mesh reinforcement in slabs at intervals to insure proper embedment. Locate mesh in center of slab unless indicated otherwise on the drawings.

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DIVISION 3 - CONCRETE

SECTION 03300 - CONCRETE WORK

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of General Provisions and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Provide all concrete work of strengths and weights as indicated on drawings. Where not indicated, concrete shall be not less than 2,500 p.s.i.
- D. Construction and removal of forms for concrete including shoring, bracing, cribbing, centering and screeds.
- E. Placement, leveling, curing, protection, bonding, jointing, filling, grouting, sacking, honing, rubbing of concrete and finishing of concrete surfaces, except as otherwise specified.
- F. Bonding, drypacking, grouting, setting of plates, bolts, dowels, and setting and securing of sleeves, inserts, anchorage and embedded items in forms.
- G. Setting screeds and fine grading for concrete cast on grade.
- H. All miscellaneous concrete and related work not otherwise provided for.
- I. Lightweight concrete fill on metal decking at Maintenance building.
- J. Housekeeping pads for equipment.
- K. Moisture barrier under floor slabs on grade at Supervisor's and Clerk's offices, Maintenance building.

1.02 Related Work in Other Sections:

- A. Reinforcing steel - refer to Section 03200.

- B. Sleeves, pipes, conduit, hangers, inserts, ties, anchor bolts and anchors and miscellaneous hardware required by other trades to be furnished and located by trades requiring same.
 - C. Tests and Inspections: Refer to Section 01400.
 - D. Design Mixes: Refer to Section 01400.
 - E. Concrete pavements: Refer to Section 02615.
 - F. Site concrete work: Refer to Section 02625.
- 1.03 Requirements:
- A. Submittals: Submit mix designs, shop drawings, manufacturer's technical data and material specifications, certificates and samples, as applicable.
 - B. Grades and Uses of Concrete: Refer to General Notes, Structural Plans and Paragraph 3.01 of this section.
- 1.04 Conform with all applicable requirements of ACI Standards 301-81, 302-1R-80, 303-81, 304-73, 305-72, 306-66, 308-81, 309-74, 347-78.
- 1.05 Inspection:
- A. Each truckload of concrete for walls will be measured for slump by slump cone test, ASTM C143. A truckload of concrete shall be rejected if the slump exceeds slump specified in Paragraph 3.01 C except that, if slump is less, water may be added to achieve specified slump.
 - B. Delivery of each truckload of concrete shall be timed so all loads will be deposited in the same elapsed time from start of mixing. Telephone contact with the plant shall be maintained as required for a well coordinated placement.
- 1.06 Condition of Concrete Surfaces with Epoxy Coatings:
- A. The concrete surfaces shall be of sound structural grade and have a smooth wood float finish or fine broom finish, free of all ridges, fins, voids or air entrained holes.
 - B. Concrete shall be cured by water curing method. Curing compounds or chemical curing agents of any type shall not be used.

- C. Concrete shall be cured at least 28 days and not coated until it is completely dry. Where required, the base slab shall be sloped for proper drainage.
- D. Saw-cut joints or expansion joints shall be properly installed over all structural supports or as recommended by the coating manufacturer.
- E. Any required drains, ducts, or other penetrations shall be installed at the time the concrete deck is poured.
- F. Voids, rock pockets and excessively rough surfaces shall be finished with an epoxy grout or ground to match the unrepaired areas.
- G. All surfaces shall be free of visible moisture, grease, dirt and corrosion. Remove all fresh asphalt, resin-based curing compounds, loose scale and any other foreign deposits.

ARTICLE 2 - PRODUCTS

2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacturer.

2.02 Materials:

A. Concrete Materials:

- 1. Portland Cement: Conform to ASTM C150, Type I or II, low alkali, tested and of adequate chemical and physical characteristics, possessing a demonstrated low shrinkage potential. Do not change brand or type of cement during progress of work without prior permission of Engineer.
- 2. Aggregates (Normal Weight Concrete):
 - a. Conform to ASTM C33, and as specified herein. Each specified or required size graded and batched separately. Submit pit source and characteristics of each type aggregate to Architect prior to designing mixes.
 - b. Sources of Aggregate: From approved deposits.

- c. Fine Aggregate: Washed natural sand of hard strong particles. To contain not more than 1% of deleterious material. Grading per grading table. Fineness modulus, 2.85 to 3.15.
- d. Coarse Aggregate: Clean washed gravel or sound crushed rock. Not more than 5% flat, thin, elongated or laminated material. Not more than 1% deleterious substances. 1" aggregate graded from 1/4" to 1". Fineness modulus, 6.90 to 7.40. 1-1/2" aggregate graded from 1/2" to 1-1/2". Fineness modulus 7.80 to 8.20.
- e. Aggregate Size Requirements: Largest practicable aggregate size shall be used for each condition of placement subject to the following limitations: Maximum size in any case shall not exceed:
 - (1) 3/4 of the clear distance between reinforcing and form surfaces.
 - (2) 1/3 of the depth of any slab section.
 - (3) 1/5 the minimum clear nonreinforced width in vertical sections.
- f. Grading of Aggregates - Table:

Minimum and Maximum Percentages Passing by Weight

<u>Sieve</u>	<u>Size</u>	<u>Combined 1" and Fine</u>	<u>Combined 1-1/2" 1" and Fine</u>
1-1/2	inch		95 to 100
1	inch	98 min.	75 to 90
3/4	inch	70 to 90	55 to 77
3/8	inch	45 to 65	40 to 55
#4	mesh	31 to 47	30 to 40
#8	mesh	23 to 40	22 to 35
#16	mesh	17 to 35	16 to 30
#30	mesh	10 to 23	10 to 20
#50	mesh	2 to 10	2 to 8
#100	mesh	0 to 3	0 to 3

3. Lightweight Aggregate:

- a. Aggregates for lightweight concrete shall conform to the requirements of the "Specification for Lightweight Aggregates for Structural

Concrete", UBC Standard 26-3 or ASTM C330 except as modified by this section. Lightweight aggregates shall be rotary kiln expanded shale or clay having a surface sealed by firing. The coarse aggregate shall not be crushed after firing except that a small amount of aggregate, three-fourths inch in size and smaller, may be crushed to the extent necessary to produce the required coarse aggregate grading. The coarse aggregate size shall not exceed three-fourths inch. The absolute volume of coarse aggregate shall not exceed 8.8 cubic feet per cubic yard of concrete.

- b. Lightweight aggregate shall be furnished from a producer with not less than 5 years' experience with successful production and use of lightweight aggregate. The processing plant shall be of the rotary kiln type, capable of uniformly burning the product at controlled temperature.
- c. The loss ratio of lightweight concrete shall be not less than nine-tenths (0.9) when subjected to 20-25 cycles of the freeze and thaw test.
- d. Splitting ratio for lightweight concrete shall be not less than 5.5 as determined by the method set forth in ACI 318.
- e. The percentage of wear shall be not more than 40 by the Abrasion Test.
- f. Lightweight aggregate that, upon being subjected to the test for organic impurities, as per ASTM C40, produces a color darker than the standard, shall be rejected, unless it can be demonstrated that the discoloration is due to small quantities of materials not harmful to the concrete. The amount of unburned or underburned lumps shall not exceed 2% by dry weight. The loss on ignition of lightweight aggregate shall not exceed 2% by dry weight. The loss on ignition of lightweight aggregate shall not exceed 5% by the test procedure described in ASTM C144.
- g. Unit weight (dry loose weight) of lightweight aggregate shall be within the following limits:
 - (1) Fraction retained on a No. 8 sieve shall weigh 38 to 40 lbs. per cu. ft.

(2) Fraction passing No. 8 sieve shall weigh 62 to 65 lbs. per cu. ft.

4. Water used for mixing and curing concrete shall be clean, free from acids, alkalis, oil, decayed vegetable matter, sugar, citrates, and shall be suitable for drinking.
5. Admixtures:
 - a. A water-reducing admixture may be used for better workability, shrinkage reduction, plasticity, and adhesiveness of all concrete conforming to ASTM C494, Type D (water reducing and retarding) "Pozzolith 344N" manufactured by Master Builders. Where retardation is required, use Pozzolith 300R.
 - b. Relative durability factor of 100% instead of 80% (as required by ASTM C494) shall be used. No admixture with rapid or excessive bleeding or which will require concrete to be reconsolidated, revibrated or retempered, shall be used.
 - c. No product disclaimers of responsibility by manufacturers will be accepted or approved.
 - d. When field service is requested for admixture use, a qualified concrete technician employed by the manufacturer shall be available to assist in proportioning concrete materials for optimum use, to advise on proper use of admixture and adjustment of concrete mix proportions to meet job site and climatic conditions. The concrete mix must meet ACI 318 standards.

B. Forming Materials:

1. Unexposed or Plastered Surfaces: New DFPA "Plyform B-B," or sound D.F. #2 and better boards and plank, milled shiplap or T&G.
2. Exposed Concrete Surfaces: High density overlaid plywood, form coated and edge sealed or Burke's "Neotex" form panels.
3. Where applicable, apply approved bond breaker prior to setting reinforcing steel mat. If rain occurs, remove reinforcing prior to reapplying bond breaker.

4. Metal Slab Forms: For self-supported slabs may be used in lieu of plywood where appearance is not a factor, if in good condition with straight even side joints capable of being securely closed to avoid leakage of concrete. Patented, prefabricated wall form system composed of metal frames containing plywood surfaces may be used upon approval of the Engineer.
5. Studs, Wales, Shoring, Centering, Bracing: #2 grade or better D. F. of adequate size, utilizing doubled wales.
6. Form Joint Filler for Exposed Concrete: Durable, insoluble paste wood filler similar and equal to "Plastic Wood" or "Wood Dough", well-sanded and sealed with a penetrating sealer.
7. Form Coating: Surface-conversion type form release compound, reapplied for each reuse to cleaned forms. Coating shall not leave residual matter or adversely affect bonding of finish material. Mineral oils or other nondrying ingredients are not permitted. "Nox-Crete" by Nox-Crete Chemicals, "Rich-Cote" by Neptune Manufacturing or equal.
8. Forming Accessories: For exposed surfaces, use "Burke Architectural Snap Ties," "Dayton Sure Grip and Shore Company," or equal. Ties shall have a 1" diameter plastic cone spacer allowing a full 1" break-back. Form tie plugs shall be precast concrete, color as approved by the Engineer. Plug surface shall be dense and smooth. Ties for walls retaining earth shall not leave holes through the entire wall section and shall break back not closer to the exterior surface than 1-1/2". No wood, absorbent or compressible material shall be used for spreaders.
9. Wood nailing blocks, grounds, bucks, where permitted, shall be clear D.F., milled dovetail shape, dip treated in "Woodlife" and dried at least 12 hours prior to use.

C. Accessory Materials:

1. Curing Materials:

- a. Curing materials, shall exceed the moisture requirement of ASTM C309. "Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete".
 - (1) "Masterkure" manufactured by Master Builders, "Thompsons Sealer" manufactured by Thompson, Inc., or equal.
 - (2) Material shall provide moisture retention not to exceed a loss of 0.555 gm/cm² when used at a coverage of 450 sq. ft. per gallon tested in accordance with ASTM C156.
 - b. Cloth Curing Mats: Conform to ASTM Designation C440.
 - c. Waterproof Curing Paper: Conform to ASTM Designation C171 "Sisalkraft."
2. Control Joint Sealers and Fillers:
- a. For sealing joints in exposed concrete slabs, use "Epibond 585" manufactured by Furane Plastics or "Colma Joint Sealer" manufactured by Sika Chemical Co., "Hornflex Pourable" W. R. Grace & Co., gray color.
 - b. Filler-Sealer for Joints Under Resilient Flooring: Refer to Division 9 for neoprene based underlayment compound, applied as part of the resilient floor covering work.
- D. Cement Grout and Drypack:
1. Precision support grout shall be Masterflow 713 Grout manufactured by Master Builders, Cleveland, Ohio consisting of a hydraulic cementitious system, specially graded and processed natural fine aggregate and additional technical components. Other products will only be acceptable providing written approval of the engineer is obtained prior to bidding. Acceptance will be granted only upon satisfactory evidence proving that the substitute material meets all of the following requirements, conforming to CRD 621-81 Corps of Engineers.
 - a. Free of gas producing or releasing agents.
 - b. Free of oxidizing catalyts.

- c. Free of inorganic accelerators, including chlorides.
- 2. Drypack: Premixed grout shall be used - use only enough water to make a stiff mix consistency. Premixed grout shall be used under base plates per manufacturer's recommendations.
- E. Hardened Concrete Materials: Shall be a pre-mixed, ready-to-use product comprised of specially processed, size-graded metallic aggregate, combined with a cementitious binder, plasticizing and water reducing admixtures; color as directed by Engineer. Master Builders Masterplate 200 is approved by the Engineer; other products similar in nature and meeting or exceeding these specifications are acceptable upon approval by the Engineer.
- F. All Concrete Floors Shall Have Surface Curing-Compound Including Hardened Concrete: Shall be equal to Master-Kure as manufactured by Master Builders. Other products similar in nature and meeting or exceeding these specifications are acceptable upon approval by the Engineer.

ARTICLE 3 - EXECUTION

3.01 Concrete Proportioning:

- A. General: Refer to "Tests and Inspections" for these provisions. Mix designs to produce concrete as called for in the General Notes on the Structural Drawings, minimum ultimate strengths at 28 days, dense, cohesive, and plastic.
- B. Admixtures: If used, adjust water to secure same workability and slumps as concrete without admixtures. Admixtures for concrete in contact with metal deck shall not contain chloride salts.
- C. Consistency: Water shall not exceed amount permitted in mix designs. To be checked by the slump test, ASTM Designation C143, to be made when test cylinders are cast, and additionally as required. Maximum slumps as follows, and shall not be exceeded:
 - 1. Slabs on grade and fill slabs: 3"
 - 2. Self-supported structural slabs, beams and columns: 4"
 - 3. Footings: 3"

4. Reinforced walls: 5"
5. Thin reinforced walls (less than 8" and congested situations): 6"

3.02 Mixing of Concrete:

- A. Ready-mixed concrete shall conform to ASTM C94 and T22-94305-c Method B and C, and as follows:
- B. Plant Requirements: Plant shall be equipped:
 1. To handle at least 4 sizes of aggregate to prevent intermixing before placing in weight hopper.
 2. With an accurate continuous-reading moisture meter connected to sand compartment of the weight hopper.
 3. Approved, positive method of dispensing admixtures accurate to within 3%.
- C. Water and Mixing Time: Concrete, at batching, shall have a portion of the required water withheld (approximately 2-1/2 gals./cu.yd.) to be added under supervision of Job Inspector. Mix minimum 3 or more minutes after last water is added. Concrete shall be in final position within 1-1/2 hours after first water is added to batch, provided concrete is still plastic. Retempering is not permitted.

3.03 Form Construction:

- A. General: Substantial, unyielding, true to line, plumb, level, and tight boards run horizontally, driven up tight, secured to each stud. Responsibility of Contractor, but subject to approval of the Engineer.
- B. Form ties shall be evenly spaced vertically and horizontally. Form ties in forms with ribbed liner shall be located in the recessed portion of the concrete rib.
- C. Formwork Accuracy: Deflection of 0.0025 x span maximum. Tolerances as required by ACI 347.
- D. Form Joints: Treat all butt joints with closed cell vinyl foam gaskets of the size necessary to produce a tight seal. Pressure sensitive tape shall be applied to the joints on the interior of the form. Care shall be taken to prevent displacement of the tape.

- E. Vertical and horizontal construction joints or pour joints where required shall occur only when approved by the Engineer.
- F. Chamfer corners of exposed concrete columns only where shown on drawings.
- G. Coordination: Form for and provide slots, openings, chases, recesses, grounds, nailers, and screeds required by other trades and subsequent work. Assure that conduit, pipes, sleeves, anchors, hangers, ties, etc. are secured in forms before placement of concrete.
- H. Wood in Forms: No wood, temporary or permanent, to be used or installed inside forms, except for items specified.
- I. Openings for Cleaning and Form Removal: All blind areas and dead spaces shall be provided with openings to permit form removal and cleaning out of combustible debris and rubbish. After completion of cleaning, the blockout or opening shall be filled in.
- J. Earth backing may be used for forms for footings, etc. where excavations maintain clean, firm shape. Earth form shall be 1" wider than shown on all sides.

3.04 Conveying and Placing Concrete:

A. General:

1. Clean and wet forms before placing concrete, and clean excavations of loose material.
2. Time of Placing: Not until reinforcement, sleeves, anchorage, conduit, inserts are in place and have been inspected by the Engineer.
3. Pouring Against Hardened Concrete Surfaces: Remove laitance and incrustations and expose 1/4" of solidly embedded sound aggregate. Wet surfaces; slush vertical surfaces with neat cement paste before placing new lift.
4. Concrete conveying and placing shall conform with the requirements of ACI 304-73, except as herein modified. A description of methods and sequence of placement shall be determined in the Preconstruction Conference and confirmed in writing by the Contractor to the Engineer. Proposed method shall be used in fabricating the sample panel.

B. Execution:

1. Conveying: Care shall be taken with conveying equipment to prevent contamination of exposed concrete by other mixes. Method of conveyance shall be the same for all exposed concrete unless approved by the Engineer.
2. Depositing:
 - a. Lifts shall be a minimum of 12" and a maximum of 18" deep.
 - b. Concrete shall not be dropped more than 6'. Appropriate placement devices shall be used to deposit concrete.
 - c. Place concrete in approximate final location. Do not move concrete with vibrators.
 - d. Stop pours at form joints only.
 - e. Place concrete directly into piles with an elephant trunk or tremie. Concrete shall not be placed when the temperature is above +90°F. or below +45°F. or if likely to go above +90°F. or below +45°F., before the concrete has had its initial set, unless the Contractor takes special precautions to control the temperature of the concrete during that period of time.
3. Consolidation (Internal Vibration):
 - a. Internal vibration shall be used to consolidate all exposed concrete. Maintain a standby vibrator at all times. If a vibrator breaks down, use the standby and obtain another vibrator for standby use.
 - b. Vibrator insertion shall be approximately 18" cc maximum (so that affected areas overlap) within 4" of the form. Do not vibrate concrete within 2'-0" of an unconfined edge. Penetrate preceding lift 6" minimum when one exists. Hold vibrator in concrete until consolidation is complete and withdraw slowly.
4. Compacting: Thoroughly tamp and spade fresh concrete to insure flow into all parts of forms and around reinforcement. Mechanical high-frequency, low amplitude vibrators producing minimum 7500 impulses per minute shall be used, one vibrator at

each pour location per 10 yards per hour. Key pour lifts. Do not vibrate forms unless previously approved by the Engineer. Spade at form faces to bring up entrapped air and assure good surfaces with minimum air bubble pitting, using properly designed hardwood spading tools that will not damage form surfaces or entrap air.

3.05 Pump Method of Placement:

- A. Pump method of placement may be authorized by approval from the Engineer for certain conditions. The work shall be the responsibility of the Contractor, for the efficiency of the method and the adequacy of the results obtained.
- B. Pumps used shall have a demonstrated capacity to deliver to the forms the types of mixes required by these specifications, at the slumps specified in Paragraph 3.01 C, under average job conditions, or those required by this work.

3.06 Placement of Concrete Slabs (Including Self-Supported Slabs and Concrete Fill over Metal Deck):

- A. Preparation: Fine grade earth subgrades smooth and level and sprinkle well just prior to placing concrete. Broom or wash clean deck and form surfaces, leaving no standing water. Place screeds at intervals not exceeding 8'-0". Support screeds on screed support systems that will provide accurate support and shall be adjusted for expected construction deflections for a level floor. Check entire area for inclusion of, and accurate and secure locations of all inserts, anchors, sleeves, chairs, and bolsters, and insure that all steel is properly in place.
- B. Placement: Place at a rate no faster than concrete can be properly leveled and compacted, and at point of final repose, directly ahead of the screed bar, vibrating mass just ahead of the screed. Screed twice, the first to strike a full, rough level and move the concrete mass ahead. Follow this with necessary filling of low areas and another screeding to final level. Remove any puddles of "soup" (laitance), pull screeds and screed supports, and fill all depressions, and tamp with flat-surface or mesh tamper only enough to embed coarse aggregate to permit finishing, a maximum 1/8", allowing as much time between tamping as weather conditions will allow.

- C. Leveling and Floating: Level using leveling floats. Commence fog spray curing as specified below directly following this operation. Allow to stand until water sheen disappears from surface. Power float surface to even surface, producing levels or slopes indicated on drawings. Surface tolerance to be true as specified in ACI 117. Follow with troweling or other finishes as specified hereinafter for "Cement Finish".
- D. Moisture Barrier: Place 6 mil thick polyethylene sheeting in as large sheets as possible and lap at least 6" over a 1" layer of sand. Overlap top layer of the laps in the direction in which the concrete is to be spread and seal all laps with mastic. Turn up and seal sheeting against walls, columns, conduit, pipes, or other penetrations, using mastic, and terminate 1/2" below the finish floor elevation. Make provisions for screed stakes by depressing the moisture barrier to form pockets deep enough so that the screed stakes will not puncture the moisture barrier, and then fill in the pocket with sand. After placing, cover moisture barrier pocket with sand. After placing, cover moisture barrier with a uniform 1" layer of sand. Sand shall conform with requirements of Paragraph 2.02.

3.07 Curing of Concrete:

- A. Cure all concrete for at least ten days. Forms maintained tight and wet are considered adequate curing. Fresh backfill is adequate curing for footings and subgrade walls. Exposed concrete surfaces shall be cured by application of additional procedure.
- B. Horizontal Concrete and Slabwork: Commence curing during finishing of surfaces immediately after "bleed water" disappears by use of fine mist-type fog spray and continued without interruption until application of long-term curing, which shall be done after final troweling when concrete has attained final permanent set and bleeding has stopped. Long-term curing shall be done as specified below.
- C. All Slab Surfaces: Those receiving separate finishes such as toppings or tile setting beds shall be moist cured or cured with reinforced kraft paper or curing mats, maintained moist. Exposed surfaces or those receiving resilient floor finishes may be cured as specified above, or with specified liquid membrane-forming curing compound, applied completely and evenly in strict accordance with manufacturer's directions in two coats, one 90° to the other. Liquid curing compound shall be applied to all formed surfaces immediately upon loosening of forms.

- D. Curing shall conform to ACI 308-71. Proposed methods shall be used in fabricating the sample panel.
- E. Concrete slabs to receive epoxy surfacing shall be cured by water curing method only; curing compounds or chemical agents shall not be used. Concrete shall be cured a minimum of 28 days or until it is completely dry.

3.08 Form Removal:

- A. Forms shall be removed a minimum of 48 hours and a maximum of 72 hours after placing.
- B. Remove forms at approximately the same elapsed time after the pour throughout the job.
- C. Remove tie cones as soon as forms are removed. Care shall be taken when removing cones to avoid spalling the edges of the cone hole.
- D. Forms, shoring and centering shall not be removed until concrete has hardened to permit removal safely and as indicated below:
 - 1. Footings, foundation walls, piers (not over 6' high) - 3 days minimum.
 - 2. Walls, grade beam side forms - 5 days minimum, or when concrete has attained 2/3 of specified strength, whichever is longer.
- E. Take care in removing forms from exposed surfaces that surfaces are not marred or gouged, that corners are true, sharp and unbroken. Break back snapties neatly, without spalling tie holes at surface.
- F. No steel spreaders, ties, or other metal shall project from or be visible on any concrete surface.
- G. Tie holes shall be cleaned, flushed with water and patched while concrete is green, as specified herein-after.

3.09 Stoppages and Construction Joints:

- A. The Engineer shall approve location of construction joints. Stop pours level with vertical keys as detailed. Maximum horizontal dimension of a single unit of placement, 80 feet in a straight line, coincident with designed architectural features.

- B. Provide keys and dowels at construction joints as indicated. Horizontal construction joints required to be bonded to subsequently placed concrete to be sand-blasted or treated with sprayed-on retardant to insure bonding surface. Wash surface to expose aggregate after section has set.
- C. Construction joints (pour joints) in slabs shall be made with "Burke" metal joint form as specified below.

3.10 Slab Control Joints:

- A. Joint Spacing: Provide joints at locations indicated on the drawings, or if not shown, locate joints at 20'-0" o.c. maximum spacing (column center-lines) for interior slabs on grade. Locate joints coincident with architectural building features where applicable. Where possible, locate interior joints under partitions. Use 4-1/2" deep "Burke" metal joint form with tight crimped top. Set joints at indicated lines as side forms and screeds using manufacturer's metal stakes. In placing adjacent slab section, allow for shrinkage through height of slab section. At unexposed slabs, concrete may be finished over top of joint. At exposed slab, joints shall be tooled to produce rounded edges.
- B. Interior and exterior control joints shall be made at 20'-0" o.c. using 1" tooled joint made with jointing tool capable of producing joint 1" deep by 1/8" wide at surface with slightly rounded edges.
- C. Saw-cut joints or expansion joints in concrete slabs to receive epoxy surfacing shall be installed as recommended by coating manufacturer.

3.11 Finishing Exposed Vertical Concrete Surfaces:

- A. Provisions herein apply to all concrete exposed in the finish work, painted or plain, exterior or interior.
- B. Fins, ridges, high spots shall be honed smooth with abrasive brick or power grinders while concrete is green, immediately after specified form removal. Excessive honing is not permitted. Grind all form marks flush.
- C. Rock pockets, honeycomb, sand streaks, shall be cut out at least 1" deep with sides perpendicular to surface, flushed out, coated with neat cement paste and filled with dry pack in at least two layers to overfull, cured and then honed to final correct surface, line or corner.

- D. Thoroughly clean all surfaces of stains, spatter, dust, loose materials, etc., after the building is completed. Contractor shall use a 1/20 muriatic acid or trisodium phosphate wash if directed by the Owner's representative. Rake out and clean roots of all joints to receive caulking.
- E. Exposed exterior formed concrete where painting is required shall have a grout cleaned (sacked) finish.
- F. Any patching required shall be the same color as the surrounding concrete.

3.12 Patching:

- A. All surface defects or damaged areas shall be repaired as soon as possible after form removal to allow patch work to age as nearly as possible along with base material.
- B. Repair techniques shall have been perfected in tests upon the sample panel.

3.13 Plugs:

- A. Form Tie Plugs: Precast plugs in tie holes shall be recessed 1/4" below finished surfaces of concrete. Use epoxy mastic to secure plugs.
- B. Tie plugs shall be Burke "Snaplugs" or similar product by Symons, or equal.
- C. Patch recess to match color of adjacent concrete.

3.14 Cooperation - Embedded Items:

- A. Cooperate with all trades to ensure all conduit, piping, sleeves, inserts are provided for, or properly installed and secured in correct position. Contractor is responsible for correct location of all items. Piping (unless shown on drawings) shall not be cast into concrete, but may pass through in sleeves.
- B. Provide all required openings, reinforce same as required. Set rough hardware provided by others.
- C. Conduits not permitted except where specifically detailed. Conduit and piping below slab on grade to be encased in belled slab. Provide sleeves for pipes or conduit required to pass through walls as approved by the Engineer.

- 3.15 Anchorage, Miscellaneous Metal and Inserts:
- A. Provide and install, or install those provided by others accurately in sizes and in locations shown or required.
 - B. Responsibility: Accrues to the Contractor for all such items substantially in place in proper locations. Also for proper projection of anchor bolts.
- 3.16 Defective Concrete:
- A. Concrete not meeting minimum strength, nor formed as indicated, not true, plumb or level, not to required elevations, containing cracks detrimental to performance or appearance, containing shavings, debris, or has honeycombs or voids, shall be cut out, removed and replaced, or repaired to the Engineer's satisfaction.
 - B. Work required to repair, patch, replace improperly cleaned surfaces (by sandblasting if necessary) or otherwise make good any defective concrete, shall be done promptly by Contractor at his expense, including all expense of additional inspection, tests of supervision made necessary as a result of defective concrete. Also applies to repairing holes resulting from taking cores, if cores are required.
- 3.17 Concrete Finishes for Flat Work: Flat surfaces shall be screeded to the required levels and any excess water and laitance shall be removed. Concrete shall be compacted with a grid tamper and then floated to a true, level surface. Tolerance shall be as specified in ACI 117.
- A. Interior floor slabs which are to remain exposed shall receive a steel trowel finish in two troweling operations. After the concrete has hardened sufficiently so that the fine particles do not work to the surface, the concrete shall be hand or machine troweled to a smooth surface. After hardening sufficiently the surface shall receive a light or heavy broom finish as indicated.
 - B. Outdoor flatwork and exterior concrete walks shall have a hair broom finish. Submit samples of textures for approval.
 - C. Hardened Concrete: All concrete flatwork surfaces designated in the plans or specifications as having a hardened concrete shall be treated with the specified product. Apply at the rate as recommended by manufacturer in accordance with manufacturer's directions. Apply a light broom finish.

- D. Interior Float Finish: Slabs to receive architectural flooring such as ceramic tile, shall be finished with a wood float and lightly broomed and brushed clean to provide bond for the finish materials.
- E. Interior slabs to receive resilient floor covering shall be troweled, but not burnished.
- F. Finish for concrete stair treads and ramps shall be a non-slip broom finish as shown or per details on the drawings.
- G. Provide other finishes where noted.

3.18 Extreme Weather Protection:

- A. Do not place concrete when temperature is below +45°F or above +90°F at the time of placing or it is likely to go below +45°F or above +90°F before the concrete has had its initial set. Precautions must be taken to assure concrete temperature of +70°F for at least 24 hours, and between +45°F and +90°F for an additional nine days, unless climatic conditions make longer periods of controlled concrete temperature desirable. During cold weather, concrete placement shall conform with requirements of "Recommended Practice for Winter Concreting" ACI 306. During hot weather, concrete placement shall conform with requirements of "Recommended Practice for Hot Weather Concreting" ACI 305. Protective measures proposed must be submitted for the Architect's approval. Do not mix chemicals or other foreign materials with concrete for purpose of preventing freezing or drying out. In freezing weather, an approved membrane sprayed curing compound shall be used in lieu of moist curing.
- B. Do not allow the concrete to freeze in cold weather or dry out in hot weather under any circumstances during the curing period. Provide all the equipment necessary to prevent any of these two events to happen. Should the Contractor allow any concrete to either freeze or dry out, it may be required, at the discretion of the Architect that the concrete in question be removed and replaced with new concrete.
- C. Keep permanent temperature record showing date and outside temperatures. Take thermometer readings at start of work in morning and noon and high-low during night. Record readings obtained.
- D. Heating for Cold Weather Concreting:

1. Provide and maintain space heaters to provide temporary heat 24 hours per day to protect curing concrete work when outdoor temperatures at site are below +55°F. Distribute space heaters to provide inside temperature of +55°F in parts of building where concrete is being placed or being cured. When temporary heat is required, enclose work with tarpaulins, ballooned at top and bottom so that all sections of work will be maintained at +55°F. Enclosure: wind-proof and strong enough to resist weather and wind conditions. Enforce strict fire prevention methods. Take caution to direct heat so that the concrete is not subjected to excessive temperatures or drying out. In place of space heaters for outside form surfaces, vapor-proof blanket insulation may be used, provided that above concrete temperatures are maintained. Provide adequate and tight moisture barriers for at least 5 days to prevent drying out of concrete.
 2. Temporary Heat: Smokeless hot air unit heaters or steam. Salamanders not permitted. Keep all temporary heating equipment properly fueled and attended.
- E. Whenever there is doubt as to suitability of weather conditions, the Contractor proceeds with concrete work at his own risk.

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DIVISION 4 - MASONRY

SECTION 04200 - CONCRETE BLOCK MASONRY

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of General Provisions and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Provide concrete block units.
- D. Provide cement cap at fence wall.
- E. Place reinforcing steel in masonry, except dowels in concrete for masonry work.
- F. Set sleeves, inserts, reglets, anchor bolts, and other embedded items related to masonry work or embedded in masonry.
- G. Temporary shoring for lintel block.
- H. Sandblasting of block.

1.02 Related Work in Other Sections:

- A. Furnishing reinforcing steel - refer to Section 03200.
- B. Furnishing sleeves, inserts, reglets, lintels, anchor bolts and other embedded items required to be set in masonry - refer to Sections 05500, 07600, and other applicable sections.
- C. Testing and inspection - refer to Section 01400.
- D. Installation of door and window frames - refer to Section 06100.
- E. Clear waterproof coating - refer to Section 07175.

1.03 Submittals: Submit shop drawings, manufacturer's technical data and material specifications, and samples, as applicable.

- A. Before starting any work, samples of each kind of block shall be submitted for approval. All materials used on the job shall conform to the approved samples.

- B. A sample panel of each type of material used, approximately 4' high, 6' long and one wythe thick, shall be laid up on suitable foundation and in a protected location on the site. This panel shall be erected for approval by the Owner's Representative and, if not satisfactory, shall be rebuilt as directed. All finish work shall conform with the approved sample panel. Panel shall be protected and shall remain until the masonry work has been completed and then removed from the job. Panel may be part of the work.

ARTICLE 2 - PRODUCTS

2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.

2.02 Materials:

- A. Concrete Block: Hollow 115 PCF, high temperature steam cured, load bearing units, conforming to ASTM C90, Grade N-1, 8" x 8" x 16" nominal, and 12 x 8 x 16 nominal or as noted on drawings.
1. Block shall be standard block with vertical scoring on both sides to simulate 8" x 8" block. Provide lintel block at all openings.
 2. Block shall be medium sandblasted prior to installation in such a manner as to match samples in office of Engineer. Submit samples for approval. Refer to Paragraph 3.03.
 3. Block shall be supplied in two colors: Equal to Angeles No. 200 MW and Angeles No. 304 LW.
- B. Portland Cement: Low alkali and conforming to ASIM C150, Type I or II.
- C. Sand: ASTM C144, except that no less than 4% or more than 10% shall pass the No. 100 sieve.
- D. Pea Gravel: ASTM C404 graded with not more than 5% passing the No. 8 sieve with 100% passing the 3/8" sieve.
- E. Hydrated Lime: ASTM C207, Type S, containing 85% calcium oxide by weight.
- F. Water: Clean, from domestic supply.

- G. Admixture: For use in grout and mortar - Sika Red Label and Grout-Aid, one pint per sack of cement.
- H. Anchors and Ties: Anchors and ties shall be of zinc-coated steel. Zinc-coating shall conform to ASTM A153. Corrugated or crimped ties shall be not less than 7/8" wide and of not less than 16 gauge (0.0598") zinc-coated sheet steel and not less than 6" long.
- I. Expansion Joint Material: Conform with Section 07900 for caulking and sealants and compressible backer material.

2.03 Mortar and Grout Proportions:

- A. General: All parts by volume measurement.
- B. Mortar: 1 part portland cement, 4 parts sand, 1/4 part minimum to 1/2 part maximum hydrated lime and admixture.
- C. Grout: 1 part portland cement, 2-1/4 parts minimum to 3 parts maximum damp loose sand, 2 parts pea gravel and admixture in proportion as recommended by manufacturer.
- D. Cement Cap: Proportions shall comply with requirements of Section 03300 for concrete walks except aggregate shall not exceed 1/2" size.

2.04 Mixing Mortar and Grout:

- A. General: Determine all parts of mortar and grout by accurate volume measurements and mix in mechanical mortar mixer in batches containing not less than one full sack of cement, unless otherwise approved.
- B. Order to Mixing: In mixing each batch of mortar or grout, mix the water, sand and cement until a smooth plastic mass without lumps is obtained. Grout shall contain sufficient water to cause it to flow freely without segregation.
- C. Retempering and Time Limit: Maintain mortar plastic and grout fluid continuously until used. Retemper on the mortar boards only by adding water within a basin formed with the mortar and work mortar into the water. Dashing or pouring water over the mortar will not be permitted. Do not retemper or use the mortar which has become harsh and nonplastic. When mortar has been maintained plastic, and grout fluid, they may be used up to but not more than one hour after original mixing.

- D. Mortar specimens shall develop not less than 1000 psi at 7 days and 1800 psi at 28 days (Type S). Grout prisms shall develop 1200 psi at 7 days and 2000 psi at 28 days.

ARTICLE 3 - EXECUTION

3.01 Masonry Installation:

- A. General Requirements: All work shall be plumb, level and true to within 1/8" in 10'-0" of line and dimensions shown on the drawings. Wetting of block will not be allowed.
- B. Laying Masonry: Lay up masonry in running bond in full bed of mortar with head joints solidly filled with mortar and shove into place. Mortar bed shall be leveled back from grout space. Furrowing is prohibited. If necessary to move or shift a unit already laid, remove all setting mortar, clean and apply only fresh mortar for final placement.
- C. Unless specifically shown on the drawings, no masonry less than 1/2 length will be allowed in the work.
- D. Mortar in all bed joints shall be full-rounded. Furrowing of bed joints will not be permitted.
- E. All head or end joints shall have sufficient mortar to form dams to retain grout. Grout in lifts of no more than 2'-0" unless high-lift grouting is used in conformance to the Building Code or O.S.A. IR 24-4.
- F. Sawcut all required cuts, slots, bevels, angles, etc.

3.02 Special Requirements:

- A. Extreme care shall be employed to prevent any grout or mortar from staining the face of the masonry to be left exposed. If any grout or mortar does contact the face of such masonry, it shall be removed immediately. Unless work is kept absolutely clean, Contractor may be required to remove and replace the work at his own expense.
- B. Protect all adjoining work from dropping of mortar or grout.
- C. Where fresh masonry joins masonry that is partially or completely set, the exposed surface of the set

masonry shall be cleaned with a wire brush and lightly wetted so as to obtain the best possible bond with the new work.

- D. Wherever possible, grout from inside face of the masonry. Fill all wall cavities by pouring full of grout. Puddle or vibrate grout immediately and sufficiently to cause it to fully encase the reinforcing steel. The use of a trowel for puddling is prohibited. If the work is stopped for one hour or longer, the grout shall be stopped 1-1/2" below the top.
- E. Stopping: Where it is absolutely necessary for construction purposes to stop off a longitudinal run of masonry, rack back each course and stop the grout 4" back of the rack. Tothing will not be permitted unless special approval is given.
- F. Jointing:
 - 1. General Requirements: Maintain uniform joints throughout. Solidly fill all joints between units and between units and other materials. Fill all holes made by line pins in exposed work.
 - 2. Joints: Strike all joints flush and tool to a smooth concave surface. Concealed joints receiving membranes shall be struck flush. Where shown joints shall be sacked or cut flush.
 - 3. Expansion Joints: Not to exceed 24' o.c. and shall comply with requirements of Section 07900.
- G. Reinforcing: Accurately set and place all reinforcing steel, except dowels in concrete, in strict accordance with the drawings and notes thereon. Secure vertical steel firmly in place by means of frames or other suitable devices. In any space containing reinforcement, clear distance between masonry and the reinforcement shall be at least 1/2 inch at all points.
- H. Curing: All work shall be cured for 3 days by light sprinkling (do not use heavy watering) twice each day.

3.03 Sandblasted Finish:

- A. All sandblasted surfaces of concrete block shall be abrasive blasted in such a manner that the resulting

surfaces shall have a uniform appearance similar in all respects to a medium sand blasted texture finish to match sample on file. Sandblasting method shall be approved by local governing authorities.

B. All exposed surfaces of block shall be blasted with an abrasive that will not adversely affect the color of the finished surface.

C. Match approved samples.

3.04 Protection and Cleaning: Protect corners subject to possible damage with substantial board covers. Clean off any mortar or grout on masonry work immediately. Any masonry showing mortar or grout at completion of work shall be replaced. All holes and/or openings 1/8" or larger shall be tuck-pointed with the same mortar mix as used in laying masonry.

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DIVISION 5 - METALS

SECTION 05100 - STRUCTURAL STEEL

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of General Provisions and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Provide steel girders, beams, purlins, columns, and all other fabricated and rolled shapes shown on structural drawings.
- D. Bolting and welding.
- E. Base and bearing plates, shims and wedges.
- F. Punching of holes for attachment of work of other trades.
- G. Shop prime coat.

1.02 Related Work in Other Sections:

- A. Miscellaneous items of steel and iron - refer to Section 05500.
- B. Grouting of column base plates and installation of cast-in-place items furnished under this section - refer to Section 03300.
- C. Tests and Inspections - refer to Section 01400.

1.03 Requirements:

- A. Submittals: Submit shop drawings, manufacturer's technical data and material specifications, as applicable.
- B. Certification of Materials: Identify all structural steel by heat or melt number and accompany with mill analysis and test reports. Furnish evidence to the Architect that the materials conform with the requirements of these specifications.

C. Fabrication and Erection:

1. Perform all work in accordance with the applicable provisions of the AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings," and AWS "Structural Welding Code", latest edition.
2. All structural steel, both in the shop and in field shall be transported and handled and erected in such manner as will preclude any injury thereto and, in no case shall the material be subjected to any undue stresses in any part of connection.

E. Cooperation: Coordinate the work in the structural steel section with that of all other sections. Provide all punchings and drilling indicated on the drawings, or required for the attachment of their work to the structural steel framing for pipe and duct supports, anchors, aluminum sash, doors and similar work. Provide necessary drilling and punching; accurately locate and arrange to receive and engage the same.

F. Field Measurements: Before starting work, secure all field measurements pertaining to or affecting the work of this section and verify the locations and exact position of all anchor bolts occurring therein.

ARTICLE 2 - PRODUCTS

2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.

2.02 Materials:

- A. Structural steel shall conform with ASTM A36 for shapes, plates and bars.
- B. Welding electrodes shall conform with AWS D1.1, E70, series. Electrodes for welding reinforcing steel to be low hydrogen electrodes.
- C. Unfinished bolts and anchor bolts shall conform with ASTM A307. High strength bolts shall conform to ASTM A325, friction type.
- D. Headed Welded Studs: Nelson "Granular Flux-Filled Shear Connector and Anchor Studs", - "KSM Shear Connector Studs" or approved equal, manufactured of C1015, 1010, 1017, or 1020 cold-rolled steel conforming to ASTM A108.

- E. Pipe columns shall be ASTM A53, Grade B.
- F. Tube steel shall be ASTM A501, Grade B, 42 ksi.
- G. Primer Paint:
 - 1. General: All primer paint shall be compatible with the finish coatings described in Section 09900 of these specifications.
 - 2. The standard shop paint shall conform to one of the following:
 - a. Steel Structures Painting Council Specification 15-68T, Type I (red oxide).
 - b. Steel structures Painting Council Specification 15-68T, Type II (asphalt coating).
 - c. Fed. Spec. TT-P-86g, Type II or TT-P-636d.
 - d. Or, shall be a shop paint which meets the minimum performance requirements of one of the above listed specifications.

ARTICLE 3 - EXECUTION

3.01 Welding:

- A. Structural welding (shop and field) shall be done by the electric submerged or shielded metal arc process and shall have inspection by the laboratory of record. Operators shall be thoroughly trained and experienced in arc welding of structures, capable of making uniformly reliable butt and fillet welds in flat, vertical and overhead positions and by producing neat and consistent work in actual operation. Each operator shall have passed all welding tests of the American Welding Society.
- B. Surfaces to be welded shall be free of any paint, grease, loose scale and foreign matter. Clean welds each time the electrode is changed and chip clean all burned or flame-cut edges before welds are deposited thereon. The same electrode may be used with various thicknesses of plate, but change current used and number of passes made proportionately.
- C. After being deposited, brush welds with wire brushes. Welds shall exhibit uniform section, smoothness of welded metal, feathered edges without undercuts or overlays, and freedom from porosity and clinkers.

Visual inspection at edges and ends of fillet and butt joint welds shall indicate a good fusion with penetration into base metal.

- D. During assembly and welding, hold component part of a built-up member with sufficient clamps or other adequate means to keep the parts straight and in close contact. In welding, precautions shall be taken to minimize "lockup" stresses and distortion due to heat. No welding shall be done under windy conditions until adequate wind protection screening has been provided. Any welds or parts of welds which are found to be defective shall be cut out with a chisel and replaced.
- E. The maximum space between members to be butt welded shall not exceed 1/4". Bevel all pieces or members up to 1/8" thickness to form a single or double "vee" before being welded. Bevel welds over 3/8" in thickness to form a double "vee" wherever possible.
- F. Lay fillet welds in the position indicated on the drawings and to the sizes shown. In measuring fillet welds, consider only the effective portion. The maximum space between pieces for members to be fillet welded shall not exceed 1/16".

3.02 Erection:

- A. Erect all structural steel with qualified riggers and carefully plan and lay out so that a minimum of cutting shall be required. Erect work plumb, square and true to line and level, and in precise position, as indicated. Provide temporary bracing and guys, wherever necessary, to provide for the loads and stresses to which the structure may be subjected, including those due to erection equipment and their operation, and leave in place as long as it may be required for safeguarding all parts of the work.
- B. As erection progresses, securely bolt up work as required to maintain the steel in proper position while field bolting and welding is being done and as required to take care of all deadloads, wind and erection stresses. No field bolting or welding shall be done until the work has been properly aligned, plumbed and leveled.
- C. Set each column base plate in exact position as to alignment, plumb and height. The center of each base shall be true to the column center within a tolerance of 1/16", and its height shall be adjusted in exact position. Maintain all bases at the exact position and level while they are being grouted.

- D. Carry out erection of structural steel work in proper sequence with the work of other trades, and frame, bed and anchor to concrete and related work in strict accordance with the detail drawings and approved setting drawings.

3.03 Connections:

- A. Unfinished Bolts: Make field connections with unfinished bolts only where indicated.
- B. High Strength Steel Boltings: Where structural joints are made using high strength bolts, hardened washers and nuts tightened to a high tension, the materials, method of installation and tension control, types of wrenches to be used, and inspection methods shall conform to Specification for Structural Joints using ASTM A325 or A490 bolts, established by the Research Council on Riveted and Bolted Structural Joints, of the Engineering Foundation.
 - 1. High strength bolts used shall have a suitable identifying mark placed on top of the head before leaving the factory.
 - 2. Tightening of nuts shall be done with properly calibrated wrenches. The minimum bolt tension for the size of bolt used shall be in accordance with tables listed in the above-referenced standards.
 - 3. Calibrated wrenches shall be checked individually for accuracy at least once daily for actual conditions of application.
 - 4. Bolts that have been completely tightened shall be marked with identifying symbol.
 - 5. Hardened washers shall be installed as per AISC Specifications.
 - 6. Contact bearing surfaces of bolted parts shall be free of scale, slag, burrs, and pits, or dirt, paint, or other foreign material and/or any defects which would prevent solid seating of parts.
 - 7. Bolt lengths shall be the grip plus 1-1/4".

- 3.04 Headed Welded Studs: Perform inspection of all shop and field welding. Type and capacity of welding equipment shall be checked and approved by Welding Inspector. At the beginning of each day's work make minimum of two test stud welds with equipment to be used to metal which is same as

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actual work piece. Test studs shall be subjected to 90° bend test by striking them with heavy hammer. After test, weld section shall not exhibit any tearing out or cracking.

- 3.05 Anchor Bolts: Inspect the installation of anchor bolts, make all necessary field measurements and, if necessary, furnish templates to insure that all structural steel will fit the job conditions. Locate all columns as indicated on the drawings. Setting of anchor bolts, in hardened concrete, which may be necessary because of error or oversight, and in existing concrete work, shall be made in suitable drilled holes and solidly grouted in place, under the direction of the Engineer.
- 3.06 Finish: Clean all steel and iron of any grease, rust, mill scale, or other foreign matter, and give one shop coat not less than 1.5 mils thick, of the specified primer. Material to be embedded in concrete shall not be primed. Clean and repair damaged shop prime coat in field with same prime as used in shop.

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DIVISION 5 - METALS

SECTION 05300 - METAL DECKING

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Provide steel roof deck units.
- D. Provide steel floor deck units.

1.02 Related Work in Other Sections:

- A. Structural steel - refer to Section 05100.
- B. Cutting of openings other than those indicated on the structural drawings: Provided under those other applicable sections.
- C. Tests and inspections - refer to Section 01400.

1.03 Submittals: Submit shop drawings, manufacturer's technical data and material specifications, as applicable.

- A. Note diaphragm deck welding pattern on shop drawings.
- B. Comprehensive manufacturer's descriptive data including specifications and installation recommendations. Specifications shall include all physical properties and load tables.

1.04 Quality Assurance - Reference Standards:

- A. Sections and properties of metal shall conform to minimum specifications for the design of "light gauge cold formed steel structural members" as published by AISI.
- B. The Standards of the Steel Deck Institute, the Factory Mutual Engineering Association Loss Prevention Data Sheet 1-289 requirements, and all applicable codes and ordinances shall be fully complied with.

- C. Deck is designed for diaphragm action to resist lateral forces. Welding pattern provided shall conform to an approved ICBO welding pattern arrangement.
- 1.05 Product Delivery, Storage and Handling: Deliver, store and handle metal decking in such a manner that it will not be damaged or deformed. Exercise special care so as not to damage or overload the decking during the entire construction period. Do not use metal decking for storage or as a working platform until the sheets have been welded in position. Stack decking stored at the site before erection on platforms or pallets and suitably protect from the weather.
- 1.06 Suspended Acoustic Tile, Gypsum Board and Plaster Ceilings: Ceiling can be hung from metal deck with hangers spaced at 4'-0" o.c. maximum each way. Weight of ceiling material shall not exceed 5 lbs. per sq. ft. Ceiling hanger connection to metal deck shall be as shown on Architectural Drawings. No other items can be hung from the metal deck without Engineer's approval.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.
- 2.02 Materials:
- A. Galvanized Metal Deck:
1. Sectional profile, depth and minimum gauge are indicated on the structural drawings.
 2. Upper surfaces of the roof deck ribs shall be flat. Roof decks with stiffening grooves in the top horizontal hats of units are not acceptable.
 3. Decking to receive membrane roofing shall be vented (slotted or perforated) galvanized corrugated metal deck.
- B. Steel for Galvanized Deck: ASTM A446, Grade A.
- C. Flashing and Closures: Galvanized sheet steel as specified for decking.
- D. Protective Coating: Zinc, ASTM A525 and FS-QQ-S-775d type 1, class e, G-60.

E. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with Mil. Spec. MIL P-21035.

- 2.03 Fabrication: Form deck units in lengths to span three or more support spacings with flush, telescoped or nested 2" end laps and interlocking side laps, unless otherwise shown or specified.

ARTICLE 3 - EXECUTION

- 3.01 Install all decking as per governing codes, drawing requirements, and manufacturer's specifications and recommendations.
- 3.02 Ship all deck units to job site in standard widths and cut to proper lengths such that end joints occur over supporting members. Perform all column notching, bevel cuts and other field cuts as required.
- 3.03 Place steel deck units on supporting framework and adjust to final position with proper bearing before permanently fastening. Verify that supports are properly aligned and sufficiently level to permit proper bearing and report all discrepancies.
- 3.04 Provide flashings and closures where required to prevent concrete leakage. Provide between decking and columns and at open ends of all cell runs at columns, walls, openings, etc., and those which occur where cells change direction. Fasten in place by welding or sheet metal screws as per manufacturer's directions.
- 3.05 The positioning and placement of stud shear connectors shall be in accordance with the WS specification on requirements for stud welding and as detailed on the drawings. The height of stud shall be a minimum of 1-1/2" above the top deck flute and a minimum of 1" below the top concrete surface.
- 3.06 Make all welds in accordance with structural drawings. Use only welders certified for welding in light gauge metal.
- 3.07 Opening reinforcement shall be as detailed on the drawings. Cutting of holes other than those detailed on the drawings shall be done only as specifically approved by the Architect. Holes not shown on structural drawings shall be cut and reinforced in accordance with details on drawings under

this section but shall be located and paid for by trade requiring openings. In general, reinforcing is not required for holes 6" or less in diameter.

- 3.08 Leave slag in place at welds to be covered by concrete. Elsewhere touch up all welds and field cut edges with galvanizing repair paint. Grind smooth all welds in areas that will be exposed to view.

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DIVISION 5 - METALS

SECTION 05500 - MISCELLANEOUS METAL

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Pipe railings, pipe sleeves, handrails and brackets.
- D. Pan type stairs and landings and checkered plate type stairs and landings.
- E. Gratings.
- F. Steel ladders.
- G. Supports for ceiling hung toilet partitions.
- H. Steel angle corner guards, pipe guards and rails.
- I. Channel door frames.
- J. Steel curbs where ducts penetrate roof deck.
- K. Structural shapes not included in structural steel work.
- L. All formed and bent plate 14 gauge and heavier.
- M. Chain guards at pits.
- N. Supports for metal wall siding.
- O. Nonslip nosings at stair treads.
- P. Miscellaneous structural steel shapes and plates for attaching to and supporting elevator guide rails, except where shown on Structural Drawings.
- Q. Sill supports for elevator entrances.

- R. Pipe supports for benches.
- S. Checkered plate flooring.

1.02 Related Work in Other Sections:

- A. Structural steel - refer to Section 05100.
- B. Backing plates, sleeves, and other items in connection with plumbing, electrical and mechanical work - refer to respective sections.
- C. Rough hardware - refer to Section 06100.

1.03 Requirements:

- A. Submittals: Submit shop drawings, manufacturer's technical data and material specifications, and samples, as applicable.
- B. Field Measurements: Secure all field measurements required for proper and adequate fabrication and installation of all work covered by this section. Exact measurements are the Contractor's responsibility. Field alterations will not be permitted without approval of the Engineer.
- C. Dissimilar Metals: Where metals are in contact with plaster, concrete or other type metals, paint contact faces of the metal before installation, with heavy bituminous coating.

ARTICLE 2 - PRODUCTS

2.01 General:

- A. All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.
- B. All metals shall be free from any defects which would impair the strength, durability, appearance, and shall be of the best commercial quality, for the purposes intended and adequate to withstand the strains and stresses to which they will be subjected. Metals shall be protected from injury at the job, in transit, and until erected in place, inspected, and approved.

2.02 Materials:

- A. Structural steel such as rolled shapes, angles, plates, anchors, clips, etc. shall conform with ASTM A36.
- B. Architectural and miscellaneous steel shall be mild steel.
- C. Steel pipe other than structural pipe shall conform with ASTM A120.
- D. Sheet steel shall be high quality, low carbon, not-rolled sheet with good welding and forming qualities.
- E. Galvanized sheets, where required, shall be hot-dipped and tight coated steel sheet as per ASTM A525. Coating weight shall be not less than 1.25 oz. per square foot.
- F. Galvanizing structural member, angles, channels, bolts, etc., shall conform to ASTM A123, G-90.
- G. Primer Paint:
 - 1. General: All primer paint shall be compatible with the finish coatings described in Section 09900 of these specifications.
 - 2. The standard shop paint shall conform to one of the following:
 - a. Steel Structures Painting Council Specification 15-68T, Type I (red oxide).
 - b. Fed. Spec. TT-P-86g, Type II or TT-P-636d.
 - c. Or, shall be a shop paint which meets the minimum performance requirements of one of the above listed specifications.
- H. Cast steel shall conform with ASTM A27.
- I. Iron castings shall conform with ASTM A48.
- J. Checkered plate: 4-way galvanized, medium checkered plate as manufactured by Inland Steel or Ryerson Steel "Multi-Grip" S-400.

- K. Malleable iron castings shall conform with ASTM A47.
- L. Machine bolts shall conform with ASTM A307.
- M. Anchors for securing items of miscellaneous metal to concrete and masonry shall be cinch anchors, or approved equal, not less than 3/8", and of the threaded type for anchoring with the bolt head out. Anchor bolts where set in concrete shall be hook type, not less than 1/2".
- N. Welding electrodes shall conform with AISC and the Code for Arc and Gas Welding in Building Construction, A.W.S. Publication D1.1, use E-70XX Series Electrodes.
- O. Metal gratings and trench covers and frames shall be galvanized traffic or non-traffic type, sizes and shapes as required.
- P. Nonslip nosings at stairs shall be equal to Wooster No. WP-4SP, American Abrasive Metals No. DS4AL, or equal.

ARTICLE 3 - EXECUTION

3.01 Welding:

- A. Except for any modifications indicated on drawings and/or specified herein, the AISC Code of Standard Practice for Steel Buildings, and the AWS Code for Fusion Welding and Gas Cutting in Building Construction, both as amended to date, shall govern all materials, fabrication and erection of all work under this section.
- B. Make all welds in accordance with the best standard practice. Perform welding on the unexposed sides to prevent pitting, discoloring, weld-halo and other surface imperfections. Thoroughly clean surfaces to be welded. Welds shall show a uniform section and reasonable smoothness, without any distortion. Dress and finish exposed surfaces of welded joints to produce invisible connections. Furnish welding alloys in the same color and character as the surfaces of the metals joined.

3.02 Workmanship, Fabrication and Erection:

- A. Workmanship shall be in accordance with the best standard practices of the trade and shall be done by mechanics skilled in the type of work required. Insofar

as possible, fit and shop assemble all work ready for erection. Accurately make jointing and intersections in true planes, and with adequate fastenings. Make exposed joints even and smooth, and grind exposed weld joints smooth and flush.

- B. Provide holes of the proper size and in the correct location as required for attachment of the work of other trades. Cut, tap, and drill as required. All finished items shall be free from kinks, twists, burrs, and open joints. Damaged or distorted materials will not be acceptable.
- C. Work to be built in with concrete, or masonry, shall be of the proper form required for anchorage, or be provided with concealed anchors.
- D. Form all work true to detail, with clean, straight, sharply defined profiles. Exposed joints shall be close fitting and made where least conspicuous.
- E. Install supporting members, fastenings, frames, hangers, bracing, brackets, bolts, angles, and the like; all as required to set and connect all items of miscellaneous metal to concrete and steel framing.
- F. Countersink holes for exposed screwheads. Provide all necessary lugs, brackets, and clips so that the work can be assembled and installed in a neat and substantial manner.
- G. Conceal fastenings where possible. Unless otherwise indicated, bolts and screwheads shall be flathead or countersunk oval, as best suited for the purpose.
- H. Weld in place plates for mounting any items of finish hardware.
- I. Provide all bolts, anchors, inserts, and other miscellaneous steel and iron fastenings in forms before concrete is poured, or built into masonry, as indicated on drawings, details or schedules, or as necessary to complete the work. Examine and check the Architectural, Structural, Mechanical, and Electrical Drawings for number, type and locations of such items.

3.03 Miscellaneous Items:

- A. Furnish, fabricate, and install all miscellaneous angles, channels, bent plate, clips, anchors, and other

miscellaneous metal work required for the complete job as indicated on the drawings. Form such as detailed or if not detailed, as required for the location and purposes served, and in accordance with the applicable provisions specified herein. Furnish and install all miscellaneous metal items not specifically mentioned herein, or in other sections, but which are customarily considered as part of the work, the same as if fully specified herein and detailed on the drawings.

- B. Furnish and install light steel structural items not noted on Structural Drawings or called for under "Structural Steel" section but which are shown on the Architectural Drawings or as required to complete the specified work.
- C. Furnish and install sleeves through masonry or concrete walls and footings as required, of standard weight steel sections of a size sufficient to allow 1/4" clearance all around between the sleeve and item to be inserted.
- D. Furnish and install anchors, brackets, and plates of suitable steel where required in connection with steel, iron, masonry and concrete construction.
- E. Pan Type Stairs:
 - 1. Stair stringers, unless otherwise indicated on drawings, shall be steel channels. Treads and risers for pan type stairs shall be not less than 14 gauge steel. Treads and riser brackets shall be steel angles. Subplatforms for pan type stairs shall be not less than 14 gauge steel reinforced with angles or tees and bolted to the framing, or steel decking. Furnish all anchors, bolts, hangers, supports, and other accessories needed for complete assembly and installation. Bolting shall have concealed or flush heads. Install stairs accurately and securely as detailed on the approved shop drawings.
 - 2. Form subtreads and platforms with bent nosing and bottom of riser to provide a key to receive the poured in place cement fill.
- F. Channel Supports for Ceiling Hung Toilet Partitions: Furnish and install channel supports over all ceiling hung toilet partitions. Suspend from structure above with rod hangers and clip angles as detailed. Punch lower flange of channel with 3/8" holes or as required to suit toilet compartment details.

- G. Ladders: Vertical steel ladders shall be of widths, as indicated, fabricated from 3/8" x 2-3/4" mild steel side rails and 3/4" non-skid round steel rungs with square ends headed into rails, and the ends upset. Rungs shall be spaced not over 12" on center. Ladders shall be anchored at the bottom, top and at intermediate points not more than 5' apart with brackets secured with expansion bolts. Brackets shall be of the same size as side rails and, unless otherwise indicated, shall hold the ladder 5" away from the wall.
- H. Pipe Handrails and Railings:
1. Fabricate steel pipe handrails of standard weight steel pipe, sizes and shapes as indicated. Railings shall be flush type with joints welded and ground smooth. Secure rails to concrete with flange fittings and expansion bolts. Secure railings to stud walls with flanges bolted to backing plates. Backing plates are included in Sections 09200 and 09250.
 2. Return pipe handrail ends against the adjacent walls and cap. Weld vertical pipe supports to the channels or fit over steel dowels welded to the top flange of channel stringer and secure over the dowel with flush head set screws. Grind bottom edges of vertical pipe supports smooth and flush with top flange of channel stringer. Include all hangers, bolts, angles, brackets, and other accessories required for complete assembly and installation. At concrete floor terminations, set pipe rail standards in pipe sleeves, previously cast in concrete, and set in place with Por-Rok, manufactured by the Hallemite Company. Wherever required, removable rails and gates shall be provided.
- I. Safety Chains and Guard Rails: Construct safety chains of galvanized wrought iron, straight link type, 3/16" diameter with at least 12 links per foot, and with snap hooks on each end. Snap hooks shall be boat type and eye bolts for attachment of chains shall be galvanized 3/8" bolt with 3/4" eye diameter, anchored as indicated on the drawings. Two chains, 4" longer than the anchorage spacing, shall be supplied for each guarded area. Locate guard rails where indicated on the drawings. Mount the top chain or rail 3 feet 6 inches above the floor and mount the lower chain or rail 2 feet above the floor.

- J. Neatly fabricate steel channel and angle frames for doors, duct openings, scuttles, mechanical equipment, louvers, and other frames as shown and detailed to the exact size required and in accordance with approved shop drawing. Corners shall be neatly joined, welded and ground smooth. For securing to concrete or masonry weld concealed anchors on the back. Secure bar stops to frames with countersunk flathead screws or plug weld from the back. Wherever required, prepare steel frames to receive the necessary hardware. Where mechanical equipment such as fans, blowers, etc., and sheet metal are shown or specified to be attached to steel frames, the drilling, tapping, and attachment will be done by trade involved.
- K. Furnish curb angles, corner guards, bumpers, etc., of the sizes and shapes called for and with anchors welded to the backs and of the sizes and spacing shown.
- L. Provide and install miscellaneous rolled shapes in connection with elevator work as required for a complete installation.
- M. Checkered Plate Stairs: Stair stringers, unless otherwise indicated on drawings, shall be steel channels. Treads for checkered plate stairs treads shall be not less than 3/16". Risers shall be not less than 16 gauge plain steel. Tread and riser brackets shall be steel angles. Furnish all anchors, bolts, hangers, supports, and other accessories needed for complete assembly and installation. Bolting shall have concealed or flush heads. Install stairs accurately and securely as detailed on the approved shop drawings.

3.04 Finish:

- A. Except where indicated, or specified to be galvanized, clean all miscellaneous steel and iron of any grease, rust, mill scale, or other foreign matter, and give one shop coat not less than 1.5 mils thick of the specified primer. Material to be embedded in concrete shall not be primed. Galvanize all exterior metal items. Touch up in field with primer paint comparable to shop applied primer.
- B. After welding is completed, repair any damage to the galvanizing by applying "Drygalv" as manufactured by Dynaflux, North Carolina, local wholesaler: Fesco Inc., Los Angeles, (213) 254-9131; "Galvicon" as manufactured

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by Southern Coatings, Inc., South Carolina, local distributor: V.B. Anderson Co., Santa Ana, (714) 547-6684; "Z.R.C. Cold Galvanizing Compound" as manufactured by Z.R.C. Chemical Products Co., Massachusetts, local distributor: Mechanical Distributors, Whittier, (213) 698-6655. Apply touch-up as per manufacturer's instructions to provide a coating equal to the original finish.

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DIVISION 6 - WOOD AND PLASTICS

SECTION 06100 - ROUGH CARPENTRY

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Blocking and nailers.
 - D. Miscellaneous items of rough carpentry work indicated on the drawings and required for a complete job.
 - E. Install pressed metal door and window frames in concrete block walls.
- 1.02 Related Work in Other Sections:
- A. Finish Carpentry and Millwork - refer elsewhere in Division 6.
 - B. Concrete Formwork - refer to Division 3.
 - C. Installation of pressed metal door and window frames in gypsum wallboard walls - refer to Section 09250.
- 1.03 Submittals: Submit shop drawing, manufacturer's technical data and material specifications, as applicable.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.
- 2.02 Materials:
- A. Blocking and Nailers: Douglas Fir, "Construction" grade, pressure treat with chromate zinc chloride.

- B. Plywood: Conform to U.S. Product Standard P.S. 1-74. Plywood shall be grade-marked by the American Plywood Association (APA), Pittsburgh Testing Laboratories (PTL) or Timber Engineering Company (TECO). Plywood shall be exterior grade, structural.
- C. Nails, Screws, and Lag Screws: Commercial Standard.
- D. Bolts and Washers: American Standard.
- E. Treated Lumber: Cut surfaces in treated lumber shall be given a brush coat of approved type preservative.
- F. Fire Retardant: All wood and plywood shall be treated with Baxter "Pyresote", Barnard "Bar Flame" or equal.

ARTICLE 3 - EXECUTION

- 3.01 Provide and securely fasten in place all blocking and nailers and other rough carpentry work indicated or required to complete the work.
- 3.02 Erect door frames in accordance with the drawings, shop drawings and manufacturer's details for applicable conditions.

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DIVISION 6 - WOOD AND PLASTICS

SECTION 06200 - FINISH CARPENTRY AND MILLWORK

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Backboards for telephone and electrical equipment.
 - D. Job-built shelving, laminated plastic and plywood.
 - E. Laminated plastic counters.
 - F. Laminated plastic faced cabinet work.
 - G. Oak gratings at Battery Room.
 - H. Installation of finish hardware, except items installed under Sections 08100, and 08400.
 - I. Miscellaneous items of wood finish indicated on the drawings or required for a complete job.
- 1.02 Related Work in Other Sections:
- A. Rough carpentry work - refer to Section 06100.
 - B. Metal doors - refer to Section 08100.
 - C. Paint finishes - refer to Section 09900.
 - D. Dry wall - refer to Section 09250.

1.03 Requirements:

A. Submittals: Submit shop drawings, manufacturer's technical data and material specifications, and samples, as applicable.

1. Shop Drawings:

- a. Submit shop drawings for all work, identified with location, quality, grade, type of finish and species of wood.
- b. Affix Certified Compliance Grade Stamp indicating grade specified to the shop drawings, certifying that work will be manufactured in accordance with the grade specified.
- c. The mill shall take such field measurements as may be required for their work and be responsible for same.

2. Samples: Submit in triplicate, showing laminated plastic colors as specified by the Engineer.

B. Priming and Backpainting: Priming and backpainting of all carpentry and millwork is specified in Painting section. Do not set items until priming and backpainting have been done.

C. Protection: Protect all work against damage of any kind until final acceptance of the building. Repair or replace damaged work to the satisfaction of the Engineer without additional cost to the Owner.

1.04 Delivery, Storage and Handling:

A. No fabrication, finishing or installation shall be performed until shop and erection drawings and finish samples have been approved.

B. Deliver, store and handle counter tops in a manner to prevent damage and deterioration.

C. Defer delivery to the job until the installation and storage areas are complete and dry of all wet-type construction.

D. Maintain relative humidity in storage areas not to exceed 60 percent.

- E. Protect all surfaces of work subject to damage while in transit.

1.05 Reference Specifications and Standards:

- A. Manufacture all millwork and cabinetwork in accordance with the standards established in the latest edition of the Manual of Millwork of the Woodwork Institute of California, or equivalent construction, in the grade or grades hereinafter specified or as shown on the drawings.
- B. All cabinetwork shall be manufactured in accordance with the standards established in the latest edition of the Specification Guide for Wood Cabinets of the Southern California Association of Cabinet Manufacturers.
- C. Before delivery to the jobsite, the millwork suppliers shall issue a Certified Compliance Certificate indicating the products he will furnish for this job and certifying that they will fully meet all the requirements of the grade or grades specified.
- D. Each unit of casework shall bear the Certified Compliance Grade Stamp indicating the grade specified.
- E. Each plastic laminate counter top shall bear the Certified Compliance Grade Stamp indicating the grade specified.
- F. In lieu of the Certificate, furnish a Certificate of Compliance from an approved independent testing laboratory.

ARTICLE 2 - PRODUCTS

2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.

2.02 Materials:

- A. Lumber and plywood shall be new, clean stock of the species and WIC grades shown below.
 - 1. Douglas Fir for concealed stripping, blocking and framing manufactured and graded in accordance

with "Standard Grading and Dressing Rules 16 of W.C.L.I.B., "D" VG Finish Grade S4S, kiln-dried to a maximum 12% moisture content.

2. Softwood: WIC Section 3, "Custom" grade Douglas Fir, vertical grain.
3. Softwood Plywood: WIC Section 5, "Custom" grade Douglas Fir-rotary cut.
4. Hardwood: Select Red Oak, WIC Section 6.

B. Laminated Plastic Counter Tops and Splashes:

1. All laminated plastic counter tops and splashes shall be "Custom" grade per WIC Section 16, 6" high, integral cove back, with self edge and splash. Color finish as selected by Engineer.
2. Laminated plastic shall meet standards of the National Association of Electrical Manufacturers.
3. Grade: Standard .050" thick for horizontal surfaces and 1/32" grade for vertical surfaces. All panels shall have backing sheets to assure stability and moisture resistance.

C. Casework:

1. All casework shall be WIC "Custom" grade per WIC Section 15, plastic laminated faced cabinets.
2. Construction shall be flush type.
3. Cabinet doors shall be WIC Type H.
4. Edge band all plywood shelving with glued solid hardwood stock set with tongue and grooved joints.
5. Furnish and install cabinet hardware as specified herein. Submit standard products of other manufacture in lieu of products specified herein, for approval by the Engineer.

D. Gratings and Benches: Fabricate as detailed.

E. Hardware:

1. Adjustable Shelf Standards: Knappe and Vogt 255 and 256 or Garcy U73 and Y73 for flush mounting. Natural aluminum finish.

2. Drawer Slides: Knappe and Vogt 1100 or Garco 381.
3. Hang Rods: 1-5/8" o.d., .035 gauge, nickel plated steel tubing. Furnish center supports for spans four feet or greater.
4. Pulls: Quality No. 179, or Builders Brass No. 9054, with backplate.
5. Catches: Hager No. 1437 or Stanley No. 46.
6. Lift Top Hinges: Stanley 311-1/4, or Hager CD 1311, size as required for top thickness.
7. Hinges: Hager No. 1822-1/2 or Stanley No. 1583, 1-1/2" x 3/4" for flush doors and Hager No. 1043 or Stanley No. 331 for overlay doors.
8. Locks: Schlage #46-001 or Corbin #0796.
9. Finish: US26D unless noted otherwise.
10. Drawer Stops: Provide stops to prevent drawers from accidental removal.
11. Self Brackets: 16 gauge formed brackets, as detailed, shop applied prime coat.

ARTICLE 3 - EXECUTION

3.01 Condition of Surfaces:

- A. Examine all grounds, stripping and blocking to secure cabinets.
- B. Correct all defects before proceeding.

3.02 Millwork: Assemble all millwork at the mill as far as practicable, and deliver to building ready to set in place. Work material in the best manner known to the trade, mortise and tenon, dowel, block, and glue together so as to avoid the use of nails as much as possible. Follow detail closely, cut moldings cleanly and define sharply and make miters accurately. Butt joints without an approved device for preventing the separation of the joint will not be accepted. Set all nails, and where screws are used in exposed surfaces, conceal with wood plugs.

3.03 Installation:

- A. Install counter tops and cabinets plumb and level without distortion.

- B. Shim as necessary with concealed shims.
- C. Accurately scribe and closely fit all face plates, filler strips and trim strips to irregularities of adjacent surfaces.
- D. Shelving: Single boards may be used for shelving 12" or less in width. Built up shelves more than 12" wide shall be 3/4" thick plywood.
- E. Install nailers and blocking where shown or as required.

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1.04 Quality Assurance:

- A. Applicator shall follow material manufacturer's recommended application procedures.
- B. Performance Criteria:
 - 1. The sprayed fireproofing shall have been tested and reported by Underwriters Laboratories, Inc. or other certified testing agency in accordance with the procedures of ASTM E119.
 - 2. Thickness shall be as indicated in Research Report for hourly rating required by the prevailing building code jurisdiction.
 - 3. The spray applied fireproofing shall be factory blended material, applied at a density to provide compliance with specified performance specifications and test criteria.
 - a. Bond Strength: The spray applied fireproofing applied over steel shall have a minimum bond strength of 200 psf when tested in accordance with ASTM E736.
 - b. Air Erosion: The fireproofing material shall not be subject to losses from the finished application by sifting, flaking or dusting. Minimum allowable weight loss of the fireproofing materials is .025 gms/ft.² when tested in accordance with ASTM E859.
 - c. Compressive Strength: The fireproofing shall not deform more than 10% when subjected to 500 psf compressive forces in accordance with ASTM E761.

1.05 Verification of Surfaces:

- A. All surfaces to receive fireproofing shall be cleaned as required.
- B. Verify painted surfaces as suitable to receive "direct-to-steel" fireproofing.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused.
- 2.02 Materials:
- A. Spray-on fireproofing shall be a sprayed cementitious or fibrous material containing no asbestos.
 - B. Material shall be "Monokote" City of Los Angeles Research Report: RR 23848, I.C.B.O. Report No. 1578 or "Cafco", City of Los Angeles Research Report: RR 23723, I.C.B.O. Report No. 1244. Product shall also be acceptable to governing authorities.
 - C. Other products that comply with performance criteria specified in Section 1.04B will be acceptable when approved by the Engineer prior to bid.

ARTICLE 3 - EXECUTION

- 3.01 Fireproofing shall be mixed in a clean machine mixer according to the printed instructions and may be applied in one or more coats to the required thickness. Fireproofing shall not be applied to any surface on which there is loose paint, dirt, dust, oil or any other matter that would impair adhesion.
- 3.02 Apply bond coat on the underside of floor deck sections as required by fireproofing manufacturer prior to application of fireproofing.
- 3.03 All thickness shall be complied with and in accordance with the hourly ratings required by the drawings and/or local codes.
- 3.04 At areas where fireproofed beams are less than 8'-0" above finished floor, a minimum 1/8" thick protective overcoat consisting of 1 part gypsum and 3 parts sand shall be applied over fireproofing material or as otherwise detailed on drawings.
- 3.05 Protect all adjoining construction and surrounding areas from spray and overspray with screen cloths or drop cloths. Clean all work so damaged to satisfaction of Engineer or replace as required.

for his approval both for esthetics and effectiveness, accompanied with a letter stating the actual application rates required to meet the guarantee requirements.

- 1.06 Supervision: Applicator shall have the necessary equipment to properly apply the sealer. Manufacturer shall be notified at least 48 hours prior to starting application. The work shall be commenced under the supervision of the manufacturer or a company representative.
- 1.07 Product Delivery: Sealer material shall be delivered to site in containers bearing name and batch number of manufacturer, with seals intact until time of application.
- 1.08 Guarantee: The applicator shall guarantee that he will immediately repair and correct any deficiencies or leakage that may appear in the treated work at no cost to the Owner during a two-year period following application. The Contractor shall supply from the manufacturer sufficient material as required to reseal areas where leakages may occur at no cost to the Owner for 5 years following application. Excepted from the guarantees are leaks caused by structural cracking or movement and damage from natural causes.
- 1.09 Applicator shall be trained and approved by the Manufacturer.
- 1.10 Warranty:
 - A. The Contractor shall provide a written guarantee signed by the manufacturer stating, "that the sealed areas will remain waterproof for five years from date of application and that the proper formulation has been applied according to our specifications to a properly prepared substrate by a qualified applicator."
 - B. The Contractor shall also provide a formulation certification from the manufacturer indicating the manufacturer's name and the product ingredients, including percentage of each ingredient. This certificate must be presented prior to application to obtain approval for use of the product.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent

manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.

2.02 Materials:

- A. Waterproofing Material: The waterproofing material shall be a clear non-yellowing formulation containing no oil type silicones, paraffin waxes, vinyls, nor The material shall be of a penetrating type and resistant to ultra-violet light, water, oil, and the noxious elements in the air such as the nitrous and sulphur compounds. The solvent system shall conform to prevailing rules of the local Air Quality Management Control District and the product shall conform to Fed. Spec. SS-S-1996. Provide documentation showing that the material conforms to the above.
1. For Concrete Block Masonry: Waterproofing material shall be 25-36% modified urethanes in a petroleum based solvent system. Materials manufactured by Ven-Chem Co. Inc., Santa Barbara, CA (805) 967-7600, or (818) 342-1195 (L.A.), under the "Super-Kote" labels are specified herein. "Supershield" by James Darcey Co., Inc. (818) 349-3705, and "True Seal 504" by True Seal Corp. are acceptable, provided all other terms of this specification are met.
 2. For Concrete: Waterproofing material shall contain a minimum concentration of 10% of organosilane per se in an aqueous alcohol vehicle. Materials manufactured by Ven-Chem Co. Inc., Santa Barbara, CA (805) 967-7600, or (818) 342-1195 (L.A.), under the "Deep Seal" labels are specified herein. "Chem-Trete BSM" by Dynamit Nobel of America and "water Shield" by James Darcey Co., Inc. are acceptable provided all other terms of this specification are met.
- B. Anti-Graffiti Coating: Super-Kote A-G70 by Ven-Chem or any previously approved equal by the other acceptable manufacturers.

ARTICLE 3 - EXECUTION

- 3.01 Acceptance Condition of Surfaces: All surfaces which are to be sealed shall be free of dust, dirt, oil, grease, and other foreign material and must be dry to the degree required for satisfactory reception of the sealer. Surfaces shall not be acceptable for sealing if they contain cracks or voids in excess of 1/32" in width.
- 3.02 Moisture Content: The optimal acceptable levels of moisture are the following: Inside the substrate - 15%; surface of

substrate - 7% or as recommended by manufacturer, when measured by an electronic moisture meter. Depending on the severity of a preceding rain, at least seven days must elapse before application. If there are any questions concerning the amount of moisture in the substrate following a rain, the moisture meter shall be used to verify actual conditions. No material shall be applied if there is any chance of rain during the following 24 hours.

3.03 Application:

- A. Apply materials by skilled and experienced applicators using methods and equipment recommended by the manufacturer. A Hudson sprayer may not be used.
- B. Apply sealer in one (for organosilane) or two (for urethanes) coats as recommended by the manufacturer for a specific purpose. Quantity and coverage rate shall be according to the manufacturer's recommendations as determined by the preliminary tests of samples as specified herein. Under no circumstances shall the quantity be less than that recommended in manufacturer's technical data for the involved surface.
- C. Use an airless spray. The nozzle orifice of the tip should be between .014 and .016 with a 12° fan spread. Follow standard spray procedures of horizontal coverage using the proper speed of movement to supply the recommended coverage per gallon of sealer. Do not apply during windy, wet or excessively hot or cold weather conditions. Protect adjoining work from damage due to overspray. Do not dilute the sealer. Make certain that spray lines and suction tubes are absolutely clean of any contamination particularly paint and stain used in previous operations. Where indicated, application may be by brush or roller if technique and coverage is approved by sealer manufacturer. At least six hours, preferably overnight, must elapse between coats (for urethanes). For cleanup, use water (for organosilane) and use Toluene, Xylene, MEK, or lacquer thinner (for urethanes). Do not use paint thinners that will precipitate the urethane in equipment lines and guns.

3.04 Anti-Graffiti Coating Application: Apply two coats in rates as recommended by manufacturer for type of surface to be covered.

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DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07200 - BUILDING INSULATION

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Sound insulation in all partitions.
 - D. Sound insulation at electrical, TV, and phone outlet boxes in sound rated partitions.
- 1.02 Related Work in Other Sections:
- A. Insulation for ductwork and piping - refer to Division 15.
 - B. Thermal insulation at roof - refer to Section 07500.
- 1.03 Requirements:
- A. Submittals: Submit manufacturer's technical data and material specifications, as applicable.
 - B. Certificate of Compliance: Submit certificate stating that the work of this section was performed in accordance with the plans, specifications and state energy regulations. This certificate shall be signed by both the installing subcontractor and General Contractor.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.
- 2.02 Materials:
- A. Insulation shall be suitable for type of construction as applicable.

B. Sound Insulation:

1. Insulation shall conform to Fed. Spec. HH-I-521F, Type I, incombustible mineral fiber or glass fiber batts or blankets, thickness as required to develop a minimum STC rating of 50 for partitions in which sound insulation is installed, as manufactured by U.S. Gypsum. Mineral Wool Insulations, Owens-Corning Fiberglass or Johns-Manville.
2. Outlet Boxes: Polybutene-butyl rubber, minimum 1/8" thick, Lowry's Outlet Box Pads", as distributed by Harry A. Lowry & Associates, Van Nuys, California or Scotch 2200 vinyl mastic pad, 1/8" thick.

ARTICLE 3 - EXECUTION

- 3.01 Install insulation between studs in a manner as recommended by manufacturer and as indicated on the drawings. Where necessary, cut and fit insulation and completely fill all areas including behind switches, boxes, etc. Butt all joints tight. Voids will not be accepted.
- 3.02 Outlet Box Pads Application: Clean surface of dirt, dust, oil, etc. Adhere pad to back of box, molding it completely around box and around conduit entering the box.
- 3.03 Replace any insulation, or facing, which becomes torn, water soaked, or otherwise damaged.

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DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07253 - SPRAY-ON FIREPROOFING

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Spray-on fireproofing on all structural steel members and metal decking underside at second floor where shown or required.
 - D. Overcoat protection of fireproofing.
 - E. Protection of adjoining and surrounding existing construction or other areas of finished construction.
- 1.02 Related Work in Other Sections:
- A. Fireproofing with gypsum board or plaster where indicated on drawings - refer to Sections 09200 and 09250.
 - B. Concrete encasement of structural steel - refer to Section 03300.
 - C. Structural steel - refer to Section 05100.
 - D. Floor and roof deck system - refer to Section 05300.
- 1.03 Submittals:
- A. Submit manufacturer's technical data and material specifications, and other data needed to demonstrate compliance with the requirements of the prevailing code jurisdiction, as applicable.
 - B. Submit independent reports confirming that materials comply with minimum performance criteria specified herein.

- 3.06 Apply fireproofing to the underside of steel floor deck assemblies only after concrete work is complete.
- 3.07 Applicator shall scrape clean all other wall and floor areas of overspray as work progresses.
- 3.08 Patch and repair damaged sprayed fireproofing.
- 3.09 Temperature: Maintain an air and substrate temperature at a minimum of 40° for not less than 24 hours prior to and after application of the fireproofing.
- 3.10 Ventilation: Provide adequate ventilation to properly dry the fireproofing after application. In enclosed areas without adequate natural ventilation provide mechanical air circulation ventilation.

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DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07410 - METAL WALL SIDING

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Submittals.
- D. Metal wall siding.
- E. Sheet metal flashings at wall siding.
- F. Fasteners, sub-girts, closures, etc.

1.02 Related Work in Other Sections:

- A. Sheet metal, except as specified herein - refer to Section 07600.
- B. Miscellaneous metal, girts, etc. - refer to Section 05500.
- C. Tests and inspections - refer to Section 01400.

1.03 Requirements:

- A. Submittals: Submit shop drawings, engineering calculations, manufacturer's technical data and material specifications, and color samples, as applicable, for all products specified herein for the Engineer's review prior to start of work in this section.
- B. Cleanup: During the progress of the work, the premises shall be kept free of debris and waste resulting from the work in this section. Upon completion, all surplus material and debris shall be removed from the site.
- C. Provide calculations performed by a California registered structural engineer indicating wall panels will conform with Code requirements for wind and seismic loads.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.
- 2.02 Materials:
- A. Manufacture: Steelite "CFP III-1" or equal.
 - B. Wall Panels:
 - 1. Panels shall be 1-7/8" thick by 12" wide.
 - 2. Side Joint: Tongue and groove, design. Fasteners not exposed from exterior, concealed within side joint.
 - 3. Tolerance: 3/32" plus or minus adjustment feature.
 - 4. Interior female joints factory caulked.
 - C. Exterior and Interior Panel Faces:
 - 1. Pattern: Stucco embossed steel.
 - 2. Sheets: ASTM A446, Grade B, 22 gauge steel with zinc coating conforming to ASTM A525, G-90.
 - D. Finish:
 - 1. Metal shall be finished with Pennwalt Corporation "Kynar 500" fluorocarbon resin (Vinylidene Fluoride). Paint shall be applied in the factory and artificially cured in baking ovens. Paint shall be manufactured by a licensed formulator of Pennwalt Corporation.
 - 2. The metal substate shall receive a pretreatment and prime in accordance with licensed formulator's specifications.
 - 3. Painted material shall meet the following requirements:

- a. Film Thickness: 0.8 mils or more.
- b. Film Hardness: Grade F. minimum Eagle Turquoise.
- c. Paint finishes are recommended for 20 years' durability.
- 4. Paint shall be manufactured by a licensed formulator and applied by an applicator approved by the formulator. At Contractor's option, paint shall be one-coat system, minimum 1.2 mils thickness.
- 5. Color: Color as selected by the Engineer.
- E. Perimeter Trim: Trim shall be same embossed material, finish and color as exterior face units.
- F. Girts: Cold rolled steel channels, 3/4" or 1-1/2" as required.

2.02 Fabrication:

- A. Fabricate components of the system at factory, ready for field assembly.
- B. Fabricate components and assemble units to comply with fire and performance requirements specified.
- C. Apply specified finishes in conformance with manufacturer's standards, and according to coating manufacturer's instructions.
- D. Changes of plane, parallel or transverse to longitudinal axis shall be accomplished as detailed on the drawings.

ARTICLE 3 - EXECUTION

- 3.01 Inspection: Examine alignment of structural steel and related supports prior to installation and do not proceed until any defects are corrected.
- 3.02 Fasteners: Secure units to supports as recommended by Manufacturer's structural engineer providing calculations and as indicated in reviewed shop drawings.

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07600 - SHEET METAL

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Stainless steel catch pans.
- D. Scuppers.
- E. Scupper hoods as detailed.
- F. Reglets, flashings and counterflashings.
- G. Sheet metal drips at exterior doors.
- H. Sheet metal expansion joint covers.
- I. Wall louvers.
- J. All formed and bent plate lighter than 14 gauge.
- K. Caulking and sealant for work of this section.

1.02 Related Work in Other Sections:

- A. Counterflashing for plumbing vents, ducts, and mechanical equipment and piping extending through roof - refer to Division 15.
- B. Sheet metal work for ductwork grilles and similar items - refer to Division 15.
- C. Flashing for conduit through roof - refer to Division 16.
- D. Installation of pitch pockets and splash pans - refer to Section 07500.
- E. Miscellaneous metal items specified in Section 05500.
- F. Door louvers - refer to Section 08100.
- G. Finish painting - refer to Section 09900.

- 1.03 Submittals: Submit shop drawing, manufacturer's technical data and material specifications, and samples, as applicable.
- 1.04 Cooperation:
- A. Verify to make sure that adequate nailers, blocking, etc., as required for proper installation and attachment of sheet metal work have been provided and so as not to cause any delay in the work.
 - B. Roof flashings, reglets and similar work shall be in place or ready for placing before application of roofing materials. All sheet metal work installed in connection with roofing shall be applied under the supervision and inspection of the roofing applicator.
- 1.05 Inspections: Before completion of the work, examine, and if necessary, test all sheet metal work and installations specified herein. Make any repairs to the work as necessary for a completely watertight installation.
- 1.06 Guarantee: Guarantee all sheet metal work against any inherent or developed defects in material or installation, for a period of two (2) years.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture. Where model numbers are indicated, if specified models are discontinued, the Contractor shall furnish the manufacturers' updated model at no additional cost to the Owner.
- 2.02 Materials:
- A. All sheet metal shall be galvanized sheet steel with not less than 1.25 oz. per sq. ft., commercial class zinc coating prime finish, conforming to ASTM A525. Steel shall be hot-dipped and shall be tight coated so that any working of the metal will not affect the zinc coating. Sheet metal shall be gauge as shown but not less than 24 gauge where not noted.
 - B. Nails, rivets and other fastenings in connection with sheet metal shall be aluminum, stainless steel, galvanized or cadmium plated steel. Rivets shall be soft iron, tinned. Screws shall be Phillips-head, self-tapping type.

- C. Solder shall be a standard brand conforming to ASTM B32, 50% lead and 50% tin.
- D. Caulking and Sealants:
1. Vertical Surfaces: 1-part polysulfide based compound conforming with Fed. Spec. TT-S-00230C, Type II, Class A, or 2-part polysulfide based compound conforming with Fed. Spec. TT-S-00227E, Type II, Class A, or silicone conforming with Fed. Spec. TT-S-01543A, Class A.
 2. Horizontal Surfaces: 1-part polysulfide based compound conforming with Fed. Spec. TT-S-00230C, Type I, Class A, or 2-part polysulfide based compound conforming with Fed. Spec. TT-S-00227E; Type I, Class A.
- E. Reglets shall be equal to "Springlock" reglets manufactured by Fry Reglet Corporation, Los Angeles, or "Cushion-Lock" by Superior Concrete Accessories, Inc.
- F. Catch pan linings shall be 16 gauge stainless steel, No. 4 finish.
- G. Wall Louvers:
1. Fixed type shall be Airo-lite Model CB609. Operable type shall be Airo-lite Model T645. Provide bird screens in removable frame. Note: Operable louvers shall be closed at all times. They are operable for emergencies only. Operable louvers shall be pole operated. Provide 3 poles for Owner's use.
 2. Aluminum Finish:
 - a. Aluminum shall be finished with Pennwalt Corporation "Kynar 500" fluorocarbon resin (Vinylidene Fluoride). Paint shall be applied in the factory and artificially cured in baking ovens. Paint shall be manufactured by a licensed formulator of Pennwalt Corporation.
 - b. The aluminum extrusion substrate shall receive a pretreatment and prime in accordance with licensed formulators specifications.
 - c. Painted material shall meet the following requirements:
 - (1) Film thickness - 0.8 mils or more.
 - (2) Film Hardness - Grade F minimum Eagle Turquoise.

- (3) Paint finishes are recommended for 20 years' durability.
- d. Paint shall be manufactured by a licensed formulator and applied by an applicator approved by the formulator. At Contractor's option, paint shall be one-coat system, minimum 1.2 mils thickness.
- e. Color: Color as selected by the Engineer. Submit sample for approval.

ARTICLE 3 - EXECUTION

- 3.01 All surfaces to which sheet metal is to be applied shall be free from defects of any kind and brush clean. Set flush or remove as required any projections, nails, fins, etc., for a complete and workmanlike installation.
- 3.02 Field verify all dimensions for work which is to be shop fabricated. Accurately form all work with clean, straight and sharply defined profiles. Form, fabricate, and install sheet metal so as to provide for any necessary expansion and contraction in the completed work and, in addition, so that all joints will remain watertight and weathertight at all times.
- 3.03 Soldering: Thoroughly clean all surfaces before soldering. Execute soldering slowly with full flowing joints and with the joints as thin as possible. Make flat locked seams at least 1/2" wide, and sweat full of solder. Lap seams where soldered at least 3" wide. Make all flat and lap seam joints in the direction of flow.
- 3.04 Double back all exposed raw edges of sheet metal 1/2" minimum.
- 3.05 Where necessary to provide strength and stiffness, additionally reinforce joints with rivets or screws. Fasteners shall not be visible.
- 3.06 Provide sheet metal drips at the heads of exterior door openings which are exposed to the weather. Shape drips of 22 gauge as necessary to deflect the water.
- 3.07 Provide flashing reglets in concrete and at other locations indicated on drawings to receive counterflashings and other flashings as indicated and/or where required.

- 3.08 Weld all sheet metal, 18 gauge and heavier. Execute welding using the shielded electric arc method. Welding rods shall be as recommended by the manufacturer for use with galvanized sheet steel, zinc alloy sheet, cold-rolled sheet metal or stainless steel. Grind smooth and flush all welds on exposed surfaces. Touch up welds with "Drygalv" as manufactured by Dynaflux, North Carolina, local wholesaler: Fesco Inc., Los Angeles, (213) 254-9131; "Galvicon" as manufactured by Southern Coatings, Inc., South Carolina, local distributor: V.B. Anderson Co., Santa Ana, (714) 547-6684; "Z.R.C. Cold Galvanizing Compound" as manufactured by Z.R.C. Chemical Products Co., Massachusetts, local distributor: Mechanical Distributors, Whittier, (213) 698-6655; or primer paint. Apply touch-up as per manufacturer's instructions to provide a coating equal to the original finish.
- 3.09 Install sheet metal copings, gravel stops and the like which will be exposed in the finished work, and which are visible from the exterior in 10' lengths and secure with 2 screws at midpoint. Install lengths 1/2" apart at gravel stops in mastic. Seal 6" wide cover plate over joint and secure with two screws. Screws shall have neoprene washers. Install joints with caulking sealant.
- 3.10 Install expansion joints in sheet metal work where shown and as required. Work shall conform to standards of the Sheet Metals and Air Conditioning Contractors Association.
- 3.11 Install louvers in accordance with the drawings, shop drawings and manufacturer's details for applicable conditions.

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DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07900 - CAULKING AND SEALANTS

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Caulk and seal open joints left between openings and both sides of frames on the exterior of the building and all other joints between building units or materials where the drawings call for caulking or sealant, interior and exterior, or where necessary to completely seal off joints against passage of water, air, or dust.
 - D. Compressible filler behind caulking and sealant at expansion joints.
- 1.02 Related Work in Other Sections:
- A. Caulking and sealants in connection with sheet metal - refer to Section 07600.
 - B. Caulking and sealants in pavement areas - refer to Section 03300.
- 1.03 Requirements:
- A. Submittals: Submit manufacturer's technical data and material specifications, and samples, as applicable.
 - B. Guarantee: All work shall be guaranteed against any inherent or developed defects in material or installation. All work shall be guaranteed to remain watertight for a period of two (2) years.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.

2.02 Materials:

A. Caulking and Sealants:

1. Vertical Surfaces: One part polysulfide based compound conforming with Fed. Spec. TT-S-00230C, Type II, Class A, or two part polysulfide based compound conforming with Fed. Spec. TT-S-00227E, Type II, Class A, or silicone conforming with Fed. Spec. TT-S-01543A, Class A.
2. Horizontal Surfaces (except see paragraph 3): One part polysulfide based compound conforming with Fed. Spec. TT-S-00230C, Type I, Class A, or two part polysulfide based compound conforming with Fed. Spec. TT-S-00227E, Type I, Class A.
3. Horizontal Walking Surfaces: One part urethane based compound conforming with Fed. Spec. TT-S-00230C, Type I, Class A, or two part urethane based compound conforming with Fed. Spec. TT-S-00227E, Type I, Class A. Shore hardness Durometer Shore A-35.

B. Primer: Primer shall be a nonstaining product specified by the manufacturer of the sealant or caulking compound used for each substrate surface.

C. Filler: Filler shall be a material compatible to sealant, nonrotting, compressible and 50% wider than the width of the joint, Ethafoam, Compriband, or Sonofoam "Backerod." Filler shall be of sizes and shapes to suit the various conditions and to be compatible with primer, caulking and sealant used.

D. Color of Compound: As approved by Engineer.

E. Bond Release Material: Polyethylene strip, masking tape, polyethylene rope or other material approval by caulking and sealant manufacturer.

ARTICLE 3 - EXECUTION

3.01 Surface Condition: Joint surfaces to receive caulking or sealant shall be sound, smooth, clean, dry and free of all visible contaminants. Applications of non-visible coatings or contaminants to surfaces of rabbet area prior to application of sealant shall be controlled by the Engineer/General Contractor in consultation with the sealant manufacturer.

3.02 Preparation of Surfaces:

- A. Primer: Thoroughly clean joints and apply primer, if recommended by sealant manufacturer, to dry surfaces. Apply primer prior to application of joint backing, bond breaker or sealants.
- B. Joint Backing: In joints where the depth of the joint exceeds the required depth of the sealant, install joint backing to provide backing and uniform depth of sealant. Joint backing shall be installed with approximately 30% compression. Do not stretch, twist, puncture or tear joint backing. Butt joint backing at intersections.
- C. Bond Breaker Tape: Install bond breaker tape smoothly at back of joint where joint backing is not required or cannot be installed. (Sealant shall adhere only to the sides and not to the back of the joint so as to eliminate 3-sided adhesion.)

3.03 Installation:

- A. Caulking or Sealant Application: Apply caulking or sealant in accordance with manufacturer's application manual and instructions, using hand guns or pressure equipment, with proper nozzle size, on clean, dry, properly prepared substrates. Force caulking or sealant into joint and against sides of joint to make uniform. Avoid pulling of the caulking or sealant from the sides. Fill space completely with caulking or sealant.
- B. Tooling: Tooling is required to ensure firm full contact with the interfaces of the joint. Tool joints to form smooth, uniform beads with slightly concave surfaces. Finish joints shall be straight, uniform, smooth and neatly finished. Remove any excess caulking or sealant from adjacent surfaces of joint, leaving the work in a neat, clean condition. Tooling agents should only be used if recommended by the caulking or sealant manufacturer.
- C. Where an irregular surface or sensitive joint border exists, the applicator shall apply masking tape at the edge of the joint to insure joint neatness and protection. Tape to be removed after caulking or sealant is applied.
- D. Take particular care not to damage any finish or adjoining surface. Leave all exposed surfaces in a clean condition after completion of caulking and sealant operation. Clean adjacent surfaces which have become soiled by caulking or sealant work.

E. The depth of caulking or sealant material in all joints shall be not less than 1/2 the width; except that all joints shall have a minimum depth of 1/4" caulking material.

3.04 Cleaning: Clean off excess compound or smears with cleaning material recommended by the manufacturer of the compound. Leave work in a condition satisfactory to the Engineer.

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DIVISION 8 - DOORS AND WINDOWS

SECTION 08100 - HOLLOW METAL WORK

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Hollow metal doors, including Underwriters' labels where required on the doors.
 - D. Pressed steel frames for doors, windows, window walls and framed openings including Underwriters' labels required for labeled openings.
 - E. Preparation for hardware.
 - F. Installation of hollow metal doors and hardware thereof.
 - G. Door louvers where indicated.
- 1.02 Related Work in Other Sections:
- A. Furnishing hardware - refer to Section 08700.
 - B. Installation of door frames - refer to Sections 06100 and 09250.
- 1.03 Submittals: Submit shop drawing, manufacturer's technical data and material specifications, and samples, as applicable.
- 1.04 Requirements:
- A. Steel doors and frames shall conform to Steel Door Institute S.D.I. 100 Series.
 - B. Protect doors and frames from damage during transportation and from dampness and rusting at all times. Store at site in dry location on wood blocking or on suitable floors, in vertical position. Do not store in any portion of the building until after the plaster and concrete work has been completed and that portion of

building has dried out. After installation, protect frames and doors from damage during installation, protect frames and doors from damage during subsequent construction activities. Damaged work will be rejected and shall be replaced with new work without additional cost to Owner.

ARTICLE 2 - PRODUCTS

2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.

2.02 Materials:

A. Shop Painting: Apply prime finish 1.5 mils thick to all metal surfaces furnished under this section. Clean and chemically treat metal surfaces to secure maximum paint adherence and apply a baked-on dip or spray coat of rust inhibitive metallic primer, standard with manufacturer on all exposed surfaces; clean and coat inside surfaces of metal doors with rust inhibitive paint. Finished surfaces shall be smooth and free from irregularities and rough spots. Inside surfaces of door frames shall be sprayed with manufacturer's standard sound-deadening bituminous material.

B. Metal Frames for Doors, Windows, Window Walls and Framed Openings:

1. Metal for frames shall be cold-rolled, or hot-rolled, pickled and oiled, steel sheets with clean, smooth surfaces. Except where other gauges are indicated or specified, frames shall be fabricated from steel, not lighter than the following U.S. standard gauges: Frames for single interior doors over 36 inches wide, for pairs of interior doors and for exterior doors shall be 14 gauge; all other frames shall be 16 gauge.

2. Provide concealed metal for hardware as required. The gauges of metal for reinforcement shall be in accordance with the manufacturer's recommendations, provided that the gauges used are not lighter than those required by S.D.I. 100.

3. The finished work shall be strong and rigid, neat in appearance, and free from defects. Fabricate moulded members straight and true with corner joints well formed, in true alignment and fastenings concealed where practicable.

4. Miter joints for welded type frames and continuously arc-weld for full depth and width of frame and trim. Close all contact edges tight and dress welds on exposed surfaces smooth and flush.
 5. Prepare frames at the factory for the installation of hardware. Welding of hinges to frames will not be permitted. Frames shall be mortised, reinforced, drilled and tapped to templates to receive all mortised hardware; provide frames to receive surface applied hardware with reinforcing plates only. Where concealed overhead door closers are required in frame members, provide the necessary additional space, cutouts, reinforcements and provisions for fastenings in heads of frames to receive the closers. Provide cover boxes in back of all hardware cutouts. Punch door frames to receive rubber or vinyl door silencers; provide for three silencers on lock side of single doors, and two silencers for each leaf in heads of double door frames. Set and adjust lock strikes to provide clearance for silencers. Provide silencers with frames. Silencers shall not be provided at fire rated doors.
 6. Mullions and transom bars shall be closed, of tubular construction and shall member with heads and jambs and be secured thereto; use butt-welded joints for welded construction. Reinforce the joints between members with concealed clip angles of the same thickness as frames.
 7. Provide steel glazing stops, height to match integral stop, screw-attached to exterior side, at frames to receive glazing.
 8. Provide metal anchors of shapes and sizes required for the adjoining type of wall construction. Fabricate jamb anchors of steel, not lighter than the gauge used for frame. Locate anchors on jambs near the top and bottom of each frame and at intermediate points not over 24" apart. Weld, or otherwise securely fasten anchors to back of frames at jambs; make provisions for securing anchors to studs.
 9. Provide floor clips of not less than 16 gauge steel and fasten to bottom of each jamb member for anchoring frame to floor construction. Fix and drill clips to accommodate 3/8" diameter anchor bolts.
- C. Fire Doors and Frames: Provide approved hollow metal fire doors and frames at locations indicated. Construct and install approved doors, frames and hardware in

accordance with requirements of the Underwriters' Laboratories for the class of door opening indicated or specified. Fire doors and frames which bear the Underwriters' Laboratories label for the class of opening indicated will be a basis of acceptance. Provide metal stops at openings in doors. The maximum transmitted temperature end point shall not exceed the requirements of governing building code at the end of 30 minutes of fire exposure.

D. Requirements for Doors, Transoms and Fixed Panels:

1. Metal for doors, transoms and fixed panels shall be cold-rolled, pickled and oiled, stretcher leveled steel sheets with clean, smooth surfaces.
2. The finished work shall be rigid, neat in appearance, and free from defects. Form corners straight and true, well formed, and in true alignment. Dress all welded joints on exposed surfaces smooth so they are invisible after finishing.
3. Provide doors, transoms and fixed panels of type, sizes and design indicated, 1-3/4" thick unless designated otherwise. Provide clearances for doors, except fire doors, of 3/32" at jambs and heads, 1/8" at meeting stiles of pairs of doors, and 5/8" at bottom unless indicated or specified otherwise. Provide clearances for approved fire doors as required by the authority having jurisdiction. Where metal edge strips, dividers or thresholds occur, provide 1/8" clearance to underside of door.
4. Construct doors of two outer steel sheets not lighter than 18 gauge, with edges welded and finished flush. Seams or joints will not be permitted on door faces or edges. Reinforce the outer face sheets with 20 gauge interlocking vertical channels or Z-shaped members spaced not over 6" apart and spot welded to outer face sheets. Provide continuous reinforcing channels welded to face sheets at top and bottom of doors. Provide approved sound absorbing material on inside of door. Provide mouldings not lighter than 18 gauge steel. Provide metal stops at openings in doors.
5. All exterior doors and doors in sound insulated partitions shall have foamed, fire-retardant urethane sound/thermal insulation. All other doors shall have a honeycomb core.

6. Round lock edges of stiles for double-acting doors and bevel 1/8" in 2" for other hollow metal doors. Unless detailed otherwise, provide exterior doors and all pairs of approved fire doors with overlapped astragal welded to the active leaf as required.
 7. Close top and bottom edges of all exterior doors to provide a weather seal. This seal may be provided as part of the door construction or by the addition of inverted steel channels or other suitable shapes welded to the face sheets.
 8. Prefit doors to their frames and hardware at the factory prior to shipment. Doors shall be mortised, reinforced, drilled and tapped at factory to receive all mortise type hardware. Provide reinforcing only for doors to receive surface applied hardware, except push plates and kick plates; drilling and tapping for surface applied hardware shall be done in the field. Provide metal reinforcing plates for locks and mortised hardware; provide reinforcing plates for surface applied hardware as required.
 9. The gauges of metal for reinforcing plates shall comply with manufacturer's recommendations for the type of hardware used and the size and thickness of doors, provided that the gauges used are not lighter than those required by S.D.I. 100.
- E. Louvers for Doors: Unless otherwise noted, louvers indicated for interior doors shall be stationary sight-proof type, manufactured by Airolite, Ventilouver, Construction Specialties or equal. Construct louvers of 18 gauge steel. Unless indicated otherwise, louvers shall be 1" deep inverted "Vee" with extended vanes and flush mouldings. After fabrication, louvers shall be bonderized and given one shop coat of baked-on primer. Secure to door with screws.
- 2.03 Location of Hardware: (Verify all locations with the Engineer.)
- A. Locks and Latches (Cylindrical), Mortise, Unit, Integral: 38" from finish floor to center of knob.
 - B. Door Pulls: 38" from finish floor to center of grip.
 - C. Push Plate: 45" from finish floor to center of plate.
 - D. Push-Pull Bar: 38" from finish floor to center of bar or center between bars and combination.
 - E. Panic Devices (Mortise, Rim): 38" from finish floor to center of bar.

- F. Top Hinge: To manufacturer's standard, but not greater than 10" from head of frame to center line of ninge.
- G. Bottom Hinge: To manufacturer's standard, but not greater than 12-1/2" from finish floor to center line of hinge.
- H. Intermediate Hinge: Equally spaced between top and bottom hinge.
- I. Deadlocks Only (Cylindrical, Mortise, Rim): 38" from finish floor to center line of strike.
- J. Deadlocks (With Separate Latch-Set and/or Pull): 45" from finish floor to center line of strike.

ARTICLE 3 - EXECUTION

- 3.01 Erect doors and frames according to details on the drawings and/or approved shop drawings. Verify proper procedures to insure frame is installed correctly.
- 3.02 Neatly install doors and hardware in designed positions, after walls are finished with fixed units securely fastened in place and operative units adjusted to work properly.

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DIVISION 8 - DOORS AND WINDOWS

SECTION 08300 - SPECIAL DOORS

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Rolling steel doors.
- D. Rolling steel fire rated counter door.
- E. Hardware for doors.

1.02 Related Work in Other Sections:

- A. Hollow metal doors and frames - refer to Section 08100.
- B. Electrical work to junction boxes including junction boxes - refer to Division 16.
- C. Storefront doors - refer to Section 08400.
- D. Finish painting - refer to Section 09900.

1.03 Requirements:

- A. Submittals: Submit shop drawing, manufacturer's technical data and material specifications, and samples, as applicable.
- B. Labels: Labeled fire doors and frames shall conform with all requirements of the National Fire Protection Association and shall bear the Underwriters' Laboratories Label for the type of opening in which they occur.

ARTICLE 2 - PRODUCTS

2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade

available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture. Where model numbers are indicated, if the specified models are discontinued, the Contractor shall furnish the manufacturers' updated model at no additional cost to the Owner.

2.02 Materials:

A. Rolling Steel Doors:

1. Manufacture: Furnish rolling doors as manufactured by the Cookson Company, San Francisco, California 94107, Type FCM (Motor) or equal by Kinnear or Lawrence, complete with guides, hoods, operating mechanism and special features as hereinafter specified.
2. General Design: The rolling doors shall be designed to withstand a windload of 20 pounds per square foot. To insure ease of operation, the load of barrel and curtain shall be supported by two grease-sealed ball bearings.
3. Curtain: To be formed of 22 gauge interlocking slats fabricated from hot-dipped galvanized strip steel. Galvanized coating to be 1.25 oz. per sq. ft. in conformance with ASTM A525. Material to be given a grey acrylic prime coat before fabricating. Alternate slats are to be fitted with endlocks. Provide windlocks on doors. The bottom slat is to be reinforced by two steel angles, not less than 1/8" thick. Weatherstrip all exterior doors.
4. Guides: To be composed of three steel angles minimum 3/16" thick bolted with 3/8" bolts to form a groove for the curtain. Wall angle is to be of the continuous type. The guide shall be attached to the wall with 1/2" machine bolts or lag screws on 36" centers. Top of each guide shall be well-flared to facilitate entry of curtain, and provided with cast iron stops.
5. Brackets: Shall be fabricated from steel plate of not less than 1/4" thick. Brackets shall be bolted to wall angle with 1/2" bolts.

6. Gears: All gears shall be cast iron with teeth cast from machine cut patterns. The pinion gears shall not be less than 3" pitch diameter. Gear ratio shall be designed for a maximum manual effort of not more than 30 pounds.
7. Barrel: To be not less than 4" diameter steel tubing and designed to limit maximum deflection to .03" per foot. Oil tempered torsion springs shall be capable of correctly counterbalancing weight of curtain. Springs shall be adjusted by means of an exterior wheel.
8. Operation: Shall be Motor Operation (FCM) - push button control.
9. Hood: To be fabricated from galvanized steel. Hoods shall be formed to fit the curvature of the brackets and attached securely thereto.
10. Finish: Curtain and hood shall have a baked grey acrylic primer. All other exposed surfaces shall be given one coat of rust inhibiting paint. All surfaces shall be free from irregularities, runs and rough spots.
11. Provide openings with glazing stops for view windows where shown.

B. Fire Rated Counter Doors:

1. Manufacture: Furnish Series FD10-1 Rolling Fire Door as manufactured by The Cookson Company; San Francisco, California 94107 or equal by Kinnear or Lawrence.
2. General: These doors shall be constructed in accordance with Underwriters' Laboratories specifications and shall bear a Class A (3 hour) Label.
3. Operation: The doors shall be equipped with an automatic closing device which shall operate upon the operation of a Firemark No. FM 972U automatic closing device in conjunction with a smoke detector and fire alarm system. Doors shall be manually push-up operation.

4. Construction: Curtain shall be No. 10 slat of 20 gauge galvanized steel. Bottom bar to be tubular and shall have a locking device operated by a keyed cylinder. Guides shall be a box section fabricated from steel. Hood shall be 24 gauge galvanized steel.
5. Finish: Doors made with a galvanized steel curtain shall be given a factory prime coat of paint.
6. Provide Cookson "Firefly" delayed action release device.
7. Warning Device: Provide relay and warning bell, activated upon emergency release of doors.

C. Power Operators:

1. Each door shall be furnished with a power operator with screw type limit switches with contacts at each end of travel, integral motor protection for both heat and current protection, two three button weather-proof push button stations and a test laboratory approved prewired control box mounted on the power operator. The control box shall be supplied with reversing contactor with mechanical and electrical interlocks, 24 volt control transformer with primary fuses, control relay for auto-reversing and all other necessary components pre-connected to a terminal strip within the control box to facilitate field connections to power source and push button stations. All electrical components shall be UL approved.
2. Each door shall be controlled by two sets of three-button push button stations and a safety door edge air switch except the two doors at Fare Retrieval Building shall be key operated from exterior. The push buttons shall be marked "open", "close" and "stop". The "open" push button shall open the door fully without any means of stopping the door until it is fully open. The "close" push button shall close the door fully unless the safety door edge or "stop" push button is activated; then the door shall stop and reverse to fully open position.
3. Doors shall have a manual chain operated over-ride for use in case of power failure.

ARTICLE 3 - EXECUTION

3.01 All doors shall be complete in every detail and shall be installed in accordance with approved shop drawings by installers trained and approved by the door manufacturer.

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DIVISION 8 - DOORS AND WINDOWS

SECTION 08305 - ACCESS PANELS

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Furnish access panels except panels provided by Divisions 15 and 16.
 - D. Coordination related to all trades concerned with the installation of special access panels furnished by the mechanical trades (ceiling and wall).
- 1.02 Related Work in Other Sections:
- A. Installation of access panels - refer to Sections 09250 and 09200.
 - B. Furnishing access panels required by the plumbing and air conditioning trades, refer to Division 15.
- 1.03 Submittals: Submit shop drawing, manufacturer's technical data and material specifications, and samples, as applicable.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture. Where model numbers are indicated, if specified models are discontinued, the Contractor shall furnish the manufacturers' updated model at no additional cost to the Owner.

2.02 Materials:

- A. Typical access doors shall be steel, primed, 24" x 24", or as called out otherwise on the drawings, complete, as manufactured by Milcor, Karp or equal. Panels in ceramic tile walls shall be stainless steel.

	<u>Milcor</u>	<u>Karp</u>
Ceramic Tile:	M	214M
Plaster:	K	214PL
Drywall:	DW	KDW

- B. Special access doors as called out in the mechanical trades shall be of a type matching that specified above.
- C. Access doors in fire rated partitions and ceilings shall carry same rating as partition or ceiling.

ARTICLE 3 - EXECUTION

- 3.01 Access doors shall be installed under the applicable sections by mechanics of the trades engaged in the finishes of the adjacent surfaces. The location shall be coordinated with the foremen of the trades requiring the access doors, such as Plumbers, Air Conditioning and Ventilating Contractors, Electrical and Electronic Contractors, etc. The Contractor shall bring to the attention of the Architect any discrepancies, lack of adequate clearance, interferences with cabinetwork, lighting fixtures, etc., for final decision by the Engineer. All trades involved shall furnish necessary data to the Contractor two weeks before the start of work relating to this section.
- 3.02 The access doors shall be checked at the end of the job for proper opening and closing, and, if damaged, shall be repaired or replaced as necessary.

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DIVISION 8 - DOORS AND WINDOWS

SECTION 08510 - STEEL WINDOWS

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Steel windows.
- 1.02 Related Work in Other Sections:
- A. Hollow metal frames - refer to Section 08100.
 - B. Caulking - refer to Section 07900.
- 1.03 Submittals: Submit shop drawing, manufacturer's technical data and material specifications, and samples, as applicable.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture. Where model numbers are indicated, if specified models are discontinued, the Contractor shall furnish the manufacturers' updated model at no additional cost to the Owner.
- 2.02 Materials:
- A. Non rated windows shall be fixed type to match fixed rated windows, as manufactured by Rusco.
 - B. Rated horizontal sliding windows with automatic closing devices shall be "Fire-Tec" Steel Fire Windows as manufactured by Rusco.

- C. Construction: Frame and panel corners shall be neatly welded to form a weathertight joint, excess metal removed, and dressed smooth for minimal surface abrasion.
- D. Hardware: A cam-type lever handle and strike shall be provided and shall be of solid bronze.
- E. Weatherstripping: All contacts of frame and panels shall be factory weatherstripped with closed-cell foam in a weatherstripping groove.
- F. Finish: Bonderized with manufacturer's standard baked-on enamel, color as selected by Engineer.

ARTICLE 3 - EXECUTION

- 3.01 Installation: Shall be in strict accordance with manufacturer's printed instructions.

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DIVISION 8 - DOORS AND WINDOWS

SECTION 08700 - FINISH HARDWARE

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Furnish finish hardware.
- 1.02 Related Work in Other Sections:
- A. Installation of finish hardware.
 - B. Rough hardware.
 - C. Toilet compartments hardware.
 - D. Hose reel cabinets.
 - E. Metal shelf standards & supports.
 - F. Toilet room accessories.
 - G. Sliding aluminum doors and windows hardware.
 - H. Cabinet hardware.
 - I. Metal access doors.
- 1.03 Abbreviations:
- 1 - Soss Hinge
 - 2 - Sargent Locks
 - 3 - Norton
 - 4 - Glynn Johnson
 - 5 - Precision
 - 6 - National Guard
 - 7 - Builders Brass
 - 8 - Arco Merit
 - 9 - Best
 - 10 - Telkee

1.04 Quality Assurance:

- A. Approved Manufacturer: Approval of equals is for hardware to be equal or better than specified item.

	<u>Listed</u>	<u>Approved as Equal</u>
Hinges	Soss Hinge	Stanley, McKinney
Locks	Best	Schlage
Panics	Precision	As Listed
Closers	Norton	Sargent (250/251 Series) - LCN 4040
Push-Pull-Kick	Builders Brass	Quality
Thresholds	National Guard	Zero Reese
Seals & Bottoms	National Guard	Zero Reese
Key Cabinet	Telkee	As Specified
Auto Flush Bolts, Coordinators	Glynn Johnson	Door Controls

- B. Hardware supplier must be a direct factory contract supplier and who has in his employment an experienced hardware consultant who is available at all reasonable times during consultation to the District, Engineer and Contractor.
- C. Exit Doors: Openable at all times from the inside without the use of a key or any special knowledge or effort.
- D. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80. This requirement takes precedence over other requirements for such hardware. Provide only hardware which has been tested and listed by UL for the type and size of each door required, and complies with the requirements of the door and door frame labels. Where panic exit devices are required on fire-rated doors, provide supplementary marking on doors UL label indicating "Fire Door to be Equipped with Fire Exit Hardware", and provide UL label on exit device indicating "Fire Exit Hardware". State Fire Marshal listing numbers are requested.

1.05 Submittals:

- A. Comply with pertinent provisions of Section 01340.
- B. Schedules: Before delivery of hardware the supplier shall submit six copies, for approval of the Engineer, a full and complete schedule of hardware indicating the quantity, part number, installation location, and finish of each item required even though some may have been inadvertently omitted from this specifications. Hardware supplier shall furnish in triplicate, keying schedule as approved by the District. Each item shall be

properly indentified, referenced to items listed, and organized into hardware sets in the same analogous format as listed in the specification. Include an index of Doors and Heading for ease of finding each opening requirement.

1.06 Job Conditions:

- A. Coordination: Coordinate hardware with other work. Tag each item or package separately, with identification related to the final hardware schedule, and include basic installation instructions in the package.
- B. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check the shop drawings of such other work, to confirm that adequate provisions will be made for the proper installation of hardware.

1.07 Guarantee: Provide guarantee from hardware supplier as follows: Defects in materials and workmanship occurring during guarantee period shall be corrected to the complete satisfaction of the Engineer.

- A. Closers: Five years.
- B. All Other Hardware: Two years.

ARTICLE 2 - PRODUCTS

2.01 Finish:

- A. Generally to be (US10B) Oiled Rubbed Bronze plated or (DKB-Stat) unless otherwise noted under the hardware set.
- B. Spray door closers to match, unless otherwise noted.

2.02 Materials:

- A. Locksets: All locksets shall be mortise type with interchangeable 7 pin core. At labeled openings the levers to have fusible links. Handicapped requirements included.
- B. Keying Requirements as Follows: Keying of cylinder locks shall be coordinated with the District. For estimate use Grandmasterkeying charge. Furnish construction core system. Stamp all keys "Do Not Duplicate". Ship permanent keys to the District, copy of shipment to General Contractor. Removable core cylinders shall be furnished thru-out.

- C. Hinges: Outswinging exterior doors shall have non-removable (NRP) pin. All hinge open widths shall be minimum, but of sufficient height, add one additional for 30" of additional height or fraction thereof. Furnish security stud on outswinging exterior doors. All concealed bearing hinges to have stainless steel hinge pins. Finish to be "PC" at HM Doors.
- D. Panic Hardware: Furnish all sets with sex bolts unless otherwise specified.
- E. Surface Door Closers: To be of the full rack and pinion type with removable non-ferrous case and body, complete with sex bolts and grommets. Place closer inside building, stairs, room, etc. Closers shall be non-handed, non-sized, adjustable from size 2 through 6 on exterior doors adjustable from size 1 through 4-1/2 on interior doors. handicapped requirements included.
- F. Flush transom offset brackets shall be used where parallel arm closers are listed for doors with fixed panels over. Drop brackets would be required at narrow head rails.
- G. Kickplates: Except as indicated otherwise, provide 18 GA. stainless steel, 10" high x 2" less width of door. All B4E.
- H. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Omit where sound or light seal occurs.
- I. Screws: All exposed screws shall be Phillips head.
- J. Provide lead shield or similar type anchors for attaching hardware items to concrete or masonry.

ARTICLE 3 - EXECUTION

3.01 Setting Finish Hardware:

- A. Secure finish hardware with suitable fasteners of the same material and finish as the item being attached.
- B. After fitting hardware to doors, remove all finish hardware except butt hinges, carefully replace in properly marked boxes, and place in storage until painting and finishing is completed. After painting and finishing is completed, permanently install finish hardware.

3.02 Schedule of Finish Hardware: The following is a schedule of hardware to be furnished for this work. The material listed shall conform throughout to the requirements of the foregoing specifications.

HW 1

Hardware Complete by Others

HW 2

6	Hinges	450 TBB NRP - Sec Stud	PC	1
2	Flush Bolts	FB6-12"	10B	4
1	Lock	8104 LNH	10B	2
1	Cylinder	1E74	10B	9
1	Closer	PR7500 HO Active leaf	STAT	3
1	Holder Arm	#2 Inactive leaf	STAT	3
2	Stops	FB19X	10B	4
1	Astragal	139SP	PC	6
1	Threshold	896 x MSA	DKB	6

HW 3

3	Hinges	450 TBB NRP Sec Stud	PC	1
1	Lock	8104 LNH	10B	2
1	Cylinder	1E74	10B	9
1	Closer	PR7500 HO	STAT	3
1	Stop	FB19X	10B	4
1	Threshold	896 x MSA	DKB	6

Use 4B450TBB on doors over 3'-4" wide.

HW 4

3	Hinges	450 TBB NRP Sec Stud	PC	1
1	Panic Bolt	R108 x 92L	10B	5
1	Cylinder	1E72	10B	9
1	Closer	PR7500 BF	STAT	3
1	Stop	FB19X	10B	4
1	Threshold	896 x MSA	DKB	6
1	Set Seals	PF181 Head & Jambs		6

Use 4B450TBB on doors over 3'-4" wide.

HW 5

3	Hinges	450 TBB	PC	1
1	Panic Bolt	FL-D108-92L	10B	5
1	Cylinder	1E72	10B	9
1	Closer	PR7500 BF	STAT	3
1	Stop	FB14X	10B	4
1	Threshold	513A x MSA	DKB	6
1	Set Seals	TM181 Head & Jambs		6

SCRTD - Division 1
 Bus Maintenance Facility
 and Yard Improvement

HW 6

3	Hinges	450 TBB	PC	1
1	Lock	12-8105 LNH	10B	2
1	Cylinder	1E74	10B	9
1	Closer	7500 BF	STAT	3
1	Stop	FB14X	10B	4
1	Threshold	513A x MSA	DKB	6
1	Set Seals	TM181 Head & Jambs		6
1	Threshold	896 x MSA wher required	DKB	6

HW 7

3	Hinges	450-4 TBB	PC	1
1	Closer	7500 BF	STAT	3
1	Push Plate	47 8 x 16	10B	7
1	Pull Plate	57N 4 x 16	10B	7
1	Kick Plate	37 10 x 2" LDW	10B	7
1	Stop	50W	10B	4
1	Threshold	513A x MSA where required	DKB	6

HW 8

3	Hinges	450-4 TBB	PC	1
1	Lock	12-8104 LNH	10B	2
1	Cylinder	1E74	10B	9
1	Closer	P8200/8200 at 20 Min Drs	STAT	3
1	Set Seals	TM181 at 20 Min Drs		6
		Head & Jambs at 20 Min Drs		6
1	Stop	50W	10D	4
1	Threshold	513A x MSA where required	DKB	6
1	Threshold	896 x MSA where required	DKB	6

HW 9

6	Hinges	450-4 TBB	PC	1
2	Flush Bolts	FB6-18" x DP2	10B	4
1	Lock	8104 LNH	10B	2
1	Cylinder	1E74	10B	9
2	Stops	50W	10B	4

HW 10

6	Hinges	450-4 TBB	PC	1
1	Set Auto Bolts	FB7/FB8	10B	4
1	Coordinator	Cor 2 Complete	PC	4
1	Lock	12-8137 LNH	10B	2
1	Cylinder	1E74	10B	9
1	Closer	7840-04-24VDC	STAT	3
1	Closer	7820-04-24VDC	STAT	3
2	Stops	50W	10B	4
1	Threshold	513A x MSA	DKB	6
1	Astragal	139 SP	PC	6
1	Set Seals	TM181 Head & Jambs		6

SCRTD - Division 1
 Bus Maintenance Facility
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HW 11

1	Lock	W2701 (Swing)		8
1	Cylinder	1E74	10B	9
1	Lock	W2801 (Slide)		8
	Additional Hardware by Others			

HW 12

3	Hinges	450-4 TBB	PC	1
1	Latch	12-8115 LNH	10B	2
1	Closer	7500 BF-DA	STAT	3
1	Kick Plate	37 10 x 2" LDW	10B	7
1	Stop	50W	10B	4
1	Set Seals	TM181 Head & Jambs		6
1	Threshold	513A x MSA where required	DKB	6

HW 13

3	Hinges	450-4 TBB	PC	1
1	Lock	12-8165 LNH	10B	2
1	Closer	7500 BF-DA	STAT	3
1	Stop	50W	10B	4
1	Set Seals	TM181 Head & Jambs		6

HW 14

6	Hinges	450-4 TBB	PC	1
1	Set Auto Bolts	FB7/FB8-DP2	10B	4
1	Coordinator	Cor 2 Complete	PC	4
1	Lock	12-8104 LNH	10B	2
1	Cylinder	1E74	10B	2
2	Closers	P8200	STAT	3
1	Astragal	139 SP	PC	6
1	Set Seals	TM181 Head & Jambs		6
1	Threshold	513A x MSA where required	DKB	6

HW 15

3	Hinges	450-4 T	PC	1
1	Lock	8105 LNH	10B	2
1	Cylinder	1E74	10B	9
1	Stop	50W	10B	4

HW 16

6	Hinges	450-4 T	PC	1
2	Flush Bolts	FB6 x DP2	10B	4
1	Lock	8104 LNH	10B	2
1	Cylinder	1E74	10B	9
2	Holdings	#2	STAT	3
1	Threshold	896 - MSA where required	DKB	6

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HW 17

3	Hinges	450-4 TBB	PC	1
1	Lock	12-8137 LNH	10B	2
1	Cylinder	1E74	10B	9
1	Closer	7840-04-24 VDC	STAT	3
1	Stop	50W	10B	4
1	Threshold	513 AMSA	DKB	6
1	Seals	TM181 Head & Jambs		6

HW 18

Provide padlocks, keyed to door system, at rolling steel doors.

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DIVISION 8 - DOORS AND WINDOWS

SECTION 08800 - GLASS AND GLAZING

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Glass and glazing.
- 1.02 Related Work in Other Sections:
- A. Toilet room mirror - refer to Section 10800.
- 1.03 Requirements:
- A. Submittals: Submit shop drawing, manufacturer's technical data and material specifications, and samples, as applicable.
 - B. Protection of Glass: Glass which has been installed shall be identified with tapes or strings. These identifications shall be suspended near but not in contact with the glass. Tapes may be attached to the sash at head, jamb or sills with a nonstaining adhesive. Marking or coating the glass with soap, cleansing powders or other materials will not be permitted. Any glass which becomes stained because of marking or taping on the surfaces shall be replaced at no additional cost to the Owner.
- 1.04 Butt-Joint Glazing System:
- A. The Contractor shall submit the silicone sealant manufacturer's:
 - 1. Adhesion test data to production samples of metal and glass, tested in accordance with ASTM C794.

2. Compatibility statement that the materials in contact with the sealant such as gaskets, spacers, setting blocks, are compatible with the sealant after 21 days' exposure to ultra violet, 2000-4000 (micro watt u.v. radiation).
 3. Stress statement that the sealant dimensions (per detail) when exposed to the specified windload, the stress on the silicone sealant does not exceed 20 psi with a 6:1 safety factor.
 4. The Contractor shall provide the sealant manufacturer production runs of material for sealant manufacturer's evaluation including shop drawings, showing size of lights, design windload, and sealant dimensions for sealant manufacturer's statement on stress.
- 1.05 Provide Owner with containers of each type, size and color of glass installed for future use. Quantity to be provided shall be a minimum of 2% of area installed, but not less than two pieces of each size.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.
- 2.02 Materials:
- A. Glass:
 1. All glass shall conform with Federal Specification DD-G-451d; Glass, Plate, Sheet, Figured (Corrugated and Float, for Glazing, Mirrors and Other Uses). Manufacturer shall certify glass supplied was produced in accordance with this specification.
 2. Tinted Glass: 1/4" thick PPG "Solarbronze". Manufacturer shall label "air" side and "tint" side of glass.
 3. Spandrel Glass: 1/4" thick "Spandrelite" or "Vitrolux". Color of ceramic frit backing to be selected by the Engineer.

4. Wire Glass (for fire rated glazing): 1/4" thick "Baroque" or "Misco" (horizontal and vertical wires).
 5. Clear Glass: 1/4" clear float.
 6. Glass shall be tempered where shown or required.
 7. Tong marks will not be allowed.
- B. Butt-joint glazing shall conform with PPG Industries "Butt-Joint Glazing System Manual G-812" and requirements specified in paragraph 1.04 of this section.

ARTICLE 3 - EXECUTION

- 3.01 Glazing procedures shall, in general, conform with the printed recommendations and instructions of the Glazing Manual of the Flat Glass Manufacturers' Association. Contractor shall furnish all required materials and workmanship necessary to insure a completely watertight installation without any rattling. All glazing shall be performed by skilled glaziers in accordance with approved shop drawings. All glass sizes shall be verified before cutting and shall fit within a tolerance of 1/32" per 1/8" thickness. All glass shall be tight and true within the glazing members, using vinyl glazing beads where specified for this purpose. All glass shall be set without springing and with the convex side to the exterior. Any glass which is set with putty shall be shimmed, fully bedded, secured with stops, and then back-puttied on both sides.
- 3.02 Cleanup and Replacement:
- A. The Contractor shall be responsible for all glass breakage during storage at the site, during erection and shall replace all broken glass as required to complete the installation, all prior to final acceptance of the building. Keep premises clean during progress of work.
 - B. Upon completion of the building, all glass surfaces shall be thoroughly washed and polished. Any broken, scratched, chipped or otherwise defective glass, including any glass which has become stained shall be removed and replaced with proper materials and workmanship. The entire glazing operation shall be left in a neat, clean and acceptable condition, as approved by the Engineer.

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DIVISION 9 - FINISHES

SECTION 09200 - LATH AND PLASTER

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Metal lath and paperbacked metal lath.
 - D. Portland cement plaster including scratch coat for mortar set tile.
 - E. Metal studs for stud walls with mortar set tile.
 - F. Lathing accessories, plaster screeds, ventilation screeds, casing beads, corner beads and expansion divider screeds in plastered surfaces.
 - G. Install all metal access panels in plastered surfaces.
 - H. Backing plates in stud walls provided under this section.
- 1.02 Related Work in Other Sections:
- A. Gypsum board finish - refer to Section 09250.
 - B. Metal studs with two sides drywall - refer to Section 09250.
 - C. Furnishing access panels - refer to Section 08305 and Divisions 15 and 16.
- 1.03 Submittals:
- 1. Submit manufacturer's technical data and material specifications, and samples, as applicable.
 - 2. Submit samples of all textured finishes for approval prior to commencing work.

1.04 Requirements:

- A. Perform work with skilled mechanics, in each particular trade. All work shall be substantially supported, rigidly constructed, and shall finish straight, plumb or level, and shall be clean with no unfinished parts between plaster and adjoining work. Install work so as to provide a complete closure of work designated to be concealed.
- B. Coordinate lathing and plastering work with that of other trades. Lathing shall provide the proper support for plaster work and shall provide for openings and built-in features required by other trades. All plumbing, heating and air conditioning, electrical and built-in work to be plastered in shall be in proper place and condition before commencing the work of this section.
- C. Construct and maintain scaffolding in conformance with all applicable laws and ordinances, and so as not to interfere with work of other trades.
- D. Protect adjacent surfaces of other materials from damage by water or plaster materials. Plaster surfaces, which are cut out to install work of other trades, shall be neatly patched. Damaged and defective plaster work shall be made good.
- E. All work shall meet the requirements of all governing codes, ordinances, laws, regulations, safety orders and directives, etc. relating to the work.
- F. Cement plaster shall conform to ANSI Standard Specification A42.2 and A42.3.
- G. Lathing for exterior plaster shall conform with ANSI A42.3.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture. Where model numbers are indicated, if specified models are discontinued, the Contractor shall furnish the manufacturers' updated model at no additional cost to the Owner.

2.02 Materials:

A. Metal Studs:

1. Non-loadbearing studs shall be not less than 18 gauge punched channel, wide flange studs with not less than 1-3/8" knurled flanges. Track shall be punched channels.
2. Studs shall be 4" wide unless noted otherwise. Studs shall be galvanized.
3. Screwable studs shall have a minimum 1-3/8" flange.

B. Channels, Etc.:

1. Metal channels shall be cold-rolled steel, 3/4" or 1-1/2" as shown.
2. Metal furring channels shall be 7/8", 25 gauge galvanized metal.
3. Tie wire shall be 16 gauge galvanized annealed wire.
4. Hanger wire shall be 8 gauge galvanized annealed wire.

C. Lath and Accessories: The work shall include all lather's material and work required for the proper support and neat finish of all plaster work and all other related work customarily provided by the latner.

1. Lath at horizontal soffits shall be 3/8" ribbed diamond mesh expanded steel lath weighing not less than 3.4 lbs. per square yard. Metal shall be shop coated after fabrication. Lath on continuous backing or furring exceeding 1" in width shall be self-furring type. Lath on vertical surfaces shall be factory assembled 3.4 lbs. per square yard diamond mesh metal lath with Type B paper backing per Fed. Spec. UU-B-790a. Paper at Type 1 buildings shall be noncombustible with a flame spread rating of 25 or less. Lath shall conform with local code requirements.
2. Lathing accessories shall be Milcor, Pennmetal, U.S. Gypsum, Western Corneraid, or Wheeling, of sections as shown on the drawings in the longest available lengths of minimum 26 gauge galvanized steel stock.

3. Corner beads shall be small nose, expanded wing type, unless otherwise shown.
4. Plaster stops shall be made with expanded wing for interior and exterior use.
5. Provide vent screeds where shown.
6. Provide expansion control joints, equal to U.S.G. #100, in exterior cement plaster surfaces per Furring and Lathing Information Bureau (every 100 square feet of surfaces) or as indicated on the drawings.
7. Fasteners for attachment of lath shall be as recommended by lath manufacturer.

D. Plaster:

1. Portland cement shall conform to ASTM C150, Type I or II.
2. Concrete bonding for cement plaster shall be "Weld-Crete" by Larsen Products, "Thorobond" by Thoro System, or equal.
3. Lime shall be normal hydrated, Type S, processed lime conforming to ASTM C206, Miracle Brand.
4. Fiber reinforcement for exterior cement plaster shall be 1/2" long alkaline resistant, chopped glass fiber shorts, Type AR as manufactured by Owens-Corning Fiberglass, "Dur-O-Fibar" as manufactured by Dur-O-Wal, Inc., or 1/4" or 1/2" long 15 denier polypropylene fibers, "PP" Fibers, as manufactured by Fibercon, Inc., Arleta, California, or equal.
4. Sand for plastering shall be clean, hard, well-graded for plaster work and shall conform to ASTM C144. Finish coat sand shall be No. 16-20 mesh grade silica sand.
5. Water shall be potable.

2.03 Proportioning of Plaster Mixes:

A. Cement Plaster:

1. First Coat:
 - a. On Metal Lath: 1 part portland cement, 3-1/2 parts sand, 3/4 part hydrated lime, minimum 2 lbs. glass fiber shorts or 0.7 lbs. polypropylene fibers per sack of cement, and waterproof admixture added.
2. Second Coat: 1 part portland cement, 4-1/2 parts sand, 3/4 part hydrated lime, minimum 2 lbs. glass fiber shorts or 0.7 lbs. polypropylene fibers per sack of cement, and waterproof admixture added.
3. Finishing Coats: 1 part portland cement, 3 parts fine sand with sufficient hydrated lime added to make mortar work easy under the trowel. Sand to be sieve size to provide a medium finish, except showers shall have a "Shower" finish.

ARTICLE 3 - EXECUTION

3.01 Furring and Partitions:

- A. Studs for partitions shall be spaced 16" on centers. Metal studs for partitions shall have the runner tracks fastened to concrete floors and underside of slab above (where studs extend through ceiling) with 7/32" diameter by 1-3/8" long penetration Ramset stud bolts spaced 32" on center and not more than 6" from each end of the runner track. Studs shall be inserted and screwed with No. 6 screws into the runner tracks. Allow for deflection in nonload bearing studs. Every third stud shall run to slab or roof deck above if partition is not full height and shall be braced both sides at 4' o.c. from slab above with studs welded or screwed to top plate and extended at 45 degree angle. Provide 16 gauge double studs, secured together at partition ends, not abutting other building parts, cased ends, and at all jambs and openings. Provide triple studs at corners.
- B. Furring channels shall be 3/4" spaced 16" on centers and secured to each interstice or runner channel with 16 gauge wire wrapped twice around and twisted together.
- C. Extra channels or metal studs shall be provided as necessary at vertical breaks or changes in ceiling level.
- D. Partitions and furring around pipe spaces shall be as shown on the drawings and/or as required.

- E. All channels shall be in long lengths, spliced where necessary by lapping at least 12" for 1-1/2" channels and 8" for 3/4" channels and tying at two points with 16 gauge wire. Channels shall be set edgewise to plaster lines and shall be supported and stayed secure at structural walls and columns, and firmly tied at all intersections. Steel door frames and jambs shall be erected and anchored in position before adjoining steel studs are installed. Anchorage of steel studs and channels at door openings shall be adequate and permanent.
- 3.02 Backing Plates: Examine all parts of the drawings and specifications for any conditions which require surface mounted cabinet work, equipment or other furnishing which will be supported on or secured to the plastered walls. Provide 18 gauge by not less than 4" wide studs as backing for wall hung items, located by marking on the outside face of the finished wall, after installation. Backing shall extend over not less than 3 studs. Backing shall be large enough, in each case, and adequate in area to provide uniform support for the load to be applied. Where backing has been omitted, remove plaster as is necessary to properly install backing plates and then replace the plaster.
- 3.03 Access Panels:
- A. Install access panels in plastered walls under this section. Coordinate location with the foremen of the trades requiring the access panels, such as Plumbers, Air Conditioning, Electrical, etc. Bring to the attention of the Engineer any discrepancies, lack of adequate clearance, interferences with cabinetwork, lighting fixtures, etc., for final decision by the Engineer.
- B. Check the access panels at the end of the job for proper opening and closing, and, if damaged, repair or replace as necessary.
- 3.04 Lathing:
- A. Metal Lath:
1. Application of lath shall be with long dimension of the sheets across the supports. Lap lath 1" along sides and ends of all sheets. Secure lath to studs

- at 6" centers. Tie laps between supports at 6" centers. Provide paper backing behind lath with double layer on parapet tops and down parapet 12" and at plywood shear panels.
2. Extend metal lath joining masonry to be plastered over the masonry 6" and secure with concrete nails at 8" centers.
 3. At corners of openings in plastered surfaces on masonry base, place a 12" x 18" strip of metal lath diagonally to reinforce the plaster at these points.
 4. At eased or rounded vertical corners, place additional 9" wide strip of metal lath to reinforce plaster at corners.
- B. Apply paperbacked lath with long dimension at right angles to the supports. Extend both horizontal and vertical factory flaps. On vertical surfaces, apply lathing first course at the bottom and the remaining courses working up to top. Work shall be from right to left to assure proper waterproofing. Maintain waterproof integrity to shed water toward exterior. Wire over laps shall be 2" on horizontal joints and 1-1/2" on vertical joints so as to assure that the extended factory flaps automatically form required shingle fashion waterproofing. Stagger vertical laps. Attachments shall be made 6" on centers by using screws. All attachments shall engage one or more wires in the lath and encircle the flange of the support at no more than 6" on centers. When applying lath with screws, the screw must be placed under horizontal wire and be securely tightened. Side horizontal laps occurring between stud supports shall be tied together with 16 gauge tie wire.
- C. Install metal plaster stops where a plaster surface meets any surface which is not plastered.
- D. Place corner beads level and plumb, full height and/or length accurately to finish plaster lines and secure against shifting. Make splices with perfect alignment.
- E. Install expansion joints. Lath shall be broken behind expansion joints, but paper shall continue through. Expansion joints are not required over concrete walls.

3.05 Mortars:

- A. General: Proportions of material for the various mortars are by volume measurement, except as otherwise noted.
- B. Fiber reinforcement shall be added to mixer during the last minute of the mixing cycle and shall not be over-mixed.
- C. Mixing of materials shall be by machine and mortars shall be used as soon as practical after mixing. Retempering will not be permitted and no partially set or "dead" material shall be used.
- D. Measurement of material shall be accurate and mixing shall be adequate and uniform. Oversanded or over-watered plaster shall not be used.
- E. Discharge mixed mortar from the mixer into watertight boxes, and when within the building, protect adjacent floor surfaces with waterproof material.

3.06 Plastering:

A. General:

- 1. Preparatory to the start of plastering, the installation of steel furring, door frames, backing base, grounds, lathing accessories and metal access door frames shall be complete and approved by the Engineer. All necessary equipment and stock materials shall be at hand. Submit samples of special textured finish for approval of the Engineer. Plaster work of each section, once started, shall be continued without interruption to completion. Wet masonry surfaces prior to application. Plaster may, at Contractor's option, be gun or trowel applied provided the finish texture is approved by the Engineer, except that all gun-applied plaster shall be compacted with hand tools. Where gun application is used, protect adjoining construction from spray and overspray.
- 2. Where plaster gun application is used, adjoining existing or previously finished surfaces shall be protected from overspray or splatter. Any such splatter shall be cleaned immediately and surfaces left in perfect condition.

B. Cement Plaster:

1. On metal lath, plastering shall be three coat work, not less than 7/8 inch thick.
2. On masonry, plastering shall be two coat work, not less than 1/2" thick, preceded by a bonding dash coat of cement grout composed of cement, water, coarse sand and bonding material.
3. Plaster may be hand or machine applied, at contractor's option, providing finish texture is as selected by the Engineer and plaster has a 2-1/2" slump, except that machine-applied plaster shall be compacted with hand tools.
4. Scratch or first coat on metal lath shall be minimum 3/8" thick, darbied to a dense, solid mass and shall be thoroughly cross-scored to provide key for the following coat. Provide scratch coat only over paper backed wire lath as backing for ceramic tile where mortar set tile is called for.
5. Second coat shall be applied approximately 3/8" (1/2" at masonry) thick, shall be rodged to a dense, straight, even plane and scratched for finish coat. Joinings or laps in second coat shall not occur over joinings or laps in scratch coat.
6. Finish coat shall be applied to a medium sand finish to total required thickness. Match approved samples for texture. Finish at showers shall be a "Shower" finish. Any stoppages in finish coat shall occur at architectural breaks, control joints, or screeds. Laps or other unsightly differences in finish coat are not acceptable and must be replaced. Provide moveable scaffolding or similar equipment as necessary.
7. Minimum curing for first two coats is 48 hours each coat, and final coat is seven days. Keep plaster continuously moist during curing period. Take special precautions, on days of extreme weather, to prevent too rapid drying and cracking of plaster.

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DIVISION 9 - FINISHES

SECTION 09250 - DRY WALL

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Gypsum board finish for walls and ceilings.
 - D. Install access panels in gypsum board finish.
 - E. Metal dry wall accessories.
 - F. Taping, spackling and sanding for gypsum board.
 - G. Install pressed metal door and window frames in dry wall partitions.
 - H. Metal studs for walls with two sides dry wall and areas with no finish on walls.
 - I. Shaft wall system and furring of all mechanical pipes and ducts.
 - J. Acoustical sealant at floors, ceilings, and masonry where shown or where required to meet STC ratings shown.
 - K. Backing plates in stud walls provided under this section.
- 1.02 Related Work in Other Sections:
- A. Lath and plaster - refer to Section 09200.
 - B. Metal studs with one or two sides plaster - refer to Section 09200.
 - C. Furnishing access panels - refer to Section 08305 and Divisions 15 and 16.
- 1.03 Submittals: Submit manufacturer's technical data and material specifications, and samples, as applicable.

1.04 Requirements:

- A. At all times, examine all preparatory work and verify that the gypsum dry wall finish may be substantially supported, rigidly constructed and finished straight, plumb, level, true, and clean with no unfinished parts between dry wall work and adjoining work.
- B. Install all work so as to provide complete closures of work which is designated to be concealed. Properly coordinate dry wall work with that of other trades and provide for openings and built-in features. All plumbing, heating, electrical work, and other trades to be closed in shall be in proper place and condition before commencing dry wall work.
- C. Unless shown otherwise on the Drawings or required by code, install all dry wall work using the latest applicable standard methods and details in the latest edition of "Dry Wall Construction Handbook" by U.S. Gypsum Company.
- D. Where governing code requirements are more stringent than these specifications, the code requirements shall govern. Where they are less stringent, the specifications shall govern.
- E. Coordinate time of installation of attachment rods and wire for suspended ceilings to preclude omission.

ARTICLE 2 - PRODUCTS

2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.

2.02 Materials:

- A. Gypsum board shall be 1/2" and 5/8" thick as indicated and shall conform with ASTM C36. Provide Type X at all areas. Boards shall have the long edges recessed or tapered for taping. Provide water-resistant boards conforming with ASTM C630 in toilet rooms and other wet areas.
- B. Tape shall be high strength paper type conforming to Fed. Spec. SS-J-570B, Type II.
- C. Joint Compound shall be all-purpose ready-mixed compound type conforming to Fed. Spec. SS-J-570B, Type I.

- D. Fasteners: Screws for attachment to furring channels and screw-on type studs shall be No. 6, blued steel, self-tapping sheet metal screws with flat, countersunk No. 2 Phillips head, 1" or 1-5/8" long. Screws for attachment of wallboard to 18 gauge or heavier studs shall be Type S-12 dry wall screws, manufactured by U.S. Gypsum, length 1" or 1-5/8" as required.
- E. Corner reinforcement shall be galvanized steel type with perforated edges. Casing for all edges of exposed gypsum board shall be galvanized steel J-type with perforated edges. Expansion control joints shall be galvanized steel type with perforated edges, USG #093 or equal.
- F. Furring channels for support of gypsum board shall be screw-on furring channels, rolled from .022 galvanized steel, 7/8" deep, manufactured by Blue Diamond or U.S. Gypsum.
- G. Resilient channels for support of gypsum board shall be screw-on type, rolled from minimum 26 gauge galvanized steel, 1/2" deep, manufactured by Blue Diamond or U.S. Gypsum.
- H. Carrying channels shall be minimum 1-1/2" cold-rolled steel weighing not less than 475 pounds per 1000 feet.
- I. Diagonal bracing shall be minimum 2-1/2", 20 gauge steel studs.
- J. Tie wire shall be minimum 16 gauge galvanized annealed wire.
- K. Hangers shall be minimum 8 gauge galvanized annealed wire and so placed to support a maximum 16 square feet of hung ceiling.
- L. Acoustic sealant shall be a nonhardening, nonstaining caulking compound. Provide 1/4" minimum bead at all perimeters of walls.
- M. Laminating adhesive shall be equal to U. S. Gypsum Durabond 90, Gold Bond Sta-Smooth, Standard Set, or equal.
- N. Metal Studs:
 - 1. Studs shall be not less than 25 gauge, wide flange studs with not less than 1-3/8" flanges. Tracks shall be unpunched channels. Studs which will receive ceramic tile shall be not less than 20 gauge. Studs which will carry wall hung cabinets, fixtures, etc. shall be 16 gauge.

- a. All 14 gauge and 16 gauge components shall be made from cold-formed slit steel conforming to ASTM A446 Grade D with a minimum yield point of 50,000 psi.
 - b. 18 gauge and lighter components shall be made from cold-formed slit steel conforming to ASTM A446 Grade A with a minimum yield of 33,000 psi.
 - c. All studs shall have a factory applied galvanized coat with a minimum G-60 galvanized coating.
2. Shaft enclosure studs shall be U. S. Gypsum, "C-H" studs, Flintkote Series IV, "I" studs, or equal, with matching "J" tracks.
 3. Studs shall be 4" size unless noted otherwise on the drawings and shall be galvanized. For partitions where shown or required by codes, provide heavier gauge studs.
- O. Core boards, (shaft wall liner) shall be 1" thick, 24" widths, full height with "V" edges where shown. Boards shall have a fireproof gypsum core and shall be encased in strong paper.

ARTICLE 3 - EXECUTION

- 3.01 Metal studs for dry wall partitions shall be spaced at 16" o.c. unless otherwise noted and shall have the runner tracks fastened to concrete floors and underside of structure above (where studs extend through ceiling) with 7/32" dia. by 1-3/8" long penetration Ramset stud bolts spaced 32" on center and not more than 6" from each end of the runner track. Studs shall be inserted and screwed with No. 6 screws into the runner tracks. Allow for deflection in nonload bearing studs. Every third stud shall run to slab above if partition is not full height and shall be braced both sides at 4' o.c. from slab above with studs welded to top plate and extended at 45 degree angle. Provide 16 gauge double studs at doors and other openings and triple studs at corners. 25 gauge studs shall be screwed to plates (not welded).
- 3.02 Install metal door and window frames in stud walls in accordance with the drawings, shop drawings and manufacturer's details for applicable conditions.

3.03 Suspended Ceilings:

- A. Saddle-tie hanger wire with ends twisted at least 3 times around itself at 3' o.c. to 1-1/2" runner channels spaced 4' on centers and to structure above as detailed; these to be crossed with furring channels clipped or tied to the runners. Spacing for furring channels shall be 16" o.c. or as indicated. Isolate runner channels from structural walls and partitions. Locate runner channels not over 6" from parallel boundary walls or beams, furring channels 2" from parallel walls.
- B. Provide additional ceiling framing in conjunction with mechanical and electrical trades as necessary to suspend the ceiling adequately where large ventilating ducts are to be installed and to accommodate fixtures on ceilings.

3.04 Gypsum Board on Walls and Ceilings:

- A. On walls, secure boards to solid bearings along all edges and joints of all boards. Place boards vertically. Block boards less than full height of wall at joint. Horizontal application of boards will be allowed provided all joints are staggered and blocked.
- B. On ceilings, secure boards along perimeters of ceilings, around edges of openings, and to all furring members.
- C. Power drive screws with an electric screwdriver. Drive screwheads so that there will be a slight depression below the surface of the wallboard without breaking the paper. Butt edges loosely together. End joints shall be staggered and secured on supports. On walls, secure boards at 12" on centers in the field of the board and 8" on centers staggered along all abutting edges. On ceilings, secure gypsum board at 8" on center in the field and along the abutting joints. Revise spacing as required by local codes for fire rated assemblies.
- D. Install corner beads and stops, etc., in strict accordance with manufacturer's printed specifications.
- E. Offset joints on one side of wall one stud minimum from joints on opposite side of wall.

3.05 Multiple-Ply Gypsum Board Application: Apply multiple layers of gypsum board with screws or with adhesive, whichever is required by code and in accordance with the following:

- A. All Screw-On Applications: Apply first layer of gypsum, with square edges, cut-in floor to ceiling height, shall be applied vertically to the face of the stud. Attach with No. 6 1-inch screws at 12" on center on abutting edges and in the field. Apply face layer of gypsum board, cut-in floor to ceiling height, vertically over the first layer so that the vertical joints are staggered with the backerboard joints. Attach face layer with No. 6 1-3/4" long screws at 12" on center, in the field and 8" on center at perimeter of boards. Horizontal application of boards will be allowed for the first layer. Stagger and block all joints.
 - B. Adhesive Application: Apply first layer as specified for single layer application, except that joints shall not be treated. Apply the succeeding layers with adhesive spread evenly over the back surface. Boards shall be at right angles to the first layer. Spread adhesive with a notched trowel in an irregular pattern to uniformly cover the back surface of the board. Place panels in position and temporarily secure with screws. After the adhesive has set for a minimum of 24 hours, remove or spackle temporary fastenings.
 - C. Offset joints of second layer one stud minimum from joints in first layer.
- 3.06 Backing Plates: Examine all parts of the drawings and specifications for any conditions which require surface mounted cabinet work, equipment or other furnishing which will be supported on or secured to the drywall. Provide minimum 18 gauge by not less than 4" wide studs as backing for wall hung items, located by marking on the outside face of the finished dry wall, after installation. Backing shall be large enough, in each case, and adequate in area to provide uniform support for the load to be applied. Backing studs shall extend over at least 3 studs. Where backing has been omitted, remove wallboard as is necessary to properly install backing plates and then replace the gypsum board.
- 3.07 Install expansion control joints in gypsum board surfaces every 30' in each direction for walls and every 30' in each direction for ceilings.
- 3.08 Access Panels:
- A. Install access panels in gypsum board walls. Coordinate location with installation requiring the access panels.

Bring to the attention of the Engineer any discrepancies, lack of adequate clearance, interferences with cabinet-work, lighting fixtures, etc., for final decision by the Engineer.

- B. Check access panels at the end of the job for proper opening and closing, and, if damaged, repair or replace as necessary..

3.09 Accessories, Taping:

- A. Cover all external corners with protective metal bead, secured with screws and covered with taping compound. At all locations where the gypsum board terminates in a free edge, a metal casing trim shall be provided.
- B. Fill and tape all joints, including internal corners. Clean surfaces, free of dirt or dust, and set all nail heads, or screw heads, before taping.
- C. Tape and sand all dry wall partitions. Press in well, first coat of joint cement to fill the entire joint without any voids, and apply thick enough to cover the recessed edges. Immediately press reinforcing tape tightly and evenly into the cement and embed. There shall be no air bubbles or other imperfections in this application. After the first application has dried completely, apply additional coats of cement as required and sandpaper until all surfaces are perfectly flush and smooth enough to receive finish painting. Patch all screw heads, dents, and other voids or surface irregularities with the same joint cement as used for taping joints.

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DIVISION 9 - FINISHES

SECTION 09300 - TILE WORK

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Ceramic floor tile.
 - D. Ceramic wall tile and base.
 - E. Membrane waterproofing under thin set floor tile at second floor.
- 1.02 Related Work in Other Sections:
- A. Drywall in back of wall tile - refer to Section 09250.
 - B. Membrane waterproofing, except as specified herein - refer to Section 07111.
 - C. Scratch coat in back of wall tile - refer to Section 09200.
 - D. Paper backed metal lath - refer to Section 09200.
- 1.03 Submittals: Submit manufacturer's technical data and material specifications, and samples, as applicable.
- 1.03 Requirements:
- A. Except as may otherwise be specified herein, all tile work shall conform with Standard Specifications issued by the American National Standards Institute (ANSI) and the Tile Council of America (TCA) as specified for each type of application, latest editions.
 - B. Cut all tile for proper fitting around work in place. Rub exposed edges of cuts smooth with abrasive stone. Grind all tile and carefully fit where tile intersects

with fixtures, plumbing and accessories. Tile shall be carefully fitted around outlets, pipes, fixtures, and fittings so that the plates, escutcheons, or collars all overlap the cut.

- C. Keep tile free of stains before placing.
- D. Patterns of tile shall be carefully laid out and established, working from center of each wall, or space, to assure equal size tile on the ends. Joints in walls shall align with joints in floors.
- E. Locations of all accessories, anchoring devices for equipment, toilet stalls, mirror frames, and similar items penetrating through the tile finish shall be located and properly marked before any tile work is started.
- F. Check all walls for plumb and all angles for square before the tile work is started. The starting of tile work shall imply acceptance of the subsurfaces.
- G. Provide and install barriers to close off floors to traffic until the tile work has set up. Install other forms of protection and coverings as required to prevent any damage. Where trucking or continuous traffic conditions occur over tile work, provide boards or plywood covering.
- H. Provide Owner with unopened containers of each type, size, and color of material installed for future use. Quantity to be provided shall be a minimum of 2% of area installed, but not less than 1 standard size container.

ARTICLE 2 - PRODUCTS

2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.

2.02 Materials:

- A. Cement shall be standard brand of portland cement conforming with ASTM C150, Type I or Type II.
- B. Hydrated lime shall be high calcium lime, conforming with ASTM C206 or C207, Type S.

- C. Sand shall be clean, washed, sharp and fine aggregate as per ASTM C144. Sand for mortar setting beds shall be well graded to pass a No. 8 sieve with not more than 5% passing a No. 100 mesh screen.
- D. Water used for tile work shall be clean and drinkable.
- E. Grout for all tile shall be Hydroment Joint Filler by UPCO, Custom Building Products Type S, or equal. Colors as selected by Engineer.
- F. Membrane waterproofing under thin-set tile floors above grade shall be Latricrete membrane coating 301/335, Merko BFP, or equal. Conform with Latricrete Bulletin No. 235.0 and Merko specification.
- G. Tile shall be Standard Grade and shall meet or exceed the requirements of TCA A137.1 specification for tile. Tile shall be manufactured by Dal-Tile, American Olean, Pomona Tile or equal.
 - 1. All tile colors shall be as selected by the Architect.
 - 2. Glazed wall tile shall be 4-1/4" x 4-1/4" x 5/16" dust pressed, white body, square edge, machine made. Base shall match wall tile with built-in self cove.
 - 3. Ceramic floor tile shall be 4-1/2" x 4-1/2" x 5/16" slip resistant to match wall tile.
 - 4. Furnish and install all sizes and shapes and trim pieces as detailed.
 - 5. Provide honed marble thresholds where shown.
- H. Organic adhesive for thin-set tile work on drywall shall conform with ANSI A136.1, Type 1.
- I. Latex-portland cement mortar for thin-set tile work on drywall shall conform with ANSI A118.4.
- J. Curing paper for all tile work shall be nonstaining building paper.
- K. Divider strips shall be 1/8" wide, zinc alloy divider strips, manufactured by American Terrazzo Strip Company, Inc., Duggan Manufacturing Company, or approved equal.

ARTICLE 3 - EXECUTION

3.01 Wall Tile - Thin Set (Contractor may use A or B):

A. Organic Adhesive:

1. All tile shall be firmly embedded in adhesive and tapped into place; adhesive that has filmed over shall be removed and replaced with fresh adhesive. Tile joints shall be established by the space lugs on the tile, allowing a joint 1/16" thick. All joints, horizontal and vertical shall be straight and perfectly level or plumb. Surfaces found to be warped or varying from a true plane by more than 1/8" in 10' shall be removed and replaced as necessary to conform with these requirements.
2. All intersections, angles and returns shall be accurately formed. Cut edges of tile shall fit against other tiles, trim finish and built-in features, and shall be ground, rubbed smooth with a hone and carefully joined.
3. As the work progresses, surfaces of completed portions shall be cleaned with damp cloths to prevent stains. After mortar has set, the tile surfaces shall be washed down with clean water. Joints shall be cleaned and washed and then grouted.
4. Refer also to TCA, Handbook Detail No. B413, W242, and ANSI A108.4 Specification.

B. Latex-Portland Cement Mortar:

1. Mortar for setting of tile shall be a mix composed of one bag portland cement, 100 pounds clean fine sand (No. 40 mesh) and 5 gallons of Laticrete Tile Set Liquid No. 4237 to bring to a troweling consistency.
2. A coat of setting mortar shall be applied and combined with a notched trowel to leave uniform ridges, and using sufficient mortar to bed the tile completely. Tile shall be applied while the mortar surface is wet and tacky; tile shall not be applied to skinned over mortar. As the work progresses, the tiles shall be aligned and rubbed, or beaten with a block, then embed tile in mortar and assure a true surface.

3. Refer also to TCA Handbook Detail No. W243 and ANSI A108.5 Specification.

3.02 Wall Tile - Mortar Bed:

- A. Glazed tile shall be soaked in clean water for 1/2 hour before setting and removed from the water in sufficient time to allow excess water to drain before setting. Tile shall be set before the edges dry out.
- B. Mortar setting bed shall be a mix composed of 1 part portland cement, 5 parts sand, 1/2 part hydrated lime to 1 part portland cement, 7 parts sand, 1 part hydrated lime. Immediately before applying the setting bed on walls, the scratch coat shall be dampened sufficiently to saturate the mortar and without leaving standing water on the surface. Mortar setting bed shall be applied not more than 3/4" thick. Setting bed shall be applied over area which may be covered with tile while the setting bed remains plastic.
- C. A thin skim coat of portland grout shall be troweled on the face of the setting bed, or the tiles may be buttered on the backside with the skim coat while being set. Thick butter coats required for setting trimmers at angles shall have 1 part of sand added. All tile shall be placed before the mortar bed has begun to set. Any setting bed mortar which has begun to set up before the tile can be placed, shall be removed and discarded.
- D. All tile shall be firmly embedded in mortar and beaten and tapped into place. Tile joints shall be established by the space lugs on the tile, allowing a joint 1/16" thick. All joints, horizontal and vertical, shall be straight and perfectly level or plumb. Every fourth course shall be checked, during setting operations, to insure straight, horizontal and plumb lines. The mortar bed shall be cut through to the scratch coat at every fourth course by running the point of the trowel between the joints. The finish surfaces of the tile shall be checked as the work progresses, for uniformity of plane with a 10' straight-edge. Surfaces found to be warped or varying from a true plane by more than 1/8" in 10' shall be removed and replaced, as necessary to conform with these requirements.
- E. All intersections, angles, and returns shall be accurately formed. Cut edges of tile shall fit against other tiles, trim, finish and built-in features; and

shall be ground, rubbed smooth with a hone, and carefully jointed. Tile shall be cut square and neat at all electrical outlet boxes, urinals, pipes, fittings, and fixtures so that the plates, escutcheons, flanges, and covers will overlap the tile.

- F. Provide expansion joints at slab cold and control joints, at restraining walls, columns and where tile abuts other materials and where there is a change in structural back up material (concrete block to studs, etc.).
- G. As the work progresses, surfaces of completed portions shall be cleaned with damp cloths to prevent stains. After mortar has set, the tile surfaces shall be washed down with clean water. Joints shall be cleaned and washed, and then grouted.
- H. Refer also to TCA Handbook Detail No. W221 and ANSI A108.1 Specification.

3.03 Floor Tile - Thin Set:

- A. Apply membrane waterproofing at slabs above grade in accordance with manufacturer's directions.
- B. Mortar for setting of tile shall be a mix composed of one bag portland cement, 100 pounds clean fine sand (No. 40 mesh) and 5 gallons of Laticrete Tile Set Liquid No. 4237 to bring to a troweling consistency.
- C. A coat of setting mortar shall be applied over the floor slab, and combed with a notched trowel to leave uniform ridges, and using sufficient mortar to bed the tile completely. Tile shall be applied while the mortar surface is wet and tacky. As the work progresses, the tiles shall be aligned and rubbed, or beaten with a block, then embed tile in mortar and assure a true surface.
- D. Refer also to TCA Handbook Detail No. F113 and ANSI A108.5 Specification.

3.04 Floor Tile - Mortar Bed:

- A. Mortar setting bed shall be 1:6:1/10 mix of cement, sand and lime. The mortar shall be set to screeds so that tile will finish on the proper plane in line with cove base. Floor tile shall be set after a thin bed of dry portland cement has been dusted over the setting bed and worked lightly into the mortar.

- B. Tile shall be set in position and beaten with a rubber mallet firmly into the mortar to the proper slopes and levels. Beating and leveling shall be completed within one hour after placing the sheets of tile. Care shall be taken in starting the tiles to assure that each size tile, in the pattern, will run in a true, straight line from wall to wall, and be at right angles to the wall.
 - C. Refer also to TCA Handbook Detail No. F111 and F121, and ANSI A108.1 Specification.
- 3.05 Floor Expansion Joints: Install expansion joints at perimeters of floors and 16' o.c. both ways. Fill with sealant to conform with Section 07900. Refer to TCA Handbook Detail No. EJ711.
- 3.06 Grouting:
- A. Floor Tile: A neat paste of grout shall be forced into the joints. Joints shall be filled completely flush and any excess grout shall be cleaned off with clean burlap or cloths. Before grout sets, all skips and gaps shall be filled. Grout shall be color as selected by the Engineer.
 - B. Wall Tile: Tile shall be wetted, if necessary, before application of grout. Grout shall be mixed to a thick slurry with color added (if required) and forced in to completely fill the joints. Before the grout sets, the joints shall be tooled, filling all gaps or slips. Surplus grout shall be removed. Upon completion, all joints shall be full and completely flush, and the tile surfaces left perfectly clean.
- 3.07 Curing: After grouting, all tile shall be covered and moist-cured for three days with paper. Paper shall be lapped and sealed with gummed tape.
- 3.08 Cleaning: All tile shall be cleaned after grouting and pointing have sufficiently set. Any traces of cement or dust accumulation shall be removed. Acid shall not be used in cleaning glazed tile. Following the cleaning, Vaseline shall be removed from the hardware and plumbing trim, and all metal cleaned and polished.

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DIVISION 9 - FINISHES

SECTION 09500 - ACOUSTICAL CEILINGS

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under
 - C. Acoustic ceilings, including suspension system.
- 1.02 Related Work in Other Sections:
- A. Furnishing and installation of fluorescent and incandescent lighting fixtures.
 - B. Air distribution devices.
 - C. Framing, suspension, members, gypboard and appurtenances for plaster and drywall ceilings.
- 1.03 Submittals: Submit shop drawing, manufacturer's technical data and material specifications, and samples, as applicable.
- 1.04 General Requirements:
- A. Ceiling System: In ceiling suspension system, minimum load carrying capabilities of main runner members to be as required by Table No. 47-18-A, Title 21.
 - B. Drawings and Specifications: The drawings and specifications for the Acoustical Ceiling are reasonably exact, however, extreme accuracy is not guaranteed. Exact locations, distances, levels and anchorages and all other requirements shall be governed by building conditions.
 - C. Coordination: Coordinate the work of all trades in establishing locations of required electrical outlets, hanger wires, duct work, air diffusers, etc., to the end that completed work will finish in true alignment and precise position, with proper support at all required points.

- D. Workmanship: Work shall be done by qualified workmen experienced in installation of systems specified and under direction of competent foremen. Perform installation in accordance with manufacturer's recommendations and directions.
- E. Shop Drawings: Submit to Engineer for approval complete shop drawings in triplicate showing all components, layouts, details sections, mechanical and electrical elements, installation and structural details and all pertinent information. After approval, six corrected copies of shop drawings shall be filed with the Engineer. All necessary additional corrected and approved copies shall be provided for all trades requiring same.
- F. Samples: Submit three (3) samples of acoustical units and all main suspension components for ceiling specified.

ARTICLE 2 - PRODUCTS

2.01 Acoustical Ceiling: Materials listed herein, including all components are based upon Matren aluminum screw-slot system as manufactured and distributed by Universal Molding Co. and Anaheim Extrusions, Los Angeles, California. The installation shall create a modular flush type appearance with factory painted extruded aluminum grid system forming a framework braced rigidly in both directions and capable of supporting lighting fixtures, air distribution systems, and partitions. The ceiling system shall be rated minimum "Heavy-duty" structural. Equivalent aluminum screw-slot systems (channel-slot systems are not acceptable) will be considered providing all technical performance dimensional and structural data herein specified is strictly adhered to without exception.

- A. Hanger Wires: Shall be minimum 12 gauge pre-straightened, galvanized annealed steel at 4'-0" o.c. minimum along main runners, and at two (2) diagonal corners of fluorescent lighting fixtures. Wires shall be at 24" o.c. in rooms where excessive ceiling loads are indicated to be supported.
- B. Anchor each wire to the structure above with an approved device capable of supporting 75 pounds. Wires supporting fixtures shall be capable of supporting four times the fixture weight. Do not hang suspension wires more than 1 in 6 out of plumb unless counter sloping wires are provided. Do not attach wires to or bend around interfering materials such as duct work. Use trapeze or equivalent devices where obstructions interfere with

direct suspension. Construct minimum trapeze suspensions for spans up to six feet with back-to-back 1-1/2" cold formed channels. Show in detail on the Shop Drawings the lateral support system for ceilings. Demonstrate adequacy of system by calculations and/or tests, including adequacy of main runner splices and cross runner intersection connections. Base calculations on lateral loads. Provide wire supports for terminal ends of each main and cross runner. Do not use wall trim as primary support for runners or for lateral support of ceiling, and do not reeve runners to wall trim. In computing the vertical component in a splayed wire ceiling bracing system, a seismic factor of minimum .3g must be used.

- C. Main Runners: Shall be minimum heavy-duty structural rated in accordance with ASTM Standard C-635 and shall be 6063 T-5 alloy extruded aluminum with minimum 2 inch nominal high web and total face exposed width of 0.5625" maximum, including a continuous extruded 0.125" maximum screw slot.
- D. Cross Runners: Cross runners shall be the same configuration and profile as main runners, and shall have a positive, extruded structural locking clip device at the intersections, to allow for independent removal without damage to the runners.
 - 1. Main runners and cross runners shall be cross scored at all intersections to provide a continuous 1/8" maximum screw slot regress in all directions. The cross sectional profile of the runners shall have a smooth, solid planar vertical side for at least 3/8" of the shoulder to fit "snugly" against the adjacent vertical side of the haunch of the acoustical panel to effect maximum STC for elimination of sound transmission.
 - 2. Members shall be one piece configuration of same materials with equal expansion and contraction coefficients. Suspension system shall meet structural 21.0 pounds per lineal foot with support wires at 48" o.c.
 - 3. Splicing and indexing shall occur at cross runner intersections only. Random splicing is not acceptable. Cross runners shall be indexed as shown on drawings to fit within the main or other cross runners so as to eliminate all lateral and/or torque misalignment.

- E. Perimeter Moldings: Perimeter at vertical intersection surfaces, as detailed on drawings, shall be metal with paint finish to match suspension system.
- F. Positive Connection Clips: Shall be concealed structural extruded aluminum, structurally fastened to main and cross runners at each intersection. Conventional "stamped" or "pressed" clips not acceptable. Tension pull data shall be minimum 240 lbs. per bearing before clips open based upon "eccentric" load testing, i.e., 5 degrees in four (4) directions. The clip shall allow for independent removal of all cross runners without the use of special tools. Maximum relocatable flexibility is essential to the suspension system.
- G. Finish: Suspension system shall be glare-free matte-white pebble-textured factory applied baked enamel finish to match adjacent acoustical units.
- H. Acoustical Units: Cast mineral fiber, ASTM-E-84 or U.L. test #723 Class I-O-25, with factory applied washable white paint finish, weighting minimum 1.1 psf. The units shall be heavy-textured Celotex Texturetone, U.S.G. Glacier, or approved equal for the Matren system in 24" x 24" modular, 3/4" net minimum thickness.
 - 1. Profile: Factory haunched to rest on shoulder of suspension system to provide a flush face and even plane between the face of the acoustic unit and the suspension member. Manufacture all acoustical material "haunched" as a standard item for use with system specified. Provide letter of guarantee from tile manufacturer confirming that tile is manufactured for use with system specified, and is available for future replacement.
 - 2. NRC: Mounting 7, .70 to .80.
 - 3. STC: 40 - 44 laboratory certified.
 - 4. Light Reflection: Not less than 70.
 - 5. Furnish extra tile, for the lay-in systems, in the amount of 1 percent of total installed units. Tile to be furnished in original cartons, to the Owner.

ARTICLE 3 - EXECUTION

- 3.01 General Requirements: Install in a first class workmanship manner all materials necessary for the complete interior environmental systems, and be responsible for supply and installation of all necessary clips and inserts for hanging of suspension system from structure.

- A. Comply with all local codes and/or ordinances.
- B. Provide trapeze type rigging as approved and where required for suspension in areas under wire ducts or other obstructions.
- C. System lay-outs shall be indicated on the drawings.
- D. Acoustical Ceiling:
 - 1. Main Runners: Install #10 gauge galvanized annealed hanger wires at 24" o.c. as detailed along Matren main runners at two (2) diagonal corners at fluorescent lighting fixtures and secure with single wrap and three twists and attached to structure. Provide seismic "sway-wires" as detailed on the drawings.
 - 2. Cross Runners: Install Matren cross runners perpendicular to main runners at 48" o.c. and 24" o.c. in modules as indicated on the drawings.
 - 3. Perimeter Members: Shall be field mitered at interior and exterior corners and attached to the walls at a minimum of 18" o.c. with approved fasteners.

3.02 Completion and Cleanup:

- A. After all work above the ceiling line has been completed and inspected, install acoustic units.
- B. Remove and replace any damaged units, touch up and/or clean any abraded spots, level ceilings to a tolerance of 1/8" in 12'.

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DIVISION 9 - FINISHES

SECTION 09650 - RESILIENT FLOORING

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Preparatory work.
- D. Vinyl composition floor tile.
- E. Vinyl composition floor tile at elevator cabs.
- F. Cleaning, polishing and protections.
- G. Vinyl edge reducing strips.
- H. Topset base.

1.02 Requirements:

- A. Submittals: Submit manufacturer's technical data and material specifications, and samples, as applicable.
- B. All colors will be selected by the Engineer from manufacturer's standards.
- C. Provide Owner with unopened containers of each type, size, and color of material installed for future use. Quantity to be provided shall be a minimum of 2% of area installed, but not less than one (1) standard size container.

ARTICLE 2 - PRODUCTS

2.01 General:

- A. All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required,

they shall be of the same manufacture. Where model numbers are indicated, if the specified models are discontinued, the Contractor shall furnish the manufacturers' updated model at no additional cost to the Owner.

- B. All flooring shall be delivered in sealed cartons, plainly labeled or marked to indicate color, pattern, gauge, lot number, and sequence of manufacture within the lot. All flooring shall have been manufactured within the 6-month period previous to installation.

2.02 Materials:

- A. Vinyl composition tile shall be 12" x 12" x 1/8" thick with square and true edges, Fed. Spec. SS-T-312, Type IV, Grade B.
- B. Adhesive shall be as recommended by manufacturer.
- C. Topset base shall be 4" high, rubber, with preformed corners, Fed. Spec. SS-W-40a, Type I.
- D. Floor leveling cement shall be Ardex K-15 manufactured by Ratron, Inc., Northridge, California, or Floorstone manufactured by Tamms Industries.

ARTICLE 3 - EXECUTION

3.01 Installation:

- A. Fill all cracks and low spots with a floor leveling cement. Remove all dirt, mortar, and plaster droppings and any other matter that would prevent adhesion or cause bumps, depressions, or other defects in the appearance or durability of this finish floor covering, and make surface smooth, level, and uniform.
- B. Maintain a temperature of not less than 70° F. in the locations (at floor level) for not less than 48 hours before installation and for 10 days after installation. Allow flooring to condition in the locations for at least 24 hours before installation.
- C. Do not lay flooring until other work including painting has been substantially completed. Cement and lay flooring in a manner that will result in a complete and first-class installation. Install flooring on all covers for telephone and electrical ducts or other items which occur within the limits of the floor. Reference markers, holes, or openings, either existing or required for other trades that are in place, or plainly established, shall be replaced in the covered floor, in the case of holes or openings to be drilled or cut open as necessary.

D. Installation of Floor Tile:

1. Lay tile with center of tile or joints of tile on the center lines of the room, or area, with borders equal in size. Locate transition between rooms with different colors at center of door when door is in a closed position. Match tile for color and pattern by using tile from cartons in the same sequence as manufactured.
2. Tile shall be laid with grain pattern running in one direction. Grain pattern shall run the long way of room or space.

E. Neatly cement all floor covering to the subflooring. Allow no open cracks or voids, and no raising or puckering at joints. Cut neatly to and around all permanent fixtures. Roll floor covering to assure a tight bond to the subfloor and eliminate all trapped air.

F. Provide vinyl reducing edge strips at all exposed unprotected edges of floor covering and with a smooth, even seam. Flooring shall abut or pass under thresholds.

3.02 Protection: During installation operation, the entire areas shall be closed to traffic and work of other trades. Where traffic is unavoidable, floors shall be protected with building paper and also boards or plywood, where trucking is being done over the installed area.

3.03 Cleaning: After completion, all resilient floor covering shall be protected from the work of other trades by covering with non-asphaltic building paper. After the work of all other trades has been completed, the temporary protections shall be removed, the surfaces washed with a neutral cleaner and all heel and scuff marks removed so that the resilient floor covering is ready to be waxed. One coat of wax shall be applied and polished with a polishing machine.

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DIVISION 9 - FINISHES

SECTION 09811 - EPOXY FLOOR COATING

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Battery room flooring.
 - D. Pump room flooring.
- 1.02 Related Work in Other Sections:
- A. Battery room wall finish - refer to Section 09812.
 - B. Painting - refer to Section 09900.
- 1.03 Submittals: Submit manufacturer's technical data and material specifications, and color samples, as applicable.
- A. Submit samples not less than 6" x 6" in size, showing the approximate applied thickness, texture and color.
 - B. Submit product data sheets and a list of materials by name and quantity to be used on the project in order to demonstrate compliance with these specifications.
- 1.04 Provide Owner with two gallons of same material as applied at completion of work.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture. Where system numbers are indicated, if the specified systems are discontinued, the Contractor shall furnish the manufacturers' updated system at no additional cost to the Owner.

2.02 Materials:

- A. All products specified herein are No. 115 manufactured exclusively by Con/Chem, Inc., 12923 Cerise Avenue, Hawthorne, CA 90250. Phone: (213) 679-3396. Equivalent products of Stonhard, Inc., will be acceptable. Submit to insure equivalency.
- B. Cono/Weld 501: Low viscosity, 2-component, penetrating epoxy primer for concrete and other siliceous substrates.
- C. Cono/Crete 115: 100% solids, chemical and abrasion resistant epoxy mortars.
- D. Finished Composite: The installed Cono/Crete surfacing system shall consist of a primer coat followed by application of the Cono/Crete epoxy mortar at 1/4" minimum.

2.03 The materials shall be delivered to the job site in the original sealed containers bearing the product name, color, manufacturer's lot number, directions for use and precautionary labels. Materials shall be stored indoors, protected from damage, moisture, direct sunlight and temperatures below 60°F. or above 100°F.

ARTICLE 3 - EXECUTION

- 3.01 Applicator shall be trained and approved by the manufacturer. Apply materials in accordance with manufacturer's instructions.
- 3.02 Substrate Preparation: The concrete surface must be thoroughly clean, dry and free from any surface contaminants or cleaning residue. Acceptable methods of cleaning are acid etching followed by the complete and thorough removal of the resulting residue. Clean with Cono/Clean 7.
- 3.03 Environmental Conditions: The following conditions are required for proper application and cure of the Cono/Crete surfacing system:
 - A. Surface and surrounding air temperature must exceed 50°F. but must be less than 100°F., with materials at not less than 65°F. during application.
 - B. Application and curing must be performed with the work area free from drafts or wind, with temperature conditions controlled or falling, and with full protection from direct sunlight.

- C. Surface and air temperatures must be not less than 5°F. above the dew point during application and at least the first 6 hours of cure.

3.04 Installation:

A. Priming:

1. All surfaces shall be primed by roller or spray application applied uniformly at approximately 200-250 sq. ft. per gal. As part of the application, the primer shall be mechanically scrubbed into the surface with horizontally rotating electric floor scrubbing machines or equal.
2. The primer shall be mechanically mixed and applied in accordance with instructions, then allowed to cure to "initial set," but not more than 12 hours before proceeding with application of the Cono/Crete surfacer.

- B. Surfacing: The Cono/Crete aggregate filled epoxy mortar shall be mechanically mixed in accordance with instructions and applied using a screed box pulled in parallel adjoining segments allowing application at a controlled thickness of 1/4" minimum on flat profile surfaces. Each segment placed shall then be lightly troweled with steel finishing trowel to achieve a tight "closed" surface. The Cono/Crete mortar shall be applied at approximately 95-100 sq. ft. per large unit on flat new concrete floors, and at decreasing coverage rates based on surface profile and depth of erosion.

3.05 Protection:

- A. Adequately protect the completed work from water, airborne dust or other surface contamination until cured tack free, and until the surface cannot be penetrated by pushing with a screwdriver, approximately 15-24 hours after application.
- B. Protect from vehicular traffic and other physical abuse, immersion and chemical exposure until the completed system has thoroughly cured - approximately 48-72 hours.

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DIVISION 9 - FINISHES

SECTION 09812 - BATTERY ROOM WALL FINISH

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Battery room wall finish.
- D. Pump room wall finish.
- E. Epoxy coating on bench rack in Battery Room.

1.02 Related Work in Other Sections:

- A. Battery room flooring - refer to Section 09811.
- B. Painting - refer to Section 09900.

1.03 Submittals: Submit manufacturer's technical data and material specifications, and color samples, as applicable.

- A. Submit samples not less than 6" x 6" in size, showing the approximate applied thickness, texture and color.
- B. Submit product data sheets and a list of materials by name and quantity to be used on the project in order to demonstrate compliance with these specifications.

1.04 Provide Owner with two gallons of same material as applied at completion of work.

ARTICLE 2 - PRODUCTS

2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent

manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture. Where system numbers are indicated, if the specified systems are discontinued, the Contractor shall furnish the manufacturers' updated system at no additional cost to the Owner.

2.02 Materials:

- A. All products specified herein are No. 300-1-0981 manufactured exclusively by Con/Chem, Inc., 12923 Cerise Avenue, Hawthorne, CA 90250. Phone: (213) 679-3396. Equivalent products of Stonhard, Inc., will be acceptable. Submit to insure equivalency.
- B. Cono/Weld 501, Cono/Prime 506: Low viscosity, 2-component epoxy primers. Cono/Weld 501 for substrates except metal. Cono/Prime 506 for metal substrates.
- C. Cono/Glaze 201, 202: 98% solids high build epoxy coatings.
- D. Finished Composite: The installed Cono/Glaze coating system in 2 or more coats of Cono/Glaze applied over the selected primer. Cono/Glaze is usually applied at 10-18 mils nominal thickness per coat.

2.03 The materials shall be delivered to the job site in the original sealed containers bearing the product name, color, manufacturer's lot number, directions for use and precautionary labels. Materials shall be stored indoors, protected from damage, moisture, direct sunlight and temperatures below 60°F. or above 100°F.

ARTICLE 3 - EXECUTION

- 3.01 Applicator shall be trained and approved by the manufacturer. Apply materials in accordance with manufacturer's instructions.
- 3.02 Substrate Preparation: Surfaces must be thoroughly clean, dry and free from any surface contaminants or cleaning residue.
- 3.03 Environmental Conditions: The following conditions are required for proper application and cure of the Cono/Glaze surfacing system:
 - A. Surface and surrounding air temperature must exceed 50°F. but must be less than 100°F., with materials at not less than 65°F. during application.

- B. Application and curing must be performed with the work area free from drafts or wind, with temperature conditions controlled or falling, and with full protection from direct sunlight.
- C. Surface and air temperatures must be not less than 5°F. above the dew point during application and at least the first 6 hours of cure.

3.04 Installation:

A. Priming:

- 1. All surfaces shall be primed by brush or spray application applied uniformly at approximately 200-250 sq. ft. per gal. and 300-350 sq. ft. per gal. on metal.
- 2. The primer shall be mechanically mixed and applied in accordance with instructions, then allowed to cure to "initial set," but not more than 48 hours before proceeding with application of the Cono/Glaze surfacer.

B. Coating:

- 1. The Cono/Glaze epoxy coating shall be mechanically mixed in accordance with instructions and each application shall be uniformly applied by brush, roller or airless spray, at the rate of approximately 100-150 sq. ft. per gal.
- 2. The application rate on horizontal surfaces may be as required to achieve the specified thickness, but shall be no greater than 150 sq. ft.

- C. Surfacing: The Cono/Crete aggregate filled epoxy mortar shall be mechanically mixed in accordance with instructions and applied using a screed box pulled in parallel adjoining segments allowing application at a controlled thickness of 1/4" minimum on flat profile surfaces. Each segment placed shall then be lightly troweled with steel finishing trowel to achieve a tight "closed" surface. The Cono/Crete mortar shall be applied at approximately 95-100 sq. ft. per large unit on flat new concrete floors, and at decreasing coverage rates based on surface profile and depth of erosion.

3.05 Protection:

- A. Adequately protect the completed work from water, air-borne dust or other surface contamination until cured tack free, approximately 18-24 hours after application.
- B. Protect from foot or vehicular traffic and other physical abuse, immersion and chemical exposure until the completed system has thoroughly cured - approximately 48-72 hours.

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DIVISION 9 - FINISHES

SECTION 09900 - PAINTING

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Preparation of surfaces to be painted.
- D. Surfaces to be Painted:
 - 1. Painting exterior metal.
 - 2. Painting black that portion of the ductwork interior which is visible through the grilles.
 - 3. Painting interior metals, gypsum board and plaster.
 - 4. Painting pressed metal door, window and cased opening frames and hollow metal doors.
 - 5. Painting of exposed mechanical and electrical items in areas to be painted.
 - 6. Painting of nonferrous metals, prime coated, plated or factory finished items specifically noted to be painted or where such items occur as accessories or appurtenances to units otherwise required to be painted.
 - 7. Painting exterior mechanical equipment, and mechanical items on the roof or building exterior.
 - 8. Paint exterior plaster.
 - 9. Paint metal portions of door weatherstripping.
 - 10. Paint expansion joints in plaster and drywall surfaces.
 - 11. Paint existing plaster soffits at transportation building.

E. Surfaces Not to be Painted:

1. Aluminum with factory finish.
2. Stainless steel.
3. Finish hardware, except hardware with USP finish.
4. Acoustical ceilings.
5. Flooring.
6. Electrical fixtures and receptacles.
7. Exterior concrete pavements.
8. Toilet compartments and accessories.
9. All items with complete factory finish, except mechanical and electrical items as specified hereinbefore. Verify with the Engineer which factory finish items such as grilles, diffusers, etc. require field painting.
10. Other surfaces as indicated on the drawings.

1.02 Related Work in Other Sections:

- A. Prime coat painting of miscellaneous metal - Section 05500.
- B. Prime coat painting of hollow metal doors and frames - Section 08100.
- C. Painting of nonferrous metals, unless specifically noted or shown as an integral part of a unit otherwise requiring painting - various sections.
- D. Parking striping - Section 02580.
- E. Epoxy coatings - Sections 09811 and 09812.

1.03 Submittals: Submit shop drawings, manufacturer's technical data and material specifications, and samples, as applicable.

- A. Submit a complete list of all materials proposed for use in the work, in the form of a shop drawing, identified by manufacturer's name and product label prior to start of painting.
- B. Secure color sample before undercoating. Samples of colors selected and finishes specified shall be furnished to the manufacturer for color-matching. Approval of

colors must be obtained before proceeding with the work. Unless otherwise specified, all undercoats shall be tinted slightly to approximate the finished colors and each undercoat shall be a different tone or value than the previous undercoat.

- C. Prepare and submit 8-1/2" x 11" samples of each color and finish before work of this section begins. For natural and stained finishes, provide samples on type and quality of wood installed on the project.
- D. Prepare sample wall areas as may be directed by the Engineer. These areas will be the standard of work for the project when approved.

1.04 Requirements:

- A. Provide, install, remove and transfer fixed, movable and hanging scaffold, staging and planking as necessary for proper performance of the required work. Do not use fixtures for scaffolding.
- B. Number of coats specified are minimum that shall be applied. It is intended that paint finishes of even, uniform color, free from cloudy or mottled surfaces be provided. Each coat shall be of proper ground color to receive succeeding coat and shall appreciably differ in color tint. Each coat shall be approved by the Engineer before next coat is applied; otherwise, an extra coat will be required over entire surface involved.
- C. All material must comply with local air pollution control requirements and Federal lead content requirements.
- D. Colors shall be as selected by the Engineer.
- E. Inspect surfaces to be painted and make a satisfactory correction of defects in workmanship or material that might affect the finish.
- F. Take extreme precautions to protect exposed construction from paint splatter. Work that will remain unpainted shall be free from paint blemishes.
- G. Provide Owner with unopened containers of each type, size, and color of material installed for future use. Quantity to be provided shall be a minimum of 2% of area installed, but not less than one (1) gallon size container.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.
- 2.02 Materials:
- A. All paints, enamels, varnishes, etc., shall be of the brand and quality specified and shall be delivered at the site of work in clean, unopened original containers and stored where designated.
 - B. Materials necessary to complete the painting and finishing schedule as herein specified and listed by material numbers and names, are standards for kind, quality and function, and are taken from the stock list of architectural finishes of the Sinclair Paint Company and Dunn-Edwards.
 - C. Materials as manufactured by the following companies may be submitted to the Engineer for approval for use on the project: Sinclair, Dunn-Edwards, Sherwin-Williams, Pratt & Lambert and Frazee.
 - D. Colors indicated in Finish Schedule are Frazee numbers.

ARTICLE 3 - EXECUTION

- 3.01 Preparation of Surfaces:
- A. General: Surfaces to be painted or finished shall be in a suitable condition for a proper finish.
 - B. Drywall (gypsum board) shall be dusted clean and free from incrustations and other foreign matter.
 - C. Wood surfaces shall be sanded and dusted clean. Nail holes, cracks, or other defects shall be carefully puttied after the prime coat with putty matching the color of the paint. Knots and sappy areas shall be covered with clear shellac or approved known sealer where the finish is to be paint or enamel.
 - D. Preparation of Metal Surfaces Not Galvanized: All grease, oil, dirt, etc., shall be removed by mineral spirits. Rust, scale, and defective protective paint

shall, if necessary, be removed by scrapers, wire brushes, or other approved means, and then cleaned with mineral spirits. Final cleaning with mineral spirits shall be done not less than 30 minutes nor more than 3 hours before application of paint.

- E. Preparation of Galvanized Surfaces: Galvanized surfaces specified to be painted shall be first washed with paint thinner to remove all dirt, oil or grease. Surfaces shall then be washed with a solution of chemical phosphoric metal etch and allowed to dry. Cleaning of galvanized surfaces shall be done the same day they are to be painted with the specified prime coat.
 - F. Preparation of Concrete Block Surfaces: Surfaces shall be dry (less than 12% moisture content) and free of efflorescence, incrustations and other foreign matter. Any glazed surfaces shall be slightly roughened. Any other coatings shall be removed with a light sandblast or hot water wash.
 - G. Preparation of Plaster Surfaces: Surfaces shall be dry (less than 8% moisture content) and free of efflorescence, incrustations and other foreign matter.
 - H. Finish Hardware: Shall have been fitted and contact plates removed before painting. Plates for electric switches and plugs shall have been fitted and removed.
 - I. Prime and backprime all items of wood furnished under Section 06200 and set against masonry or plaster.
- 3.02 All work shall be executed by skilled craftsmen, experienced in their trade. All work shall be of the highest standards and methods. Paints shall be mixed and applied in strict accordance with the manufacturer's printed direction for his product. All materials shall be applied smoothly with proper film thickness, but not less than 1.5 mils thick per coat, without runs, sags, skips or any other defects. Enamels and varnishes shall be lightly sanded between coats, dusted and wiped clean before re-coating.
- 3.03 Execute work under favorable weather conditions or conditions suitable for the production of first class work. No exterior or interior painting shall be done until surfaces are thoroughly dry and cured.
- 3.04 Protection: Protect all surfaces and objects inside and outside of buildings, grounds, lawns, shrubbery, and adjacent properties against damage. Be responsible for the

orderly storage of materials, removal of all combustible rags, empty containers, etc., at the end of each day, taking every possible precaution to prevent fire.

3.05 Inspection: All work shall be approved by the Engineer and any work not complying with these specifications shall be properly and promptly corrected.

3.06 Schedule of Finishes:

A. Finish Schedule: Surfaces shall be finished in accordance with the following procedures for the surface and finish desired thereon.

Manufacturer: Sinclair Dunn-Edwards

B. Exterior:

1. Metal - Ferrous:

1st Coat	No. 15	43-4
2nd Coat	No. 248	42-23
3rd Coat	No. 250	42-8

2. Metal - Galvanized:

Pretreatment -	No. 7113	42-36
1st Coat	No. 25	43-3
2nd Coat	No. 248	42-23
3rd Coat	No. 250	42-8

3. Plaster:

1st Coat	No. 18	---
2nd Coat	No. 1300	---

C. Interior:

1. Finish - Enamel:

Surface:

Gypsum Board (Drywall):

1st Coat	No. 1770	W101
2nd Coat	No. 975	5 Series
3rd Coat	No. 1800	5 Series

Manufacturer: Sinclair Dunn-Edwards

Plaster:

1st Coat	No. 890	W101
2nd Coat	No. 975	5 Series
3rd Coat	No. 1800	5 Series

Concrete Block:

1st Coat	No. 1010	W305
2nd Coat	No. 975	42-31
3rd Coat	No. 1800	5 Series

Metal - Ferrous:

1st Coat	No. 15	42-44
2nd Coat	No. 975	42-31
3rd Coat	No. 1800	5 Series

Metal - Galvanized:

1st Coat	No. 28	42-44
2nd Coat	No. 975	42-31
3rd Coat	No. 1800	5 Series

D. Painting Mechanical and Electrical Work:

1. Paint all roof mounted equipment, exposed exterior and interior heating, ventilating, plumbing, mechanical and electrical work, except items indicated not to be painted and items in mechanical rooms.
2. Thoroughly clean items such as equipment, pipes, vents, roof ventilators, duct fittings, miscellaneous supports and hangers, electrical conduit, fittings, pull boxes, outlet boxes, unfinished surfaces of plumbing fixtures, and all other work not specifically mentioned of all rust, corrosion, oil, and other foreign materials, and remove all blisters or loose paint.
3. Prime unprimed surfaces and the bare areas of shop primed items.
4. After priming, finish all such mechanical and electrical work with the second and third coats of paint as specified.

5. Any of the above mentioned work occurring in finished rooms or spaces shall be prepared and primed as specified above, and then given the second and third coats of wall paint or enamel to match the adjoining wall or ceiling surfaces.
6. Paint inside surfaces of all ducts, dampers, and louvers, as far back as visible from the room in which they open, with two coats of flat black paint.
7. All exposed pipes, conduits, and major lines shall have the following color code and will be labeled for easy identification:
 - a. Engine Coolant (EC) - Blue.
 - b. Chassis Grease (CG) - White.
 - c. Compressed Air (CA) - Exposed Galvanized Pipe.
 - d. Gear Oil (GO) - Purple.
 - e. Motor Oil (MO) - Green.
 - f. Sprinkler System - Red.
 - g. Torque Oil (TO) - Brown.
 - h. Parts Cleaning Solvent (S) - Tan.
 - i. Industrial Water - Grey.
 - j. Conduits - color of ceiling.

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DIVISION 10 - SPECIALTIES

SECTION 10010 - MISCELLANEOUS SPECIALTIES

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Fire extinguishers and cabinets.
 - D. Kitchen appliances.
 - E. Lockers.
 - F. Locker room benches.
 - G. Seats at handicap showers.
 - H. Chalk boards, tack boards and bulletin boards.
 - I. Telephone enclosure.
 - J. Signs and graphics.
 - K. Coat hooks.
 - L. Television wall bracket.
- 1.02 Related Work in Other Sections:
- A. Toilet Compartments and Toilet Room Accessories - refer elsewhere in Division 10.
- 1.03 Requirements:
- A. Submittals: Submit shop drawings, manufacturer's technical data and material specifications, as applicable, for all products specified herein for the Engineer's review prior to start of work in this section.

- B. Cleanup: During the progress of the work, the premises shall be kept free of debris and waste resulting from the work in this section. Upon completion, all surplus material and debris shall be removed from the site.
- C. Colors: Where items have a finish involving choice of colors, colors will be selected by the Engineer from manufacturer's standards.
- D. Manufacture: Products specified are to establish a quality. Equal products of other manufacturers will be allowed subject to approval of the Engineer.
- E. Fastenings:
 - 1. On gypsum board or plaster wall surfaces, fastenings shall be with screws into wood or metal blocking, bolts or molly anchors, not less than 1/4" diameter. Screwing into gypsum board or lath with plugs will not be acceptable.
 - 2. Fasten into concrete or masonry, with self-drilling masonry anchors, Phillips Redhead, Bulldog, Rawl Sabertooth, or equal.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture. Where model numbers are indicated, if the specified models are discontinued, the Contractor shall furnish the manufacturers' updated model at no additional cost to the Owner.
- 2.02 Materials:
 - A. Fire Extinguishers and Cabinets:
 - 1. Extinguishers: Model ABC-20, 20 lb. stored pressure type, U.L. rating 20A-80 B:C, manufactured by Standard, Sierra, Potter-Roemer, or equal.
 - 2. Cabinets: Model 4208 factory primed steel cabinet, surface mounted type with Style A door, manufactured by Standard Fire Equipment Division of Zurn Co. or equal by Potter-Roemer or Sierra.

B. Kitchen Appliances:

1. Microwave Oven: Model JET 235 Countertop by General Electric.
2. Built-In Cooktop: Model RV 38C by General Electric, 30" x 19" size.
3. Refrigerator: Model TFF 22RB by General Electric.
4. Garbage Disposer: Model GFC 195 by General Electric.

C. Lockers:

1. Manufacture: Republic, Lyons, or equal. Lockers shall be single tier, 12" x 18" x 6'-0". Provide metal base and sloping tops.
2. Material: Doors and door frames shall be made of cold rolled and leveled sheet steel. Other parts shall be made from mild coldrolled steel. All steel to be free from imperfections and capable of taking a high grade enamel finish.
3. Doors shall be 18 gauge steel, adequately flanged. Formations shall consist of 2 right angles at lock side of door; 2 right angles at hinge side; and 1 right angle formation at top and bottom.
4. Door frames shall be not less than 16 gauge steel capable of taking same high grade finish as balance of locker. All parts to be channel formation securely welded together. Sides of frame shall form a continuous door strike.
5. Locking device shall be a positive automatic type locking device of the pre-locking type, whereby locker may be locked while door is open, then closed without unlocking and without damaging locking mechanism. The silencers on the frame hooks shall be securely attached with a rivet having the head molded into the rubber. Lock bar shall be of double channel formation and tamperproof. All handle parts, including fixed case and lifting trigger, to be made from sturdy zinc die cast material. The fixed case to be attached to the door with 2 round Phillips Head screws with Sems external washers and 1 centering stud. The case fully shields the lifting trigger from below. The lifting trigger to have 2 right angle lugs that insert into the lock bar without the use of a fastening device. The lifting trigger to be equipped with rubber silencers at top and bottom to prevent metal-to-

metal contact. The handle design must be free of openings or surfaces that permit leverage to be applied that forces the handle upward when in a locked position. There shall be 3 locking points on lockers.

6. Latching shall be a one-piece, self-contained spring steel latch, so designed as to be easily removable from the lock bar for replacement, but completely contained within the lock bar without the use of additional fasteners, and is under tension to provide rattle-free operation. The latch shall be coated with a non-staining solidified lubricant to provide smooth trouble-free service. The lock bar shall be of double channel construction providing maximum strength, so formed as to hold the latch within the door channel at proper operating location. The lock bar shall be held laterally in the door channel by means of non-removable self-formed retainers, pierced from the door and held in place vertically by the lock bar handle lugs. Rubber silencers are provided at each frame hook on the door jamb. The rubber bumper is to be riveted to the frame hook with a non-corrosive rivet whose head is molded into the rubber making the rivet an integral part of the bumper.
7. Locks: All lockers shall be furnished with built-in master keyed grooved key for each lock. Locks of standard manufacturers.
8. Hinges shall be at least 2" wide of the full loop, tight pin style, to be securely welded to frame and riveted to door. Doors shall have 3 hinges.
9. Body: All locker body components shall be made of cold rolled steel specially flanged for added strength and rigidity to insure tight joints between bolts. All bolts and nuts shall be zinc plated.
10. Finish: Before enamel is applied, the surfaces of the steel shall be phosphatized in a 5 stage process to inhibit corrosion and increase the durability of the applied enamel. All parts shall then be finished with a heavy coat of enamel. Enamel shall be baked on. Body parts are finished in a standard neutral color. Exposed parts shall be color as selected by the Engineer. Bolts and nuts shall be zinc plated.

11. Number Plates: Each locker shall have a polished aluminum number plate with black numbers not less than 1/2" high. Plates to be attached with split rivets.
 12. Equipment: Lockers shall have 1 hat shelf approximately 9" below top of locker. Lockers shall have 1 double prong back hood and 2 single prong wall hooks. All hooks shall have ball points, and shall be made of steel. All hooks shall be attached with 2 bolts or rivets.
 13. Ventilation: Doors shall be louvered at top and bottom for ventilation. Lockers shall have 6 louvers at top and bottom.
 14. Provide metal base and sloping top for all lockers.
- D. Locker Benches shall be made from laminated maple, 1-1/4" full finished thickness. Bench tops shall be 9" wide and furnished in lengths as shown. Tops shall be mounted on pedestals consisting of sturdy 1-1/4" O.D. Tubing with 10 gauge steel flanges welded to each end. The overall height shall be 17-1/2". Provide factory applied clear urethane finish.
- E. Shower Seats for Handicap: Bobrick B-5181 or equal by Parker.
- F. Dry-Marker Chalkboards: Greensteel, Inc., white color "Dry Marker Boards," porcelain enamel on steel, ground coat on concealed surface, on 1/4" plywood with 0.005" aluminum backer sheet, with snap-on aluminum trim and chalkrail, equivalent by Nelson-Adams, Claridge, or equal. Furnish 2 dozen marker pens per board, colors as selected. Tack-boards shall be equal to Greensteel "Vinyl Tac-TEX" tackboards, colors as selected, with trims as above for dry marker boards. Round ends of chalkrails to 2" radius. Sizes as shown on drawings.
- G. Bulletin Boards: Greensteel, Inc. "M" Series, size shown, with "Vinyl Tac-TEX" back, equivalent by Nelson-Adams, Claridge, or equal. Sizes as shown on drawings.
- H. Tackboards: Greensteel, Inc. AL Series with 1/4" cork laminated to 1/2" fiberboard, aluminum trim and chalk rail.
- I. Signs and Graphics:
1. Room Exit, Toilet Rooms, (Men and Women), Conference Room, Lunch Room/Kitchen, Training Room and Miscel-

laneous Signs: Vomar ES 100, Insert Series, Helvetica medium text or equal. Submit shop drawings with lettering layouts, samples and product data.

2. Signs shall be the "silk screen" process type, as indicated.
 3. Exterior Painted Signs: Paint large identification numerals in Helvetica Medium typeface, size and placement indicated, using silicone polyester exterior enamel of color approved by the Engineer. Sign materials shall be galvanized steel.
- J. Coat Hooks: Toobs, manufactured by H.U.D.D.L.E., Culver City, California, as indicated on the drawings.
- K. Telephone Enclosures: Western Electric "Econo-Shelf."
- L. Television Wall Bracket: "Improved Style" wall bracket, Type OP, manufactured by Peerless Sales Co., (312) 865-8870, or equal. Secure to wall framing in a manner to prevent sagging.

ARTICLE 3 - EXECUTION

- 3.01 Install products of this section in accordance with the manufacturer's directions.

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DIVISION 10 - SPECIALTIES

SECTION 10161 - LAMINATED PLASTIC TOILET COMPARTMENTS

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Laminated plastic toilet partitions.

1.02 Related Work in Other Sections:

- A. Toilet room accessories - refer to Section 10800.
- B. Miscellaneous specialties - refer to Section 10010.

1.03 Requirements:

- A. Submittals: Submit shop drawing, manufacturer's technical data and material specifications, and samples, as applicable.
- B. Colors: Submit color chart to the Engineer for selection and approval.
- C. Fastenings:
 - 1. On gypsum board or plaster wall surfaces shall be with screws into wood or metal blocking, or with bolts or molly anchors, not less than 1/4" diameter. Screwing into gypsum board or plaster with plugs will not be acceptable.
 - 2. For fastening into concrete or masonry, self-drilling masonry anchors shall be used: Phillips Redhead, Bulldog or Rawl Sabertooth.

ARTICLE 2 - PRODUCTS

2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of

the same manufacture. Where model numbers are indicated, if the specified models are discontinued, the Contractor shall furnish the manufacturers' updated model at no additional cost to the Owner.

2.02 Materials:

- A. Partitions shall be "ceiling hung" type. Screens shall be wall hung units matching partitions. Partitions shall be Sanymetal, Bobrick, or equal.
- B. Toilet Compartments:
 - 1. Doors, stiles, wallposts and panels shall have a finished thickness of 1" (25mm) and shall have a uniform flush front appearance.
 - 2. Core of doors, stiles, wall posts and panels shall be 3-ply, 45 lb. density, resin impregnated particle board. Stiles shall have leveling device welded to 11 gauge (3.2mm) steel core and be concealed by a one piece 4" (102mm) high, type 304 satin finish stainless steel.
 - 3. Surface of toilet compartments shall be high pressure laminated plastic 1/16" (1.6mm) thick with matte finish and shall be edged with type 304 satin finish stainless steel or self edged with laminated plastic. All laminating shall be done with adhesives that prevent delamination from moisture and heat in washrooms.
 - 4. All door hardware, mounting brackets and support brackets for seats shall be type 304 satin finish stainless steel.
 - 5. No door hardware or mounting brackets shall be exposed on exterior of toilet compartments and/or dressing compartments except on compartments with outswinging door.
 - 6. Threaded steel inserts shall be factory installed for mounting hinges and door latch with stainless steel one-way machine screws furnished. Provide a chrome plated cast alloy coat hook/door bumper. Stainless steel one-way sheet metal screws shall be furnished for installing coat hook and door keeper. Stainless steel Phillips head screws furnished for mounting brackets. Hinges shall hold door of unoccupied compartment partially open. Locked compartment may be opened from outside by lifting door.

ARTICLE 3 - EXECUTION

3.01 Products of this section shall be installed in accordance with the drawings, approved shop drawings and manufacturer's printed instructions.

* * * * *

DIVISION 10 - SPECIALTIES

SECTION 10670 - STORAGE EQUIPMENT

ARTICLE 1 - GENERAL

The General provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the work specified in this Section.

1.01 Work Included:

A. Equipment items as listed below by Equipment Mark Number:

1. 1120 Cabinet, Drawer, Gasket (Ref. Article 2.01)
2. 1420 Rack, Arm, Single Face, 7 Foot (Ref. Article 2.02)
3. 1500 Rack, Glass (Ref. Article 2.03)
4. 1535 Rack, Pallet, with Deck, 8' (Ref. Article 2.04)
5. 1630 Rack, Tire Storage, 2 Tier (Ref. Article 2.05)
6. 1680 Shelving Unit, 18" (Ref. Article 2.06)
7. 1685 Shelving Unit, 12" (Ref. Article 2.07)

B. Installation of equipment with necessary labor, services, and incidentals necessary for complete and operational equipment installation.

1.02 Quality Assurance:

A. Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.

1.03 Submittals:

A. Product Data:

1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.
2. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

B. Submit shop drawings including calculations performed by a California licensed structural engineer and details for anchorage in accordance with local code seismic resistance requirements.

1.04 Warranty:

- A. Warrant work specified herein for one year from substantial completion against defects in materials, function and workmanship.
- B. Warranty shall include materials and labor necessary to correct defects.
- C. Defects shall include, but not be limited to:
 - 1. Parts: Loose, damaged, and missing.
 - 2. Finish: Abnormal deterioration.
- D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.
- E. Availability: All parts shall be readily available locally in the United States.

1.05 Product Delivery, Storage, and Handling:

- A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid, dusty conditions.
- B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Mark Number of this specification.
- C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.06 Labeling:

- A. Manufacturer shall securely attach in a prominent location on each major item of equipment a noncorrosive nameplate showing manufacturer's name, address, and model number.

ARTICLE 2 - PRODUCTS

2.01 CABINET, DRAWER, GASKET
Equipment Mark Number: 1120

- A. Capacities and Dimensions:
 - 1. Overall cabinet dimensions:
 - a. Width: 35 inches.

- b. Depth: 32 inches.
 - c. Height: 40 inches.
 2. Inside drawer dimensions:
 - a. Width: 30-5/8 inches.
 - b. Depth: 31-3/8 inches.
 - c. Height: 2 inches.
 3. Number of drawers: 11.
 4. Shipping weight: 300 pounds.
- B. Features and Construction:
 1. Construction: 19 gauge steel with steel frames.
 2. Drawers: Interchangeable with stops to prevent pulling out accidentally, and hinged to hang vertically for convenient access.
 3. Drawer bottoms: Grid pegboard with ten pins and attachment nuts per drawer to permit positioning of gaskets to retain shape and location.
 4. Drawer pulls: Hook type with label holders, two each per drawer.
- C. Accessories: Stove bolt retaining pins with attachment nuts, 100 each.
- D. Finish: Durable enamel in Owner's choice of manufacturer's standard colors.
- E. Manufacturers Reference:
 1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
 - a. Lockport Steel Fabricators, Incorporated
P. O. Box 248
Lockport, Illinois 60441
Telephone: (815) 726-6281
 - b. Model: 504 with accessories.
 2. Above manufacturer constitutes only known source for specified item.

2.02 Rack, Arm, Single Face, 7 Foot
Equipment Mark Number: 1420

A. Capacities and Dimensions:

1. Overall dimensions:
 - a. Width: 36 inches.
 - b. Depth: 22 inches.
 - c. Height: 84 inches.
2. Arm capacity: 325 pounds each.

B. Features and Construction:

1. Material and bracing: Heavy guage steel with three lateral brace panels and four diagonal braces.
2. Adjustment: Uprights pierced on nominal 2 inch centers for vertical adjustment of arms.
3. Arms: Seven per upright, 14 total.

C. Accessories:

1. Stock tray, 12 by 36 inches, Equipto No. 6053, one each.
2. End unit, Equipto No. 1063, one each to finish each row.

D. Finish: Durable enamel in District's choice of manufacturer's standard color.

E. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
 - a. Equipto Storage Systems
227 Griffith Avenue
Aurora, Illinois 60507
Telephone: (312) 859-1000
 - b. Model: 1062 with 1063 end unit and accessories.

2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

a. Lyon Metal Products Incorporated
1933 Montgomery Street
Aurora, Illinois 60507
Telephone: (312) 892-8941

b. Republic Steel, Industrial Products Division
1038 Belden Avenue Northeast
Canton, Ohio 44705
Telephone: (216) 438-5200

2.03 Rack, Glass
Equipment Mark Number: 1500

A. Capacities and Dimensions:

1. Capacity:

- a. Roller bins: 400 pounds each.
- b. Compartments: 100 pounds each.

2. Overall dimensions:

- a. Width: 114-1/4 inches.
- b. Depth: 61-1/2 inches.
- c. Height: 92-1/2 inches.

3. Gravity roller sections:

- a. Length: 60 inches.
- b. Overall width: 27 inches.
- c. Rollers:
 - 1) Diameter: 1.9 inches.
 - 2) Spacing: 3 inches on center.

B. Features and Construction:

- 1. Construction: Fabricate per specification and as indicated on Drawings.
- 2. Materials:

- a. Frame and base: Constructed of No. 1 or better Douglas Fir.
 - b. Dividers and panels: Constructed of 3/4 inch, five ply, B or better plywood with smoothest surfaces facing up or out.
 - c. Exposed edges: Covered with hardwood nosing.
3. Fastening: All joints securely glued and fastened with countersunk wood screws.
 4. Rack base: Slotted to permit entry of lift truck forks.
 5. Gravity roller sections: Constructed of 16 gauge steel, installed to be removable without disassembly of storage rack.
- C. Accessories: Gravity roller sections, five each Litton No. RG 1916 as manufactured by Litton Unit Handling Systems, 7102 Industrial Road, Florence, Kentucky 41042, Telephone: (800) 354-9795.
- D. Finish: Paint exposed wood surfaces with two coats of durable semi-gloss enamel in District's choice of color.
- E. Manufacturers Reference: Custom fabricated item as indicated on Drawings.
- 2.04 Rack, Pallet, with Deck, 8'
Equipment Mark Number: 1535

A. Capacities and Dimensions:

1. Beams:

- a. Minimum capacity: 6000 pounds per pair of beams.
- b. Dimensions:
 - 1) Length: 96 inches.
 - 2) Width: 5-1/4 inches.
 - 3) Depth: 2-3/4 inches.

2. Frames:

- a. Capacity: 20,000 pounds per pair of frames.
- b. Dimensions:

- 1) Width: 3 inches.
- 2) Depth: 36 inches.
- 3) Height: 96 inches.

3. Overall dimensions:

- a. Width: 96 inches.
- b. Depth: 36 inches.
- c. Height: 96 inches.

B. Features and Construction:

1. Beams:

- a. Construction: Welded, step-type heavy gauge steel box channel.
- b. Attachment: High tensile studs, three each on each end to engage tapered keyhole slots in uprights, locking flush by means of spring loaded lock snaps.
- c. Quantity: Two pair per section with solid steel decking equipped with panel locks.

2. Frames:

- a. Construction: Continuously arc welded, heavy gauge steel box section uprights with deep channel cross and diagonal members.
- b. Adjustment: Tapered keyhole slots on 2 inch centers for vertical beam adjustments.
- c. Base plate: Heavy gauge steel arc welded to upright with holes for anchoring to floor.
- d. Row ends: Provide extra upright frame to finish each row.

C. Finish: Durable enamel in District's choice of manufacturer's standard colors.

D. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

a. Egipto Storage Systems
225 South Highland Avenue
Aurora, Illinois 60507
Telephone: (312) 859-1000

b. Model: 86223D5 with 70096H36 upright assembly

2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

a. Lyon Metal Products Incorporated
1933 Montgomery Street
Aurora, Illinois 60507
Telephone: (312) 892-8941

b. Republic Steel Industrial Products Division
1038 Belden Avenue Northeast
Canton, Ohio 44705
Telephone: (216) 438-5200

2.05 Rack, Tire Storage, 2 Tier
Equipment Mark Number: 1630

A. Capacities and Dimensions:

1. Width: 96 inches.
2. Depth: 16 inches.
3. Height: 84 inches.

B. Features and Construction:

1. Upright frame: Welded units consisting of two identical vertical posts joined by horizontal and diagonal bracing members.
2. Upright post: Minimum 16 gauge steel with rear face having punched, slotted holes on 2 inch centers for beam adjustment.
3. Upright horizontal braces: Minimum 14 gauge steel welded to upright posts.
4. Upright diagonal sway braces: Minimum 12 gauge ribbed steel welded to upright spacer braces.
5. Beams: Minimum 16 gauge steel box channel with top provided with integral auxiliary flanges to strengthen beam and bottom flanged 90 degrees to the vertical front face with attachment holes for tie

bands.

6. Tie band: Minimum 12 gauge flat band steel 1 inch wide punched at each end for attachment to beam flanges.
 7. Beam assembly: Each horizontal load bearing beam assembly fabricated with 3 prong, minimum 10 gauge steel, wedge fit clip welded to each extreme end.
 8. Assembly: Designed for assembly and adjustment without use of tools.
- C. Accessories: Anchoring for upright assembly, Lyon No. 7459, one per vertical post.
- D. Finish: Durable enamel in District's choice of manufacturer's standard colors.
- E. Manufacturers Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
 - a. Lyon Metal Products, Incorporated
1933 Montgomery Street
Aurora, Illinois 60507
Telephone: (312) 892-8941
 - b. Model: 7525 single section and 7531 upright assembly
 2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
 - a. Euipto Storage Systems
227 Griffith Avenue
Aurora, Illinois 60507
Telephone: (312) 859-1000
 - b. Republic Steel Products
1038 Belden Avenue Northeast
Canton, Ohio 44705
Telephone: (216) 438-5200

2.06 Shelving Unit, 18"
Equipment Mark Number: 1680

A. Capacities and Dimensions:

1. Overall Dimensions:
 - a. Width: 36 inches.
 - b. Depth: 18 inches.
 - c. Height: 84 inches.
 2. Installed shelf height from finished floor:
 - a. Top shelf: 84 inches.
 - b. Second shelf: 74 inches.
 - c. Third shelf: 64 inches.
 - d. Fourth shelf: 52 inches.
 - e. Fifth shelf: 40 inches.
 - f. Sixth shelf: 28 inches.
 - g. Bottom shelf: 14 inches.
- B. Features and Construction:
1. Shelf construction: 18 gauge steel with double flanged, box-formed edges on all four sides and front and rear shelf edge reinforcing channels.
 2. Uprights: Double flanged with tapered bracket slots punched on 1-1/2 inch centers for vertical shelf adjustment.
 3. Shelf securement: Slip-in shelf brackets to reinforce and securely lock shelf into place on all four corners.
 4. Commonality: Units to share common end and back panels with adjoining units.
 5. Assembly: Designed for assembly and adjustment without tools.
- C. Finish: Durable enamel in District's choice of manufacturer's standard colors.
- D. Manufacturers Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

- a. Equito Storage Systems
225 South Highland Avenue
Aurora, Illinois 60507
Telephone: (312) 859-1000
 - b. Model: 773-7 shelving unit with 6717 end unit.
2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
- a. Lyon Metal Products, Inc.
1933 Montgomery Street
Aurora, Illinois 60507
Telephone: (312) 892-8941
 - b. Republic Steel Industrial Products Division
1038 Belden Avenue Northeast
Canton, Ohio 44705
Telephone: (216) 438-5200

2.07 Shelving Unit, 12"
Equipment Mark Number: 1685

A. Capacities and Dimensions:

- 1. Overall Dimensions:
 - a. Width: 36 inches.
 - b. Depth: 12 inches.
 - c. Height: 84 inches.
- 2. Installed shelf height from finished floor:
 - a. Top shelf: 84 inches.
 - b. Second shelf: 74 inches.
 - c. Third shelf: 64 inches.
 - d. Fourth shelf: 52 inches.
 - e. Fifth shelf: 40 inches.
 - f. Sixth shelf: 28 inches.
 - g. Bottom shelf: 14 inches.

B. Features and Construction:

1. Shelf construction: 18 gauge steel with double flanged, box-formed edges on all four sides and front and rear shelf edge reinforcing channels.
 2. Uprights: Double flanged with tapered bracket slots punched on 1-1/2 inch centers for vertical shelf adjustment.
 3. Shelf securement: Slip-in shelf brackets to reinforce and securely lock shelf into place on all four corners.
 4. Commonality: Units to share common end and back panels with adjoining units.
 5. Assembly: Designed for assembly and adjustment without tools.
- C. Finish: Durable enamel in District's choice of manufacturer's standard colors.
- D. Manufacturers Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
 - a. Euipto Storage Systems
225 South Highland Avenue
Aurora, Illinois 60507
Telephone: (312) 859-1000
 - b. Model: 771-7 shelving unit with 6707 end unit.
 2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
 - a. Lyon Metal Products, Inc.
1933 Montgomery Street
Aurora, Illinois 60507
Telephone: (312) 892-8941
 - b. Republic Steel Industrial Products Division
1038 Belden Avenue Northeast
Canton, Ohio 44705
Telephone: (216) 438-5200

ARTICLE 3 - EXECUTION

3.01 Inspection:

- A. Check location of rough-in work and utility stub-outs to assure match and/or non-interference with equipment to be installed.
- B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all items.
- C. Report in writing to the District or authorized representative any damaged, missing or incomplete scheduled equipment and improper rough-in work or utility stub-outs.

3.02 Installation:

- A. Perform work under direct supervision of Foreman or Construction Superintendent with authority to coordinate installation of scheduled equipment with District.
- B. Install equipment in accordance with plans, shop drawings and manufacturer's instructions:
 - 1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level, plumb and at right angles to adjacent work.
 - 2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
 - 3. Anchorage: Attach equipment securely to prevent damage resulting from inadequate fastenings. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
 - 4. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.03 Testing:

- A. After final installation is complete and prior to authorizing payment, specified equipment shall be checked for compliance with all specified features in the presence of the District.

3.04 Cleanup:

- A. Touch-up damage to painted finishes.
- B. Wipe and clean equipment of any oil, grease, and

solvents, and make ready for use.

- C. Clean area around equipment installation and remove packing or installation debris from job site.
- D. Notify District for acceptance inspection.

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DIVISION 10 - SPECIALTIES

SECTION 10800 - TOILET ROOM ACCESSORIES

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Toilet room accessories.

1.02 Related Work in Other Sections:

- A. Toilet partitions - refer to Section 10161.
- B. Miscellaneous specialities - refer to Section 10010.

1.03 Requirements:

- A. Submittals: Submit shop drawing, manufacturer's technical data and material specifications, and samples, as applicable.
- B. Colors: Where items have a finish involving choice of colors, colors will be selected by the Engineer from manufacturer's standards.
- C. Fastenings:
 - 1. On dry wall surfaces, fastenings shall be with screws or bolts into metal backing plates. Screwing into lath with plugs will not be acceptable.
 - 2. For fastening into concrete, self-drilling masonry anchors shall be used: Phillips Redhead, Bulldog, or Rawl Sabertooth.

ARTICLE 2 - PRODUCTS

2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture. Where model numbers are indicated, if

the specified models are discontinued, the Contractor shall furnish the manufacturers' updated model at no additional cost to the Owner.

2.02 Materials:

	<u>Bobrick</u>
A. Recessed Paper Towel Dispenser	B-363
B. Stainless Steel Waste Receptacle	B-2250 & B-2290
C. Soap Dispenser	B-112
D. Feminine Napkin - Tampon Vendor 10 cent operation	B-2802
E. Toilet Tissue Dispenser	B-274
F. Toilet Seat Cover Dispenser	B-221
G. Feminine Napkin Disposal	B-353
H. Grab Bars	B-5507 x 24" B-5507 x 36" B-5507 x 42"
I. Surface Mounted Wall Urn	B-2766
J. Mop and Broom Holder	B-223 x 24"
K. Mirrors	B-290, sizes as indicated
L. Combination Soap Dish and Grab Bar	B-439
M. Double Robe Hook	B-672 & B-671
N. Shower Door Enclosure: American Shower Door Model 323/335 BF	
	Finish: Bronze anodized
	Glazing: Tempered obscure glass.

ARTICLE 3 - EXECUTION

3.01 Products of this section shall be installed in accordance with the manufacturer's directions.

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DIVISION 11 - EQUIPMENT

SECTION 11060 - BUS INTERIOR CLEANING AND DEODORIZING SYSTEM

A. GENERAL

Furnish all material and labor necessary to completely install Bus Interior Cleaning and Deodorizing Systems as described hereunder and shown on "F" and "EQ" drawings. Only minor deviations from the specifications will be allowed. All deviations will have to be requested in writing at bid time.

B. PERFORMANCE

The Bus Interior Cleaning & Deodorizing System shall be capable of thoroughly cleaning and deodorizing the interior of a standard transit bus.

The system shall be capable of servicing three buses separately or simultaneously.

An OSHA approved blow gun shall be used to stir up the dust and debris in the bus. An atomizer shall be piped into the blow gun compressed air line to induce a deodorizing chemical into the bus through the blow gun.

With the fans on, the velocity inside the bus shall be 450 FPM minimum.

The air stream in the bus shall pass through a retractable bellows type air duct and interconnecting galvanized iron duct system and shall be of sufficient velocity to prevent deposition or settling of any captured dust or debris.

The dust and debris from the centrifugal fan shall discharge into a common centrifugal dust separator. The dust and debris shall settle to the bottom of the separator and the cleaned air shall be discharged to atmosphere.

A motorized rotary valve shall automatically dump the dust and debris from the bottom of the separator into a semiautomatic baler.

The semiautomatic baler shall automatically compress the dust and debris into bales.

A gravity roller conveyor shall be provided to receive and store the compacted bales as they are removed from the baler.

All anchor bolts and installation hardware shall be provided by the Contractor.

The Contractor shall provide the services of a fully qualified representative during the initial start-up of the equipment to instruct District personnel in the operation and maintenance of the equipment.

The Contractor shall send a qualified representative to the site, to consult with and instruct others responsible for carrying out all work related to the equipment installation of the Bus Interior Cleaning and Deodorizing System.

C. SHOP DRAWINGS

The Contractor shall submit to the District for approval four (4) copies of shop drawings within thirty (30) days after award of the contract and before any work is started. These drawings shall be a maximum size of 22" x 36". They shall be complete and shall contain all required information in detail, showing the complete system the Contractor intends to install, including catalog data on the following:

cyclone, fans, blast gates, rotary valve, baler, hose reels, flexible connections, air cylinders, and all pneumatic and electrical controls.

The District shall return (1) complete set to the Contractor within ten (10) days and the Contractor shall make any corrections required by the District. After these corrections are made and within ten (10) days, the Contractor shall furnish one (1) complete set of reproducible shop drawings to the District.

The approval of the drawings shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is satisfactory.

Approval of such drawings will not relieve the Contractor of responsibility for any error which may exist, as the Contractor shall be responsible for the operation, dimensions, and design of adequate connections, details, and satisfactory construction of all work.

The shop drawings shall include a schematic wiring diagram of the system the Contractor intends to furnish.

D. COMPONENTS

1. Centrifugal Dust Separator

The centrifugal dust separator shall be designed for heavy duty and high efficiency. The body and cone sections shall be constructed of 1/4" steel and shall be completely welded. The sections shall be flanged for ease of handling, shipping, and erection in the building provided by others.

The manhole-access opening shall be provided, located in the lower cone section of the separator, to allow inspection of the interior of the separator and the rotary valve. The manhole bolts shall have large wing type malleable iron handle nuts for easy removal without a wrench. The opening shall be designed to eliminate interference with proper operation of the separator.

The inner stack shall be reinforced with a 4" x 4" x 1/4" L, and shall have no supports connected to the main cyclone to prevent dirt catching and cyclone vibration. Cyclone shall be DAY Model HV-130 with bottom flange to fit 24" diameter rotary valve.

2. Fans & Gauges

The fan shall be industrial material fans with radial wheels consisting of blades welded to double steel spiders and have a minimum diameter of 50-1/2". Fans shall be Chicago 29LS, New York blower 504 Rim, Fan Engineering I.E. 0-29 or equal.

The fan shall deliver 20,000 C.F.M., against 9" S.P. (minimum) Fans shall be Class 2 construction with a minimum shaft diameter of 2-11/16". Bearing shall be extra heavy duty, split pillow blocks, spherical roller bearings, sized for an average life of 100,000 hours. The minimum inlet diameter shall be 29" O.D. and shall be flanged.

The minimum outlet area shall be 4.57 sq. ft. inside and shall be flanged. The maximum outlet velocity shall be 4,500 F.P.M.

A removable duct section shall be attached on the inlet section of the fan to allow easy replacement of the fan wheel.

The fan housing shall be all welded steel construction of minimum seven (7) gauge steel and shall be equipped with a cleanout and inspection door with quick locking tension handles.

The motor shall be a 50 H.P., (minimum) 460 volt, 3 phase, 60 hertz, drip-proof, ball bearing, 1750 R.P.M. side mounted on an adjustable frame to allow for easy belt tightening and motor removal. The air inlet and outlet shall be protected by a fine screen to prevent any possible entering of foreign matter inside the motor. The motor shall be mounted in such a position as to prevent rain water from entering the motor. Provide weather cover for motor, remote zerk fittings for easy lubrication, and weather proof disconnect switch.

The fan shall be provided with an auxiliary 4-inch steel base with vibration isolators for mounting to the roof structure. The isolator shall be Vibrex type RMU-RU-EQ, 1" deflection 6 size No. 9 for fans, and 2 size No. 5 to allow for blast gate assembly as shown on drawings, submit manufacturing weight and blast gate weight for load range check.

The V-belt drive shall be of an accepted design with a minimum service factor of 1.5. A belt guard (OSHA approved) shall be provided with the belt drive.

Provide two series 2000 Magnehilic #2010 1-10" H20 gauges across the fan.

3. Rotary Dump Valve (Refer to Drawings EQ-301, 302 & 303 for additional information)

The rotary dump valve shall be reversible 24" diameter (minimum), maximum operating pressure of 3" water. The side plates shall be removable for ease of maintenance. The rotor shall be replaceable and provided with double neoprene seals assuring effective seal between inlet and outlet. The inlet and outlet shall be flanged. The bearings shall be heavy duty with neoprene dust seals. The rotor shaft shall be machined steel.

The wheel on the rotary valve shall be driven by a 5 H.P., (minimum) 460 volt, 3 phase, 60 hertz totally enclosed fan cooled ball bearing electric motor, through a gear reducer and chain drive from the gear reducer to the rotary valve wheel. The chain drive shall be mounted as stated below and shall be provided with a shear pin hub and an OSHA approved chain guard. Provide motor disconnect switch and six (6) spare shear pins mounted in a box near the valve.

Carter Day Model AN-24 Rotary Valve shall be modified as follows: Use extended tips for reversible unit. Provide shear hub. Motor and gear box for chain drive shall be installed on front side plate directly below the main drive shaft. Maximum center line distance between chain drive and shaft shall be 10" to minimize chain deflection.

The rotary valve shall be provided with all necessary devices to operate as described in the sequence of operation.

4. Baler (Refer to Drawings EQ-301, 302 & 303 for additional information).

The baler shall be a 30" automatically cycled. A hopper shall be attached to the rotary valve to allow dumping of the material directly into the baler hopper. A dust pan shall be provided under the baler.

Power to the baler shall be with flexible cable long enough to push the baler away from the rotary valve to allow dumping of the material into a dumpster container in case of baler failure. Provision shall be made to allow feeding of the baler manually without interrupting automatic operation. The opening in the baler hopper for the operation of the photo electric control shall be covered with clear plastic to prevent dust from covering the electric eye.

The photo electric control fitted to the hopper shall cause the ram operation to automatically cycle. The ram shall have a speed of not less than one complete stroke in 15 seconds. The bale shall have a twine automatically spooled along the top, the front, and the bottom as it is being formed. The operator shall only have to pull the twine around the fourth side, cut it, and tie a knot to complete the bale tying operation. All moving parts shall be encased for operator protection. A safety bypass shall be provided in the hydraulic circuit to prevent operator abuse. Install interlock on hopper doors to prevent operator from opening doors when baler is in operation.

The hydraulic unit shall be driven by a 5 H.P. (minimum) 460 volt, 3 phase, 60 hertz totally enclosed fan-cooled ball bearing electric motor.

A control panel with thru-the-door disconnect switch shall be included on the baler with all necessary push buttons, hand-off-auto selector switch, keyed on/off safety by-pass selection switch, control relays, solid state timers, local signal horn and a remote signal bell shall be provided.

For normal operation the hand-off-auto selector switch shall be in auto position and the safety by-pass switch in off position. With these settings, the baler will cycle automatically as debris builds up in the hopper to block the light beam from the photo electric control. This will cause the ram to time start on its cycle. This is repeated until enough material to form a bale has been compacted. When this occurs, the ram will be unable to complete its forward stroke and the alarm horn and bell will sound. The operator must tie off the bale within twenty minutes or the entire cleaning system will shut down.

To tie off the bale, the operator must switch the hand-off-auto selector switch to hand position and advance the ram as far as it will go, using the advance push button.

When the bale is tied, the operator will retract the ram all the way back, using the retract-push button.

The operator will then open the unloading door and drop the bale removal limit switch activator down in front of the tied bale and set the hand-off-auto selector switch to auto position. As more debris enters the baler, it will again cycle automatically and will slowly push the finished bale out the exit door of the baler.

When the bale is most of the way out, the bale removal limit switch will energize the alarm horn and bell. The operator must pull out the bale within twenty minutes or the entire system will shut down.

After the bale is removed, the operator must shut the unloading door, return the bale removal limit switch actuator back into its holder.

The baler control panel shall provide an output to shut down the complete cleaning system on baler overload and time shut down the system if ram does not return to its full retracted position or time shut down the system if the alarm horn and bell is not reset. A keyed selector switch shall override the shut-down output from the baler and shall be marked "normal-bypassed".

5. Conveyor (Refer to Drawings EQ-301, 302 & 303 for additional information)

The gravity roller conveyor shall have 12 gauge 2 inch diameter rollers, 32 inches long and roller centers of 3 inches. The gravity conveyor shall be mounted on legs so top of rollers is equal to the height of a bale being removed from the baler. The conveyor shall be a Hytrol #205R-32-3 or equal.

6. Blast Gates

The blast gates shall be constructed of machined and welded flanged steel sections. The blades shall be of formed steel plate on sealed bearings. The blade shall be fitted to a 3" diameter x 6" stroke air cylinder operator, and a steel spring to hold the blade in a normally closed position. Gate shall be Nopac Model 1G56817 with oiler by Oil Rite or equal by Johnson control or Honeywell control

Control of the blast gate shall be such that the gate does not open until the fan is up to speed. It shall close as soon as the motor is shut down, thus reducing the starting load and preventing air from escaping through the fan.

7. Retractable Bellows Unit Shall be Either:

- a. Retractable bellows type air ducts shall be constructed of heavy waterproof neoprene impregnated nylon, supported on a steel and wood frame with a 4-1/2" x 2" neoprene nylon covered foam rubber pad attached around its leading perimeter to assure a snug fit to the bus door frame. The complete assembly shall be self-supporting and include a dust tight push button station on the exterior of the bellows.

The retractable bellows type air duct shall be sized to accommodate the bus door openings of the all sizes, styles and types of buses in use by the District.

The bellows shall be extended and retracted by two 2" diameter x 26" stroke air cylinder. The bellows support arm shall be designed to assure easy and proper alignment of the bellows to the presented angle of the bus door frame. A square duct with an opening at the lower section and leading to an adaptor for the round duct shall form the basis of the bellows unit.

The air cylinders shall be controlled by a 1/4" four-way solenoid valve. The control valve and cylinder shall be protected by a pressure reducing valve and automatic oiler, and shall be fitted with all necessary hose and fittings.

- B. The bellows assembly shall consist of base with bearings, 30-inch piston, and plates, and a vertical support frame with top pad, piston actuated natural gum rubber butterfly dampers, and bottom bumper. The base consists of a 1/2" steel plate bolted to a cement floor support two 1-1/2" diameter by 34" long rails which guide four 1-1/2" linear ball bearings. A traveling 1/2" plate acts as a support for the bearings and a base for the vertical support frame. The vertical natural gum rubber butterfly dampers shall be hinged to the vertical support frame such that when the pistons move them outward, they will form an air seal against either the folded bus door or the inside of the bus door, depending on the kind of bus. The gum rubber flaps shall have an 18 gauge sheet metal backing 4-1/2" wide full length of the pad. With this arrangement, no peripheral seal is required. The top of the door shall be sealed with a sponge rubber pad; the pad shall be removable for easy replacement; the bottom shall be sealed with a plate level with the bottom step of the bus. The vertical support frame shall be 4" deep opening on

the front to a 30" diameter opening with collar in the rear. A pneumatic control system shall control the pistons such that the butterfly dampers shall move outward after the bellows extend and before it retracts. A bolt and shear pin shall prevent damage to the bellows in case the bus is driven away before the bellows is retracted. A 28" flexible duct shall connect between the back of the duct shall be as specified under flexible connection Section 8.

8. Ducts

All ductwork shall be provided by manufacturer. Round duct work shall be 16 gauge spiral duct work. Duct shall be supplied in 6 foot sections which shall be flanged and gasketed. Supports shall be as shown on plans.

All fitting shall be as shown on plans. Reducers shall be 12 gauge. Elbows shall be 10 gauge.

All required rectangular air ducts and transitions shall be constructed of formed mild steel with welded joints and flanged ends. The material shall be no less than 14 gauge at any point and reinforcing shall be provided at any point where flexing the sheets could occur.

9. Flexible Connection

Flexible connection at fan inlet and outlet shall be flanged type custom made as manufactured by the Flexaust Company. Connector shall have steel flanges to match flanges on spiral duct. Flexible section shall be 12" long made of Flexaust hose type CWY-1X made of nylon fabric with double ply and double overlap. Working pressures are 9" H2O maximum vacuum; 9" H2O maximum pressure. Install Flex connection to 11" flange to flange.

The hose reels shall be heavily reinforced with heavy duty mounting brackets, rolled edge sheaves and extra-large rollers to protect the air hose. Reels shall have a dual needle bearing supporting hub. The hub shall be rated at a minimum pressure of 3,000 psi.

These heavy duty low pressure reels shall be equipped with and able to roll up 40 feet of 3/8" I.D., 1,200 psi minimum burst pressure air hose with 1/4" male pipe thread on both ends, and 1/4" female pipe thread air line coupler for 26 cfm full flow at 100 psi line pressure.

The hose shall be provided with a hose stop which shall strike a limit switch on the hose reel assembly. the limit switch shall have a cushion stop to prevent the limit switch from reaching the end of its stroke.

A regulator with a liquid filled pressure gauge shall supply the air to the hose reel assembly. This regulator shall be mounted on the bellows air control panel.

A manual switch shall be mounted on the hose reel to release the brake. The switch shall be actuated by a 3/8" diameter nylon rope which shall be 5'-6" above the island. The switch shall have necessary spring to hold the contacts open until the rope is pulled with a force of at least 2 lbs.

The hose reel assembly shall be an American Reeling Device, Model 1105-18-02, air rewind hose reel modified with the above accessories.

An OSHA approved blow down gun (AMFLO #2250S with 14-1/2" extension) shall be attached to the air hose with an air line connector, 26 cfm full flow at 100 psi.

11. Deodorizer System

The deodorizer system shall consist of a 15 gallon plastic solution tank, air-operated pump, air line lubricator, backflow preventer, float type automatic fill valve and a deodorant injector.

The air-operated pump shall pump deodorant into the deodorant injectors which are located in the air lines to each air hose reels at each of the four interior cleaning stations. Air pump shall be all stainless steel with teflon ring - completely corrosion proof pump.

The injector shall inject deodorizer at a predetermined rate into the airstream only when the air is being used at the blow guns. The injector shall have a lockable adjusting screw and a glass or plastic enclosure to allow visibility of the amount of deodorant injected into the airstream.

An alternate system for the deodorizer will be acceptable. The system shall consist of a 15 gallon mixing tank, a precharged pressurized liquid supply tank, a venturi fitting with fluid control and sight gauge for each bellows. Solenoid valve supplying air to the precharged tank shall be controlled in the same manner as the air supply to the air operated deodorizer supply pump.

12. Electrical & Pneumatic Control Panels

A. Electrical Control Panel

A pre-wired 480 volt, 3 phase, 60 hertz, NEMA 12 electrical control panel with thru-the-door main disconnect switch shall be supplied and installed.

The control panel shall contain all necessary circuit breakers, magnetic motor starters, step down control transformer, programmable controller and terminal blocks for all remote wiring.

All control switches, pilot lights, magnetic motor starters, circuit breakers and thru-the-door disconnect switch shall be Square D, Cutler Hammer, Allen Bradley or General Electric.

The baler shall have a circuit breaker and the rotary valve motor shall have a circuit breaker and a reversing magnetic motor starter with overload protection in all three phases. Each fan motor shall have a circuit breaker with auxiliary switch and shunt trip and a solid state reduced voltage motor-starter with up to speed contacts and overload protection in all three phases.

Each circuit breaker and magnetic motor starter shall be provided with a nameplate with designation of equipment being controlled. All other components shall be marked as shown on the electrical drawings. A safety control relay shall be provided to monitor the operation of the programmable controller. The SCR shall cause a system shut down if the PC fails to operate properly.

All controls shall be 120 volts. Provide all necessary transformers for proper control of the cleaning system. All transformers shall be protected by two fuses in the primary and one fuse in the secondary.

The programmable controller shall consist of input and output modules, processor, memory with battery backup, power supply and a rack to receive the above modular components. The programmable controller shall be programmed to perform the functions specified in the sequence of operations and shall have a minimum of four spare inputs and four spare outputs. The programmable controller shall be furnished with all necessary programming equipment for future programming by the District if required. The PC shall be a Square D Company SY/MAX model 300, General Electric Series One or an Allen Bradley Mini-PLC-2.

All wires in the control panel shall have "THHN" insulation and shall be color coded and tagged with a

number on each end of the wire. The color and number shall be marked on the wiring diagram.

All electrical components shall be "Labeled" by an approved laboratory as defined in the National Electrical Code.

The door on the control panel shall contain system on/off push button, power on pilot light, system on pilot light, rotary valve overload tripped pilot light and a shear pin broken pilot light. Each fan shall have a test-off-auto selector switch and a pilot light, the deodorant pump or deodorant solenoid shall have an on-off selector switch and a pilot light, the rotary valve shall have a run pilot light and a forward-off-reverse selector switch with sprint return from reverse position to off position and a run pilot light.

B. Pneumatic Panel

The pneumatic panel shall have all air controls for the vacuum lane mounted on the bellows unit in its own enclosure.

An air control panel shall be mounted on the main support frame and shall contain a main shut-off valve, blow down valve, automatic filter, and manifold leading to all controls. Each cylinder or pair of cylinders shall be controlled by its own air regulator; an isolation valve shall precede the regulator and a liquid-filled gauge shall indicate the regulated pressure. All air solenoid valves, venturi, and pneumatic pressure switch shall be mounted in this panel.

The panel shall be provided with a lockable door or cover. The panel shall contain all necessary controls to control one lane of vacuum operation. All connecting tubing in the air control panel shall be copper tubing with flared connections - with no exceptions.

C. Nameplates

Each and every electric and/or pneumatic control item, valves, disconnects, timers and/or relays shall be identified with a nameplate. Nameplate shall be white on black bakelite, 1/4" minimum letter height. Name plate shall be secured to the panel with pop rivets or screws.

13. Sequence of Operation

With all selector switches in automatic position, and the safety circuit normal, pushing of the on button (on the bellows unit) shall start the fan and the rotary valve. When the fan is up to speed, it shall automatically move the bellows against the bus and time open its related blast gate, turn on the stepwell lights, release the brake on the related hose reel and turn on the deodorant pump or deodorant solenoid.

Pushing the off button shall automatically move the bellow away from the bus to the retracted position, turn off the stepwell lights, turn off the deodorant pump or deodorant solenoid, time close the related blast gate and cause the related hose reel to rewind the air hose. The fan shall run for a pre-determined length of time and the rotary valve shall time off after the last fan has shut down.

With fan selector switch in test position, the same procedure shall follow, except the bellows shall not be actuated, hose reel brake shall not release or the deodorant pump or deodorant solenoid shall not be energized.

Safety circuit shall monitor the operation of the baler and the rotary valve and shall cause the complete system shut down if a fault occurs.

If the baler control is left in non-automatic position, the baler overload has tripped or the baler has not completed its stroke, it shall cause the safety circuit to time operate a complete system shut down and light a baler trouble pilot light on the electrical control panel.

If the rotary valve overload has tripped, or the shear pin has sheared, it shall cause the safety circuit to shut down the complete system and light a rotary valve trouble pilot light or a shear pin sheared pilot light on the electrical control panel.

The pilot lights shall remain on until the system is reset for normal operation again.

14. Embedded Steel

The Contract shall provide all necessary anchor bolts, cleats, sleeves, etc., to be embedded in the concrete and shall confirm all mounting dimensions in the field prior to the placement of the concrete.

15. Painting

All metal parts shall be cleaned and then covered with one coat of primer and two coats of Enamel. The primer and intermediate coat of enamel shall be applied at the factory. After installation any scratches shall be primed again and a finish coat of enamel shall be applied to all of the equipment. Contractor shall submit to the Engineer two color charts containing actual paint chips for selection of the colors.

16. Utilities

The Contractor shall be responsible for all electrical wiring from the panel to all motors, control, etc. All conduit shall be rigid conduit, All pullboxes, fittings, etc., shall be dust tight and waterproof.

A 1" compressed air line shall be installed to the air control panel. The Contractor shall be responsible for all air piping beyond this point, which is required for proper operation for the bus interior cleaning and deodorizing system.

A 3/4" cold water line will be supplied for the deodorizer.

17. Manuals

Three operating manuals and three maintenance trouble shooting manuals shall be provided by the contractor with the equipment.

A list of suppliers for all major components shall be included in the manuals.

18. Execution

The Contractor shall supply, deliver, assemble, wire, install and erect the Bus Interior Cleaning and Deodorizing System herein described and shall include all direct and indirect labor, tools, and services to provide a result in accordance with the full intent of the Specification.

19. Installation and Pre-Startup Tests

The manufacturer shall send a qualified representative to the site, as and when required, to supervise and instruct others responsible for carrying out all work related to the equipment installation.

It shall be the responsibility of the Contractor to insure that the equipment and systems to be furnished and installed, even though specified or approved, fit the spaces available. The Contractor shall make necessary

Bus Interior Cleaning and Deodorizing System

field measurements to determine actual finish dimensions of the allocated spaces. The Contractor shall install such sizes and shapes of equipment, including the connections, as will fit the allocated spaces so that the final installation shall fulfill the intent and meaning of the drawings and specifications. The Contractor shall install equipment in accordance with manufacturer's installation recommendations. The Contractor shall install items that require removal for servicing with adequate clearance so as not to permit their own removal. Equipment requiring inspection or service shall be accessible. The Contractor shall be responsible for the proper location of roughing-in and connections by other trades. All changes related to this work shall be made at no increase in the contract amount or additional cost to the District.

20. Field Service

Manufacturer's qualified field representative shall supervise the setting of anchor bolts as well as supervise the installation. Manufacturer shall provide qualified field representatives to inspect, test, adjust, and/or repair the system as installed to ensure proper operation for acceptance.

Manufacturer shall provide a qualified representative to instruct operating, and maintenance personnel in the proper operation and maintenance of all equipment and systems.

Qualified service personnel shall be available to respond to service request within 24 hours for period of at least five years.

21. Guarantee

The entire system shall be fully guaranteed against defects in material and labor for a period of one year from the date of acceptance by the District.

22. At his option the bus interior cleaning manufacturer may use a compactor ram jet, Model RF-30. The Contractor shall submit shop drawings showing change to the equipment layout and all changes to the structure. The use of the compactor will eliminate the use of the rotary valve, baler, and the conveyor and will change the sequence of the controls.

This change will be allowed only prior to award of Contract.

DIVISION 11 - EQUIPMENT

SECTION 11070 - AUTOMATIC BUS WASH SYSTEM RELOCATION

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Relocation of automatic bus wash system.

1.02 Related Work and Equipment:

- A. The required electrical service, water supply and air supply will be provided to the point of connection as shown on drawings P-601 and E-602.
- B. Anchor bolts and setting templates shall be purchased by the contractor from the manufacturer of existing bus wash system and installed by the contractor.

NOTE: Setting of anchor bolts and embedded items shall be under the supervision of the existing bus manufacturer's equipment representative.

- C. Special floor reinforcing and contract work sub-floor gravity drainage piping, pits, trenches, sumps and their associated covers and gratings and concrete pump bases shall be installed under other Sections of this specification.

1.03 Requirements:

- A. Accuracy of Data: The Contractor shall furnish sizes and accurate data and locations of any and all foundations, pads, pits, chases, penetrations through seams, floors, walls, and roof and other special openings

required for specified systems. The Contractor shall bear all expense occasioned by lack of coordination or cooperation in not extending the required information to other trades.

B. Manufacturer's Participation: The Contractor shall obtain and pay for services from manufacturer of existing automatic bus wash system who shall supervise, relocate and install automatic bus wash system as required for proper operation of system.

1.04 Functional Test and Acceptance: All performance aspects of the relocated automatic bus washer and water recirculating system shall be verified by testing through the normal, upper limit, and lower limit of all flows, pressures, switches, bus speeds, and distances travelled to meet conditions specified herein, and to the satisfaction of the Engineer. Failure of any component or system to operate as specified shall be corrected by the Contractor as a condition of acceptance by the Engineer. Final acceptance of the system shall be made after thirty calendar days of successful operation in District service.

ARTICLE 2 - PRODUCTS

2.01 The existing Automatic Bus Wash System is a Model WL-DTBW-2+20M-R, manufactured by Washtronics Ltd., Winnipeg, Manitoba, Canada. (Refer to drawings EQ-601 through EQ-605 for additional information).

2.02 The Automatic Bus Wash System consists of the following components:

A. High Pressure Rinse Unit

B. Rear Pre-Soak Unit (Foamer)

NOTE: Chemicals/soaps are extra.

C. Pre-Rinse/Detergent Applicator Unit

NOTE: Soaps are extra.

D. Two Front Brush Assemblies

E. Two Rear Brush Assemblies

NOTE FOR D/E.: Existing brushes will be re-installed.
If new brushes are required - extra.

F. Oscillating Roof Mop Unit

NOTE: Existing mop fabric will be re-installed. If new fabric is required - extra.

G. Final Rinse and Chemical Pump Unit

NOTE: Chemicals are extra.

H. Speed Sensor System

NOTE: This System will require new control cable and recalibration.

I. Automatic Bearing Lubrication System

NOTE: Copper tubing manifolds between lubrication panel and bus wash machine shall be new. Then system must be charged and set for operation.

J. Automatic Air-Line Lubrication System

NOTE: All manifolds between air-line lube pump unit and bus wash machine shall be new. Then system must be charged and set for operation.

K. Water Reclamation System

NOTE: These items have been placed into RTD storage because of the temporary installation to-date.

L. Entrance Light System

NOTE: All electric wiring and conduit shall be new. As per electrical code.

M. Anchor Bolts and Setting Templates

NOTE: See attached drawings. Setting of anchor bolts and embedded items shall be under supervision of the manufacturer's representative.

N. Air Control Panel, Air Components and Control Manifolds

NOTE: All manifolds between air control panel and bus wash machine shall be new.

O. Electric Control Panel

NOTE: All conduit and wiring from electric panel to bus wash machine components shall be new and as per electrical code.

- P. Fiberglas Curtain Assembly (both sides)
- Q. Wheel Guides and Stainless Steel Side Plates

NOTE: Existing guide rail cleats to be replaced with new ones by the Contractor.

- R. Water Piping System: The fresh water and recirculated water manifolds are located on left side of washrack.

NOTE: Some of the water reclamation equipment is in the District's storage. See equipment drawing for equipment to be supplied by the District and installed by the Contractor.

ARTICLE 3 - EXECUTION

- 3.01 The Contractor shall relocate the Bus Washing System herein described and shall include all direct and indirect labor, tools, and services to provide a result in accordance with the full intent of the Specification.

- 3.02 Installation and Pre-Startup Tests:

- A. The equipment shall be installed and the system made fully operational to the satisfaction of the Engineer.
- B. The Contractor shall make connections to all equipment in such a manner to eliminate undue strains on piping and equipment, provide necessary fittings and bends to avoid springing of pipe during assembly, and cap or plug piping and equipment connections during and after installation to prevent entry of dirt, sand and grit. Unions or flanged joints shall be installed in each line immediately preceding connections to each item of equipment or material requiring maintenance.
- C. The Contractor shall provide supports and hangers required for a proper installation.
- D. The Contractor shall provide suction and discharge piping vibration isolators for pumps.
- E. The Contractor shall hydrostatically test all field installed piping at two times working pressure for two hours.
- F. After completion of wiring, all insulated conductors shall be tested with a 1,000 volt "Megger" and shall give resistance readings of not less than 10 megohms between conductors of the same circuit and between conductors and ground. This test shall be performed

on all power and control circuits from the panelboard with the conductor disconnected from the equipment but all intermediate switches or breakers closed. The Contractor shall take voltage and ampere readings at mains of each panelboard in the presence of the Engineer of unbalance between phases exceeding five percent and correct. The Contractor shall verify and correct all phase rotations. All bolt type electrical corrections shall be tightened and then retightened after 14 to 48 hours before taping. The Engineer shall be informed of this procedure during the waiting period and shall witness each act of retightening.

- 3.03 After installation any scratches shall be primed again and a finish coat of enamel shall be applied to the equipment.

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DIVISION 11 - EQUIPMENT

SECTION 11510 - SHOP EQUIPMENT

ARTICLE 1 - GENERAL

The General provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the work specified in this Section.

1.01 Work Included:

A. Equipment items as listed below by Equipment Mark Number:

1. 2080 Buffer/Grinder, 8 Inch, w/Dust Collector (Ref. Article 2.01)
2. 2128 Charger, Battery, Fixed, Individual (Ref. Article 2.02)
3. 2210 Drill Press, Variable Speed, 17 Inch (Ref. Article 2.03)
4. 2350 Lathe, Brake Drum and Shoe, w/Dust Collector (Ref. Article 2.04)
5. 2485 Plates, Wheel Alignment (Ref. Article 2.05)
6. 3080 Cabinet, Abrasive Blast, w/Dust Collector (Ref. Article 2.06)
7. 3560 Tank, Parts Cleaning, Medium (Ref. Article 2.07)
8. 3801 Washer, Steam/Hi-Pressure (Ref. Article 2.08)

B. Roughing-in, installation of equipment, and final connection of utilities, with necessary labor, services, and incidentals necessary for complete and operational equipment installation.

C. Piping, wiring, and switching between equipment and utilities.

1.02 Related Work:

- A. Division 15: Mechanical.
- B. Division 16: Electrical.

1.03 Quality Assurance:

- A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.
- B. Manufacturer's Representative:
 - 1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out and startup.
 - 2. Training: Provide technical representative to train District's maintenance personnel in operation and maintenance of specified equipment.

1.04 Submittals:

- A. Product Data:
 - 1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.
 - 2. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.
- B. Operation and Maintenance Manual:
 - 1. Provide complete parts, operating, and maintenance manual covering equipment at time of installation including, but not limited to:
 - a. Description of system and components.
 - b. Schematic diagrams of electrical, plumbing and compressed air systems.
 - c. Instructions: Manufacturer's printed operating and maintenance literature.
 - d. List of original manufacturer's parts, recommended spare parts stockage quantity and local parts and service source.
- C. Shop Drawings: Submit Shop Drawings in accordance with Division 1 - General Requirements of these specifications.

1.05 Warranty:

- A. Warrant work specified herein for one year from substantial completion against defects in materials, function and workmanship.
- B. Warranty shall include materials and labor necessary to correct defects.
- C. Defects shall include, but not be limited to:
 - 1. Operation: Noisy, rough, or substandard.
 - 2. Parts: Loose, damaged, and missing.
 - 3. Finish: Abnormal deterioration.
- D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.
- E. Availability: All parts shall be readily available locally in the United States.

1.06 Product Delivery, Storage, and Handling:

- A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid, dusty conditions.
- B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Mark Number of this specification.
- C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.07 Labeling:

- A. Manufacturer shall securely attach in a prominent location on each major item of equipment a noncorrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

ARTICLE 2 - PRODUCTS

2.01 Buffer/Grinder, 8 Inch, w/Dust Collector:
Equipment Mark Number: 2080

- A. Capacities and Dimensions:

1. Buffer/grinder:
 - a. Motor: 3/4 HP, 3600 RPM.
 - b. Wheel:
 - (1)Diameter: 8 inches.
 - (2)Thickness: 1 inch.
 - (3)Bore: 3/4 inch.
 - c. Distance between wheels: 15-5/8 inches.
 - d. Height to center of spindle: 39-1/2 inches.
2. Dust collector:
 - a. Motor: 1/2 HP, 3600 RPM.
 - b. Base dimensions:
 - (1)Width: 22 inches.
 - (2)Depth: 16 inches.
3. Overall dimensions, nominal:
 - a. Width: 26 inches.
 - b. Depth: 18 inches.
 - c. Height: 50 inches.
4. Gross weight: 234 pounds.

B. Features and Construction:

1. Motors: Totally enclosed, direct drive motors rated for continuous service, with permanently lubricated ball bearings.
2. Wheels: One each, coarse and medium grit, standard.
3. Wheel guards: Adjustable for wheel wear, provided with exhaust outlets, adjustable work rests and spark breakers.
4. Dust collector: Integral in cabinet base, provided with front-opening doors for access to motor and filters, and removable dust drawer, entire unit meeting OSHA ventilation standards.

5. Conduits: Flexible dust collection conduits to permit guard adjustment without disturbing connections.
 6. Quenching pot: Front mounted between wheels.
 7. Transformer: Combined low voltage transformer for lamps and magnetic starter.
 8. Power supply: Connections for hookup to junction box.
- C. Controls: Magnetic starter with START/STOP pushbuttons; low voltage, no voltage and three leg overload protection. Switching and other electrical controls shall meet applicable National Electrical Code requirements.
- D. Accessories:
1. Illuminated eyeshields: Installed, Cincinnati No. 000-131, one set of two each per grinder.
 2. Magnetic starter: Pushbutton unit, installed, Cincinnati No. 000-533, one each per grinder/dust collector unit assembly.
- E. Utilities Available: 460 VAC, 3 phase.
- F. Finish: Durable enamel in manufacturer's standard color.
- G. Manufacturers Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
 - a. Cincinnati Electrical Tool Division, Setco Industries, Inc
5880 Hillside Avenue
Cincinnati, Ohio 45233-1599
Telephone: (513) 941-5000 ext. 139
 - b. Model: 602-134 with accessories
 2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

a. Power Tool Division, Rockwell International
400 North Lexington Avenue
Pittsburgh, Pennsylvania 15208
Telephone: (412) 247-3500

2.02 CHARGER, BATTERY, FIXED, INDIVIDUAL
Equipment Mark Number: 2128

A. Capacities and Dimensions

1. Cabinet dimensions:
 - a. Width: 19 inches.
 - b. Depth: 15-1/2 inches.
 - c. Height: 27 inches.
2. Recharge Range (6 cells in series):
 - a. 8 hours: 270 to 450 amp hours.
 - b. 12 hours: 451 to 720 amp hours.
3. DC cable length: 10 feet minimum.
4. AC cable length: 8 feet minimum.
5. Nominal shipping weight: 110 pounds.

B. Features and Construction:

1. Construction: Cabinet shall be fabricated of sheet steel with hinged door for access to charger components
2. Circuitry: Circuitry shall be solid state including electronic timer. Charge rate shall be automatically regulated throughout the charging cycle to eliminate over or under charging.
3. Safety features:
 - a. Improper connection: Charger shall not operate if battery is improperly connected to charger.
 - b. Improper battery type: Charger shall not operate if wrong size battery is connected to charger.
4. Cooling: Charger design shall utilize convection type cooling.

5. Meter: DC ammeter shall be mounted in front panel of charger cabinet.
 6. Overload protection: AC and DC circuits shall have overload protection.
 7. Cables:
 - a. Power cable: Primary power cable shall be three conductor stranded cable with three wire grounded plug.
 - b. Charging leads: Two conductor cable with insulated spring jaw battery clamps shall be provided.
 - C. Accessories: Wall mounting brackets, catalogue number 101-651-701.
 - D. Utilities Available: 120 VAC, 20.3 amps.
 - E. Manufacturers Reference:
 1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
 - a. Exide
101 Gibraltar Road
Horsham, Pennsylvania 19044
Telephone: (215) 674-9500
 - b. Model: ESI-6-450A
 2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
 - a. Associated Equipment Corporation
1555 Salzman Avenue
St. Louis, Missouri 63133
Telephone: (314) 385-5178
 - b. LaMarche Manufacturing Company
106 Bradrock Drive
Des Plains, Illinois 60018
Telephone: (312) 299-1188
- 2.03 Drill Press, Variable Speed, 17 Inch:
Equipment Mark Number: 2210

A. Capacities and Dimensions:

1. Motor: 1 HP, 1140 RPM.
2. Overall dimensions, nominal:
 - a. Width: 21 inches.
 - b. Depth: 33 inches.
 - c. Height: 72 inches.
3. Tilting table working surface, ground:
 - a. Width: 14 inches.
 - b. Depth: 11 inches.
 - c. Tilt range: 90 degrees to left and right.
4. Base working surface, nominal:
 - a. Width: 16 inches.
 - b. Depth: 14 inches.
5. Quill:
 - a. Stroke: 5 inches.
 - b. Diameter: 2-1/4 inches.
6. Capacities:
 - a. Diameter hole:
 - 1) In steel: 11/16 inch.
 - 2) In cast iron: 7/8 inch.
 - b. Throat: 8-1/2 inches.
 - c. Spindle to table, maximum: 34-3/4 inches.
 - d. Spindle to base, maximum: 45-3/4 inches.
7. Spindle speed: Infinitely variable, 230 to 2830 RPM.
8. Column:
 - a. Wall thickness: 11/64 inch.

- b. Diameter: 3-1/2 inches.
- 9. Weight, nominal: 387 pounds.
- B. Features and Construction:
 - 1. Speed control: Operable while machine is running to hold speed setting constant under all rated load conditions.
 - 2. Belt drive: Alignment and tension of belt shall be automatically maintained.
 - 3. Bearings: Spindle assembly shall be supported by not fewer than five permanently lubricated ball bearings.
 - 4. Tilting work table: Slots and side ledges for clamping of work; machined front apron with mounting holes; tilt scale providing accurate readings to 90 degrees right and left, with index pin at level and 90 degrees left and right positions.
 - 5. Table lock: Expanding bushing table lock for rigid positioning of table at any angle.
 - 6. Floor base: Provide with two full-length T-slots permitting insertion of T-bolts from front and rear.
 - 7. Safety features:
 - a. Chuck key: Self-ejecting type.
 - b. Guard: Steel clip-on type completely enclosing drive.
 - 8. Spindle: No. 2 Morse Taper accepting accessory Jacobs type chuck for use with standard bits.
 - 9. Motor: Totally enclosed, fan cooled.
 - 10. Depth control: Self-locking adjustment depth stop for feed.
 - 11. Table adjustment: Hand gear crank for table elevation.
 - 12. Function controls: Knobbed spoke wheels for manual speed selection and feed.
- C. Controls: 24 volt push-button control station with shrouded START button and protruding STOP button,

magnetic starter with transformer and no voltage/low voltage and three leg overload protection. Switches and other electrical controls shall meet applicable National Electrical Code requirements.

D. Accessories:

1. Motor: 1140 RPM, Rockwell No. 49-007, one each per drill press.
2. Chuck: Three-jaw Jacobs, 0 to 1/2 inch capacity with No. 2 MT shank, with key, Rockwell No. 46-968, one each per drill press.

E. Utilities Available: 460 VAC, 3 phase.

F. Finish: Durable enamel in manufacturer's standard color.

G. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

- a. Power Tool Division, Rockwell International
400 North Lexington Avenue
Pittsburgh, Pennsylvania 15208
Telephone: (412) 247-3500

- b. Model: 17-523 with accessories.

2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

- a. Clausing Corporation
811 Eisenhower Drive
Goshen, Indiana 46526
Telephone: (219) 533-0371

- b. Powermatic Division, Houdaille Industries, Incorporated
Morrison Road
McMinnville, Tennessee 37110
Telephone: (615) 473-5551

2.04 Lathe, Brake Drum and Shoe, With Dust Collector:
Equipment Mark Number: 2350

A. Capacities and Dimensions:

1. Motor: 3 HP.
 2. Spindle speeds: 20 to 90 RPM.
 3. Brake drum capacity:
 - a. Depth: 16 inches.
 - b. Diameter: 14 to 24 inches.
 4. Drum arbor diameter: 2-1/2 inches.
 5. Boring bar diameter: 2-1/2 inches.
 6. Brake block arbor: 1-3/4 inches.
 7. Dust collector base dimensions, nominal: 29 by 29 inches.
 8. Overall dimensions, nominal:
 - a. Length, including spindles: 78 inches.
 - b. Width: 42 inches.
 - c. Height: 42 inches.
 9. Weight, nominal: 2,750 pounds.
- B. Features and Construction:
1. Simultaneous cutting: Double spindle lathe specifically designed for boring drums on one spindle and turning mated lining on other spindle.
 2. Capacity: Lathe to accommodate entire dual wheel assembly consisting of dual tires and wheels mounted on hub and brake drum.
 3. Spindle speeds: Infinitely adjustable from 20 to 90 RPM.
 4. Pick off gear feeds: Furnished in 0.003 inch, 0.005 inch, 0.010 inch, and 0.018 inch per revolution.
 5. Bearings: Tapered adjustable spindle bearings.
 6. Standard equipment: Lathe assembly shall include all necessary tools and components (including boring bar assemblies, arbors, bar setting gauges, tool setting gauges, dial indicators, washers, bolts, wrenches, feed gears, spacers, silencers,

cutting tools, radii cones and fixtures) to properly turn brakes for transit buses currently operated by District or others which may be acquired by the time of beneficial occupancy of facility.

7. Dust cover: Integral brake block assembly dust cover shall completely encase spindle used for cutdown of brake block. Cover fitted with discharge port for connection to dust collector. Include necessary hose for connection of dust cover to dust collector.

C. Controls: Pushbutton ON/OFF safety control box mounted on front of base; magnetic starter with low voltage and no voltage, and overload protection on all three phases. Switching and other electrical controls shall meet applicable National Electrical Code requirements.

D. Accessories: Dust collector, Torit Model 84, one each.

E. Utilities Available: 460 VAC, 3 phase.

F. Finish: Durable enamel in manufacturer's standard color.

G. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

a. Star Machine and Tool Company
201 6th Street S.E.
Minneapolis, Minnesota 55414
Telephone: (612) 378-3232

b. Model: 53-DS

2. Above manufacturer constitutes only known source for specified item.

2.05 Plates, Wheel Alignment:
Equipment Mark Number: 2485

A. Capacities and Dimensions:

1. Capacity: 20,000 pounds.

2. Height: 4 inches maximum.

B. Features and Construction:

1. Construction: Plates shall be manufactured of heavy gauge cast steel. Turntables shall rotate freely on ball bearings in retainer ring with steel base plate. Base designed to be mounted in floor recess for drive over operation.
2. Jack: One slide plate shall be equipped with hydraulic hand jack for properly aligning bus on plates.
3. Scale: Radius gauge scale on turntables shall have range of at least 40 degrees each side of 0 degrees. Scale shall be adjustable to allow zeroing of gauge.

C. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
 - a. Bender Equipment Company, Incorporated
2315 North 26th Street
Birmingham, Alabama 35207
Telephone: (205) 323-5263
 - b. Model: F 603-F
2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
 - a. AMMCO Tools, Incorporated
2100 Commonwealth Avenue
North Chicago, Illinois 60064
Telephone: (312) 689-1111
 - b. Bear Automotive Service Equipment Company
P. O. Box 25397
Milwaukee, Wisconsin 53222
Telephone: (414) 527-3200

2.06 Cabinet, Abrasive Blast, w/Dust Collector:
Equipment Mark Number: 3080

A. Capacities and Dimensions:

1. Blower motor: 1 HP, 700 CFM.
2. Overall dimensions:

- a. Width: 48 inches.
 - b. Depth: 35 inches.
 - c. Height: 64-1/2 inches.
3. Viewing window: 12-1/2 inches by 21 inches.
 4. Gun orifice: 4/32 to 8/32 inch in 1/32 inch increments.
 5. Cabinet doors:
 - a. Width: 30 inches.
 - b. Height: 28-1/2 inches.
 - c. Quantity: Two each.
 6. Working area:
 - a. Length: 48 inches.
 - b. Depth: 33 inches.
 - c. Height: 32 inches.
 7. Shipping weight, nominal: 580 pounds.

B. Features and Construction:

1. Cabinet: Constructed of 14 and 16 gauge steel.
2. Leatherette gauntlets: Secured to 8 inch arm hole ports with rubberized gloves attached.
3. Viewing window: Angled safety plate glass.
4. Lighting: Work area inside cabinet illuminated with two 24 inch fluorescent tubes.
5. Air system: Equipped with air regulator and moisture trap.
6. Doors: One at each end of cabinet to facilitate placing and removal of parts.
7. Reclaim-separator system: Mounted on rear of cabinet, equipped with flame retardant cloth filter bag.
8. Orifices: Standard equipment for suction feed-type media gun to include sizes 4/32, 5/32, 6/32, 7/32, and 8/32.

9. Blow off: Fingertip controlled valve on media gun.
10. Media blast: Foot controlled valve on media gun.

C. Controls:

1. Illumination: ON/OFF switch to activate cabinet lights.
2. Reclaim-separator: ON/OFF switch to activate reclaim-separator and provide power to blast media solenoid.

D. Utilities Available:

1. Electrical: 120 VAC, 20 amps.
2. Air: 80 PSI, up to 85 CFM.

E. Finish: Durable enamel in manufacturer's standard color.

F. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
 - a. Blast-It-All, Incorporated
P.O. Box 1615
Salisbury, North Carolina 28144
Telephone: (704) 636-8302
 - b. Model: 4836
2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
 - a. Wheelabrator-Frye, Incorporated
451 South Byrkit Street
Mishawaka, Indiana 46544
Telephone: (219) 255-2141
 - b. Kansas Instruments, Incorporated
Highway 177 North
Council Grove, Kansas 66846
Telephone: (316) 767-6721

2.07 Tank, Parts Cleaning, Medium:

Equipment Mark Number: 3560

A. Capacities and Dimensions:

1. Pump motor: 1/3 HP.
2. Pump output:
 - a. Tank jets: 40 GPM.
 - b. Flush hose: 18 GPM.
3. Overall dimensions, nominal:
 - a. Width: 42 inches, less accessory shelf.
 - b. Depth: 30 inches.
 - c. Height, cover upright: 66 inches.
4. Soak tank:
 - a. Length: 30 inches.
 - b. Width: 29 inches.
 - c. Solvent depth: 16 inches.
5. Fluid capacity: 85 gallons.

B. Features and Construction:

1. Spray hose: Pistol-grip flush nozzle with neoprene hose, adjustable from fine spray to solid stream.
2. Flush hose: Flexible metal hose with nozzle and valve.
3. Work shelves: Bi-level, one expanded metal and one flanged steel.
4. Solvent filter: Mesh element located above fluid level for ease of service.
5. Safety cover: Spring loaded, soft closing safety cover with fusible link automatically closes at 165 degrees F.
6. Pump/assembly: Sparkless pump motor with screened intake.
7. Construction: 14 and 16 gauge steel.

8. Cleanout: 2 inch NPT bottom drain plug and two removable sludge trays.
 - C. Controls: Recessed switch with amber POWER ON light. Switching and other electrical controls shall meet applicable National Electrical Code requirements.
 - D. Accessories: External drain shelf, Graymills P/N L-6, one each.
 - E. Utilities: 115 VAC.
 - F. Finish: Durable enamel in manufacturer's standard color.
 - G. Manufacturers Reference:
 1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
 - a. Graymills Corporation
3705 North Lincoln Avenue
Chicago, Illinois 60613
Telephone: (312) 248-6825
 - b. Model: 800
 2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
 - a. Kansas Instruments Incorporated
Hiway 177 North
Council Grove, Kansas 66846
Telephone: (316) 767-6721
 - b. Kwik-Way Manufacturing Company
500 57th Street
Marion, Iowa 52302
Telephone: (319) 377-9421
- 2.08 Washer, Steam/Hi-Pressure:
Equipment Mark Number: 3801
- A. Capacities and Dimensions:
 1. Motor: 7-1/2 HP.
 2. Overall dimensions:

- a. Length: 80 inches.
 - b. Width: 40 inches.
 - c. Height: 68 inches.
3. Output:
- a. Steam: 550 GPH at 150 PSI and temperatures to 340 degrees F.
 - b. High pressure: 1100 GPH at 500 PSI and temperatures to 240 degrees F.
4. Hose length, steam and high pressure: 50 feet.
5. Nominal weight: 1,900 pounds.

E. Features and Construction:

1. Pressure system: Pump shall be driven by a 7-1/2 HP TEFC motor with magnetic starter and start/stop switch. A four cylinder piston pump shall produce a constant volume of 1100 gallons per hour with bypass valving to adjust flow to cleaning guns and an automatic bypass regulator to maintain constant system pressure level with nozzle control valves either opened or closed.
2. Burner: Unit shall be equipped with a 1,350,000 BTU gas fired burner with air mixing blower and solid state safety pilot ignition system. Burner controls shall include gas thermo-control valve, nozzle control, temperature limit switch, blower air pressure switch, water supply flow switch, and pressure switches for steam and high pressure modes.
3. Heat exchanger: Heating coil shall be 3/4 inch ID ASME inspected with pre-heater and stainless steel ASME approved relief valves for steam and high pressure modes.
4. Tank: Solution tank shall be manufactured of stainless steel with syphoning device for blending water with controlled amounts of additive from product drum. Tank capacity shall be approximately 20 gallons.
5. Guns: Unit shall be furnished with three full swivel steam guns and three stainless steel high pressure cleaning guns. All guns shall be complete with extensions, insulated handle grips and trigger control.

- a. Steam guns: Each gun assembly shall consist of 50 feet of 3/4 inch, 200 PSI working pressure wire braided hose with 3/4 inch quick disconnects, one straight nozzle and one fan nozzle.
 - b. High pressure guns: Each gun assembly shall consist of 50 feet of 1/2 inch, 1700 PSI working pressure wire braided hose with 1/2 inch quick disconnects, one 15 degree, one 25 degree and one 40 degree angle flat spray pattern stainless steel nozzles.
- F. Controls: Magnetic starter, start/stop switch and electrical control shall be mounted in moisture protected enclosure.
- G. Accessories:
- 1. Motor: 460 VAC, 3 phase, 60 cycle, one each.
 - 2. Ignition system: Solid state safety pilot ignition system, No. RA890, one each.
- H. Utilities:
- 1. Electric: 460 VAC, 3 phase.
 - 2. Water: 1200 GPH at 60 PSI, 1 inch inlet.
 - 3. Gas: 1,350,000 BTU per hour at 8 inch water column, 1-1/4 inch inlet.
- I. Finish: Unit shall be primed and painted with two coats of durable enamel in manufacturer's standard color.
- J. Manufacturers Reference:
- 1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
 - a. Pacer Kelite Division of ASM Industries
1250 North Main Street, Building No. 3
Los Angeles, California 90012
Telephone: (213) 221-9135
 - b. Model: MCX-110/55 with accessories
 - 2. Other manufacturers: Contingent upon compliance with these specifications and documentation

requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

- a. Hotsy Corporation
21 Inverness Way East
Englewood, Colorado 80112
Telephone: (303) 792-5200

- b. Jenny Division, Homestead Industries
P. O. Box 348
Coraopolis, Pennsylvania 15108
Telephone: (412) 771-2628

ARTICLE 3 - EXECUTION

3.01 Inspection:

- A. Check location of rough-in work and utility stub-outs to assure match with equipment to be installed.

- B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all items.

- C. Report in writing to the District or authorized representative damaged, missing or incomplete scheduled equipment and improper rough-in work or utility stub-outs.

3.02 Installation:

- A. Perform work under direct supervision of Foreman or Construction Superintendent with authority to coordinate installation of scheduled equipment with District or authorized representative.

- B. Install equipment in accordance with plans, shop drawings and manufacturer's instructions:
 - 1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level, plumb and at right angles to adjacent work.

 - 2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

 - 3. Anchorage: Attach equipment securely to prevent damage resulting from inadequate fastenings. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

4. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.03 Testing:

- A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with all specified features in the presence of the District.

3.04 Cleanup:

- A. Touch-up damage to painted finishes.
- B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.
- C. Clean area around equipment installation and remove packing or installation debris from job site.
- D. Notify District for acceptance inspection.

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DIVISION 12 - FURNISHINGS

SECTION 12510 - WINDOW BLINDS

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Window blinds.
- 1.02 Submittals: Submit shop drawing, manufacturer's technical data and material specifications, and samples, as applicable.

ARTICLE 2 - PRODUCTS

- 2.01 General: All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture. Where model numbers are indicated, if the specified models are discontinued, the Contractor shall furnish the manufacturers' updated model at no additional cost to the Owner.
- 2.02 Materials:
- A. Manufacture: "Riviera" blinds by Levolor Lorentzen, Inc. or "Flexalum" blinds by Hunter Douglas or "Decor" blinds by Globe Products Corp. or equal.
 - B. Description: The blind shall have 1" wide horizontal slats supported by braided ladders. All hardware shall be enclosed in a metal head. All operating hardware shall be machine clinched to head to assure perfect alignment. It shall be possible to tilt the slats to any horizontal angle by turning the transparent wand.
 - C. Slat supports shall be braided of polyester yarn, the vertical component of which shall be not less than .045" diameter, nor greater than .068" diameter for maximum strength and flexibility with minimum stretch. Braided ladders shall support slats parallel and

straight to assure proper tilt control and adequate overlap of slats. There shall be about 15 rungs per foot of ladder equally spaced at .788" intervals. Distance between ladders shall not exceed 21". The horizontal component, or rungs, shall consist of not less than 4 cables interbraided with the vertical components.

- D. Slats shall be virgin aluminum alloyed for maximum strength, flexibility, and resistance to internal and external corrosion. The slats shall be 25 mm wide (.984") plus .003" or minus .000". They shall be .010" thick before painting, plus or minus .0005". After painting, thickness shall be .011" plus or minus .0005".
- E. The head shall be .025" thick Tomized steel "U" shaped. The bottom rail shall be .031" thick Tomized steel. Both head and bottom rail shall have a plastic type coating cured at high temperature and shall be formed after coating.
- F. Lift cord shall be of adequate diameter braided of high strength synthetic fibers to provide minimum stretch and maximum strength and flexibility.

ARTICLE 3 - EXECUTION

- 3.01 Products of this section shall be installed in accordance with the drawings and manufacturers' instructions by installers trained and approved by the manufacturer.

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DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13980 - SOLAR ENERGY SYSTEM

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Furnish and install solar collectors, piping and controls as indicated and as specified herein, complete with all appurtenances required.

1.02 Submittals

- A. General: Comply with provisions of Division 1.
- B. The submittal data to be furnished shall include, but not be limited to the following:
 - Pipe and Fittings Instruments & Controls
 - Valves Piping Specialities
 - Solar Collectors Pumps
- C. Certified Test Reports: Solar collectors.
- D. Operation and Maintenance Manual: Solar energy systems.
- E. Posted Operating Instructions: Piping codes and diagrams of solar energy systems, Operating instructions, control matrix, and trouble shooting instructions.

1.03 Special Provisions

- A. Collector Warranty: Collectors shall be covered by a five year warranty against defects in materials and workmanship.
- B. Services of Technical Representative of the Collector Manufacturer: The Contractor shall provide services of a technical representative of the collector

manufacturer, at the job site during each phase of unloading installation, and testing. This technical representative shall certify in writing that the solar energy systems have been installed as recommended by the manufacturer.

1.04 Product Handling

- A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary and at no additional cost to the District.

1.05 Related Work Specified in Other Sections

- A. Finishes: Division 9.
- B. Insulation: Division 15.
- C. Electrical: Division 16.

ARTICLE 2 - PRODUCTS

2.01 Piping

- A. Solar water supply and return piping - Symbol SWS and SWR shall be Copper Pipe ASTM B88, Type L, hard drawn copper tubing.
- B. Bronze Flanges and Flanged Fittings: ANSI B16.24, flanged type up to 8 inches.
- C. Solder-Joint Fitting: ANSI B16.22, wrought copper.
- D. Unions: Nibco No. 733.
- E. Dielectric Union: Insulated union provided with a galvanized steel female pipe-threaded end and a copper solder joint and conforming with Fed. Spec. WW-U-531, Class 1, dimensional, strength and pressure requirements. Union shall have a water-tight and pressure requirements. Union shall have a water-impervious insulation barrier capable of limiting galvanic corresponding bimetallic joint. The dry insulation barrier shall be able to withstand a 600 volt breakdown test. Provide dielectric union where two dissimilar metals are connected.

- F. Expansion Joints: Bellow Type corrugated bellows with reinforcing rings and single-bellow expansion joints.

2.20 Valves

- A. Provide end connections as indicated or as required. Valves shall open when turned counterclockwise.
- B. Gate Valves: Screw-in bonnet, bronze, Class 125 Nibco No. T-111, with solid wedge disc, rising stem, and threaded end.
- C. Balancing Cock (Flow Rate Control and Meter): Bronze with threaded ends. The valves shall have square head or similar and flow indicator arc or check and shall be designed for 125 psi service and 240 ° F temperature. Provide valves with pressure ports for differential flow metering device. "Bell & Gosset" circuit setter Model CB.
- D. Check Valves: Bronze, Class 200, with springloaded check with elastomer seats.
- E. Control Valves: All valves shall be actuated by electric motors. Valves shall have electrical characteristics compatible with the control systems. Valve switches shall be fully enclosed. Valve construction shall permit backseating with seal to be replaceable without draining system. Valve body shall be bronze, suitable for 125 psig operating pressure and 240° F operating temperature. Valves shall have external position indicators and steel enclosures to protect all operating components, and all valves shall be U.L. listed.
- F. Shutoff and Diverting (2-way and 3-way) Control Valves: Bronze valves which shall be 100 percent shutoff, butterfly or ball type with stainless-steel ball, with elastomer seats and seals suitable for 240 F operating temperature and 125 psig operating pressure.
- G. Valve Operators: Electric quiet operating geared type. Use valve operators capable of delivering the torque required for continuous uniform movement of the valves and withstand, without damage, continuous stalling. Operators shall function properly with a 10 percent plus or minus change in line voltage feeding the equipment. Operator drive pinions and high speed gears may be made for non-metallic composition to insure quiet operation.

Other gears shall be machine cut bronze or steel with face widths of not less than 0.375 inch. Provide hardened steel shafts running sleeve bearings or bronze, hardened steel, nylon, or ball bearings. Totally enclosed operators and gear trains in dust-proof housings of pressed steel or metal castings with rigid conduit connections. Gear trains shall be oil immersed type. Two-position operators shall be of a single direction spring return or reversing type. Proportioning operators shall be capable of stopping at all points in the cycle and starting in either direction from all points. Reversing and proportioning operators shall have limit switches to limit the lever in either direction unless operator is stall type. Equip valve operators with a spring yield device so that when in the closed position it will maintain on the valve disc a pressure equivalent to the pressure rating of the valve.

203 Traps and Vent Valves

- A. Air Traps: Class 150, non-thermostatic, float-controlled except that valves are arranged to close promptly when water enters traps. Minimum volume 44 cubic inches.
- B. Pressure Relief Valves: ASME labeled. The valves shall have a relief setting of 20 to 30 percent higher than the system pressure. The valve seats and moving parts exposed to fluid shall be of non-ferrous material.

2.04 Solar Hot Water Storage Tanks - Symbol ST-1

- A. Provide solar hot water storage tanks as indicated on the Drawings suitable for 100 psig operating pressure.
- B. The tank shall be constructed with a glass lined carbon steel shell. The tank design and construction shall conform to the latest ASME Code for Unfired Pressure Vessels and shall be stamped for 100 psig operating pressure.
- C. Provide a 11" x 15" bolted access opening located in the lower part of the shell.
- D. The blow-off connection shall be located at the top. The hot water recirculating opening, hot water return opening, and the cold water supply openings shall be provided as indicated on the Drawings. The thermostat bulb well and the thermometer shall be provided in the upper part of the shell. The hot water supply shall be loaded at the top. All connections for lines shall be heavily reinforced screwed pattern connections.

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and Yard Improvement

- E. Provide ASME rated pressure-temperature relief valve mounted in a 1" tapped opening.
- F. Tanks shall be insulated to meet requirements of ASHRAE 90A-1980 Standards. Factory installed jacket shall be provided over the insulation.
- G. Install the number and size of magnesium anodes to provide adequate cathodic protection for the tank.
- H. Manufacturer: A.O. Smith or P.V.I.

2.05 Solar Water Circulating Pump - Symbol CP-2

- A. Type: In-line mounting, bronze or stainless steel construction.
- B. Capacity: As shown.
- C. Construction: All bronze, mechanical seal, bronze sleeve type bearings, resilient mounted motor spring type coupler, centrifugal impeller, alloy steel shaft machined and hardened thrust collar. Unit may have stainless steel impeller.
- D. Motor: Standard housing, drip-proof, voltage, phase, and current as shown.
- E. Acceptable manufacturers: "Bell & Gossett", "Armstrong", "Taco" or Grundfos.

2.06 Specialities

- A. Bolting: Carbon steel bolting; ASTM A307, Grade B. for bolts and ASTM A194, Grade 2 for nuts.
- B. Gaskets: Fluorocarbon elastomer. Gaskets shall be compatible in form with grooves in flanged faces.
- C. Brazing Metal: AWS A5.8, 15 percent Silver-base alloy, minimum melting point 1,500 °F for pressure up to 120 psi.
- D. Strainers: Class 125, Style Y pattern, threaded or soldered ends for 2 inches and smaller.
- E. Piping Identification Labels: Plastic slip-on type or tape with pressure-sensitive adhesive conforming to ANSI A13.1.

- F. Hangers and Supports: MSS SP-58, with types as required MSS-SP-69.

2.07 Solar Collectors

- A. General: The collector shall be designed to absorb incoming solar radiation and transfer the resulting heat to a circulating fluid. The collector shall consist of absorber plate coated with a selective surface, assembled in a manner to maintain thermal plus mechanical performance over a minimum 25 year service life. The collector shall be guaranteed against leaks and rusting, and degradation of the selective surface for a minimum of 5 years. Certification by the manufacturer of a collector's ability to meet the guaranty requirement shall be submitted to the Engineer prior to utilization of the product.
- B. Absorber Plant: Absorber plate shall be .010 copper sheet soft soldered (95.5 antimony silver) to copper tubes. Tube pattern shall be a connected vertical grid to a copper manifold. Vertical flow tubes shall be brazed to the manifold tubing. Solders and brazings shall be capable of withstanding 450 F at 125 psig. Tubing within the assembled collector shall have a working pressure of 125 psig.
- C. Absorber Plate Coating: Coating shall be a black chrome with the following spectral properties: minimum absorbitivity .94 and maximum emmissivity .12. Selective coating shall be durable at 450°F.
- D. Glazing: Single glazing material shall be 1/8", no iron content, edges swiped, tempered glass. Total transmissivity of the glass shall be 91% or greater. The glazing shall be gasketed with a continuous U-shaped neoprene gasket on all sides. The collector units shall be designed to withstand adverse weather conditions with winds of 150 MPH, rain, snow, hail and dust.
- E. Collector Frame: Collector frame shall be of extruded, mill finish, aluminum sides with a .05 aluminum sheet for backing or better. Air space between the absorber plate and the glazing shall be between 3/4" and 1". The collector frame shall provide thermal breaks between the absorber plate and the collector frame capable of withstanding sustained 400 degree temperatures.

Corners of the collector frame shall be mitered and sealed. Frame shall accommodate single or double glazing.

- F. Insulation. Insulation shall be provided behind the absorber plate. This insulation shall consist of 1" of fiberglass insulation immediately in contact with the absorber plate and 1" of foil faced urethane foam (non-offgasing) for a total R value of 10.0. Density of the fiberglass shall be 1.2 lbs/cubic feet.
- G. Collector Heat Transfer Fluid: Water.
- H. Collector Performance: Collector manufacturer shall provide independent third-party test results performed in agreement with ASHRAE 93-77 -Method for Testing and Rating the Thermal Performance of Flat Plate Collectors. Data shall be submitted with the name and location of the laboratory which performed the testing. Performance curves shall be linear approximations of data points collected during testing. A linear equation in the form of $y=a+bx$, where y describes the instantaneous efficiency and x is the fluid parameter $(TF-TA)Q/I$ (where TF is the average plate temperature TA is the ambient temperature, and QI is the incident radiation falling on the collector aperture) shall be provided by the manufacturer. The minimum linear curve acceptable will be where $(y=0.748;x=0)$ and $(y=0.30;x=0.45)$ (for glazed flat plate collector).
- I. Protection of collectors during Construction: Collector modules shall be covered with an opaque material after mounting during construction to prevent damage caused by stagnation conditions and to prevent injury to workmen due to high plate and manifold tubing temperatures as no flow conditions.
- J. Manufacturer: Raypak, Colt, U. S. Solar or approved equal.

2.08 Flexible Connectors

- A. Flexible connectors connecting piping to collector header shall be constructed of rubberized steel, reinforced hose suitable for 450 F and 125 psi service. Flexible connectors shall be resisting to adverse weather conditions without deterioration.

2.09 Solar Energy Controls

- A. General: The control shall be of the differential thermostat type and shall operate in such a manner that the system circulating pump is activated when the temperature sensors (see detail drawings-control sensors) exceeds the set value on the control. Set points shall be field adjustable.
- B. Control Sensors shall be matched thermistors having an electrical resistance of 10K at 77°F and a matched tracking accuracy of $\pm 1^\circ\text{F}$. Sensor housings shall be made of brass or copper. Control housing shall be weather tight when installed outdoors. Unit shall have digital readout as indicated on drawings.
- C. Manufacturer: Independent Engery C-100 or approved equal.

2.10 Solar Energy System Monitoring Equipment: Performance of the solar system shall be monitored using the following equipment:

- A. Sensors: Designed to withstand stagnation temperatures of solar collectors. Provide copper wells which can be inserted into the collector tube, or piping.
- B. Liquid-in-Glass Thermometer.
- C. Test Ports: Solid brass, 1/4" fitting to receive either a temperature or pressure probe 1/8" O.D., two valve cores of neoprene, fitted with color codes and marked cap with gasket, and rated for 1,000 psig.
- D. Pressure Gauge(0-100 psi). 4" dial, located where shown on drawings. On thermally insulated equipment of piping standoff mounting brackets, bases, adapters, or extended tubes shall be provided to allow the sensing element full immersion in the pipe flow without impediment to the flow.
- E. Controls to include relays, switches, contractors, fuses, transformers, pilot lights and panels to provide a completely integrated system controlling the solar energy collection system, hot water system and pumps in accordance with the sequence shown on the drawings.

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- F. Provide wiring in conduit in accordance with the National Electric Code.
- G. Submittal shall include a completely integrated wiring diagram showing function of all interrelated components of the solar, and domestic water heating system.

ARTICLE 3 - EXECUTION

3.01 Installation

- A. General: Install the solar collector system in accordance with this specification and the printed instructions of the manufacturers.
- B. Piping: Install piping as indicated. Accurately cut pipe to measurements established on site and work into place without springing or forcing. Locate piping out of the way of windows, doors, openings, light fixtures, electrical conduit, equipment, and other piping. Install overhead piping in the most inconspicuous places. Provide for expansion and contraction. Do not bury, conceal, or insulate until piping has been inspected, tested and approved. Locate joints where they may be readily inspected. Provide flexibility in piping connected to equipment for thermal stresses and vibration. Support and anchor piping connected to equipment to prevent strain from thermal movement and weight from being imposed on equipment. Provide sway bracing as required. Use hangers and supports in accordance with MSS SP 69. Piping shall be graded to permit complete drainage of the system.
- C. Fittings: Use long-radius ells to reduce pressure drops. The bending of pipes will not be permitted. Mitering of pipe to form elbows, notching straight runs to form full-sized tees, or any similar construction will not be permitted. Use union for disconnection of valves and equipment for which a means of disconnection is not otherwise provided. Provide reducing fittings for changes of pipe size. Bushings shall not be used.
- D. Measurements: Determine and establish measurements for piping at the job site and accurately cut pipe and tubing lengths accordingly. Where possible, use full pipe lengths. Random lengths joined by couplings will not be accepted.

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- E. Cleaning: Thoroughly clean interior of water piping before joining by blowing clear with either steam or compressed air. Maintain cleanliness of piping throughout installation. Provide caps or plugs on ends of cleaned piping as necessary to maintain cleanliness.
- F. Brazing: Brazing procedure qualification shall conform to ANSI B31.1 and preparation and procedures for joints shall be in accordance with ANSI B31.1 and CDA Copper Tube Handbook.
- G. Collector Connections to Headers: Connect collectors to top and bottom headers with soft-drawn long "S" or "U" copper tubes brazed with 15% silver solder. Use tube bender only. Hand-formed tubing will not be acceptable.
- H. Header Thermal Expansion and Contraction: Use slip-tube or bellow type expansion joints. Anchored flanged connections shall be placed for the expansion joints to work against.
- I. Flanged Joints: Use flanged joints for making flanged connecting to flanged valves and other flanged piping components. Install joints so that flanged faces bear uniformly on gas-tight. Engage bolts so that there is complete threading through the nuts and tighten until bolts are equally torqued.
- J. Sleeves: Provide schedule 10 galvanized steel sleeves for pipe and tubing passing through walls and partitions of either concrete or masonry construction. After piping has been installed, pack oakum into the space between the pipe or tubing within the sleeve and seal both ends with insulating cement.
- K. Flashing: Provide flashing for pipe and tubing extending through the roof. Flashing shall be installed so as to be watertight.
- L. Drain Lines: Provide drain lines from pressure relief valves to the nearest disposal points as directed.
- M. Identification: After piping has been tested, apply identification labels and arrows in accordance with ANSI A13.1. Insulated piping shall have identification applied over insulation jacket. Provide two copies of the piping identification code framed under glass and install where directed.

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- N. Install collectors on supports and secure with bolts as indicated on drawings.

3.02 Tests

- A. Before the system is declared operational the entire loop portion of the solar energy system shall be hydraulically tested and proved tight by applying and sustaining a pressure of 150 psig for a minimum of 2 hours. No pressure drop is acceptable. Repair defects and retest.
- B. Upon completion and prior to acceptance of the installation the following tests shall be made to verify the proper operation of the solar collection system. After review of the test data the collector manufacturer shall certify in a report to the Engineer that the system is operational.
- C. Operating tests shall take place over the duration of a typical operating day. (i.e. from the point when a minimum input of solar energy activates the automatic controls to the end of the day when diminishing sunlight causes the system to automatically shut down.)
- D. Start Up Function Test: To verify the proper operation of automatic start up control sequence record and note the following values and conditions:
 - 1. Time and date of initial start up.
 - 2. Sky conditions (haze or cloud cover will invalidate tests).
 - 3. Cold water temperature.
 - 4. Collector plate temperature at system start up.
 - 5. Hot water temperature.
- E. Operation Data Requirements. At half hour intervals during the period of the test, record the following values or note the following conditions:
 - 1. Cold water temperature.
 - 2. Collector plate temperature.
 - 3. Sky Conditions for each interval.

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4. Ambient temperature.
 5. Time for each measurement.
 6. Inlet and outlet temperatures for solar storage tank.
- F. System Parameters: The following values and samples should be recorded once during the period of the test:
1. Circulating pump, note the pump make, model, and rated capacity, and ammeter and voltmeter readings for pump during operation.
 2. All data values shall be read at the half hour unless otherwise specified. The report of the test (containing data as required by this specification) shall be supplied in quadruplicate to the Engineer. The Contractor shall furnish all instruments, test equipment, and test personnel required for the tests.

3.03 Thermal Insulation

- A. Insulate solar water supply and return piping as specified in Section 15.250 "Insulation of Mechanical Systems".

3.04 Painting and Finishing

- A. Factory Coating: Equipment and component items, when fabricated from ferrous metal, shall be factory finished with the manufacturer's standard weather resistant finishes.
- B. Field Painting: Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory are specified in Section: Painting.

3.05 Operating and Maintenance Instructions

- A. Bound Instructions: In accordance with Section 15.010 Mechanical General Provisions, complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Engineer. Each set shall be permanently bound and shall have a hard cover. The following identification shall be inscribed on the covers: the words "Operating and Maintenance Instructions," the

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name and location of the building, the name of the Contractor, and the contract number. Flysheets shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8-1/2 by 11 inches, with large sheets of drawing folded in. The instructions shall include, but shall not be limited to, the following:

1. System Layout showing piping, valves and controls.
 2. Approved wiring and control diagrams.
 3. A. control sequence describing start-up, operation, and shut-down.
 4. Operating and maintenance instructions for each piece of equipment, including lubrication instructions.
 5. Manufacturer's bulletins, cuts and descriptive data.
 6. Parts lists and recommended spare parts.
- B. Framed Instructions: Approved wiring and control diagrams showing the complete layout of the entire system, including equipment, piping, valves and control sequence, framed under glass or in approved laminated plastic, shall be posted, where directed. In addition, condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safety starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams, and posted beside the diagrams. Proposed diagrams, instructions and other sheets shall be submitted for approval prior to posting. The framed instructions shall be posted before acceptance-testing of the systems.
- C. Field Instructions: Upon completion of the work and at a time designated, the services of a project engineer shall be provided by the Contractor for a period of not less than two days to instruct the representative of the District in the operation and maintenance of the system. Those field instructions shall cover all the items contained in the bound instructions.

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DIVISION 14 - CONVEYING SYSTEMS

SECTION 14200 - OIL HYDRAULIC ELEVATOR

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. One (1) oil hydraulic passenger elevator.

1.02 Related Work in Other Sections:

- A. Legal Hoistway: Pit and machine room construction including proper overhead and machine room height and pit depth; access ladders; drains, lights and water-proofing as required by code.
- B. Supports: For guide rail bracket attachment in pit; at each floor and top of hoistway. Intermediate rail bracket supports to maintain a maximum spacing between brackets of not more than fourteen (14) feet vertically. Horizontally, supports shall be within twelve (12) inches of the clear hoistway line, and located on centerline of car rail. Pit floor capable of supporting foundations to carry imposed cylinder and equipment loads.
- C. Fixture Blockouts: And equipment blockouts and chases as required for proper installation.
- D. Grouting: And finish work around fixtures and entrance assemblies including entrance sills and jack assembly.
- E. Cast in Anchors: Inserts and sleeves, if required, including installation.
- F. Barricades: And barriers as required by code.
- G. Car Floor: Including installation. Elevator contractor shall provide proper recess for finished flooring as indicated.

- H. Finish Painting: Including frames and doors unless otherwise specified.
- I. Trenching and backfilling as required.
- J. Spoil Removal.
- K. Pit Ladders: And divider screens between adjacent hoistways.
- L. Channel jambs for freight elevators.
- M. Smoke seals, if required.
- N. Electrical Work Specified Elsewhere:
 - 1. Power Feeders: Including installation to each starter or controller; provide main line switch or fused disconnect located as directed; 3-phase, 60-cycle.
 - 2. Single Phase Power Feeders: To each car lighting and exhaust blower, including individual 20 amp circuit breakers at location shown on elevator layout and installation drawings.
 - 3. Conduit: Including wiring runs and junction boxes for remote indicator and control panels. Final hookup by elevator contractor.
 - 4. Temporary Power: Of same characteristics as permanent power for equipment testing and adjustment, if required.
 - 5. Smoke Sensors: Or product of combustion sensors in elevator lobby except Fire Control Floor; circuits to controller. Final hookup by elevator contractor.
 - 6. Telephone Instrument: Including final hookup to controller terminals and to telephone instrument.
 - 7. Standby Power: If required, including installation and hookup of emergency power and lighting supply capable of absorbing regenerative power; contact on normal/standby transfer switches to elevator controller.
 - 8. Pit and Equipment Area Lighting: And convenience outlets.
 - 9. Building Safety Systems: When required, instruments and accessories by others.

1.03 Requirements:

- A. All work shall be performed in a workmanlike manner and is to include all work and material in accordance with the drawings and as specified herein. In all cases where a device or part of the equipment is herein referred to in the singular number, it is intended that such reference shall apply to as many such devices as are required to complete the installation.
 - B. All work shall be performed in accordance with the latest revised edition (as of the date of this proposal) of the American National Standard Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks (ANSI A-17), the National Electrical Code, and/or such State and Local Codes as may be applicable. Should, subsequent to the date of this proposal, changes be made in any code, or should rulings by any code enforcing authorities extend the application of the code, the work and materials necessary to make the installation comply with such changes shall be performed as an addition to the contract price.
 - C. Coordinate installation of any inserts, bolts, power or powder driven fasteners, etc., into the slabs. Slabs are post tensioned and extreme precautions must be taken to avoid the steel tendons. Review shop and setting drawings, etc., for their locations.
- 1.04 Shop Drawings: Prepare shop drawings showing the general arrangement and loads of the elevator equipment. These drawings shall be approved and the hoistway size guaranteed before proceeding with fabrication and installation of the elevators.
- 1.05 Painting: All exposed metal work furnished by us, except as otherwise specified, shall be properly painted after installation.
- 1.06 Permits, Taxes and Licenses: All applicable sales and use taxes, permit fees and licenses imposed upon us as an Elevator Contractor as of the date of this proposal, are included in the contract price. The Purchaser agrees to pay, as an addition to the contract price, the amount of any additional taxes, fees or other charges exacted from the Purchaser or the Company on account thereof, by any law enacted after bids are taken.
- 1.07 Maintenance Service: Manufacturer will furnish standard maintenance and call-back service for a period of three (3) months on each elevator after it is completed and placed in operation. This service shall consist of periodic examinations of the equipment, adjustments, lubrication, cleaning,

supplies and parts to keep the equipment in proper operation, except such adjustments, parts or repairs made necessary by abuse, misuse or any other causes beyond control. All work shall be done by trained employees during regular working hours of the trade.

- 1.08 Warranty: Manufacturer warrant the equipment installed under this contract against defects in materials and workmanship for a period of one year from the date each elevator is completed and placed in operation.

ARTICLE 2 - PRODUCTS

2.01 Equipment Description:

A. General: Provide hydraulic elevator(s) as proposed.

B. System Description:

1. Type: Hydraulic Passenger
2. Quantity: One (1)
3. Capacity: 3000 pounds
4. Speed: 100 FPM, full load
5. Operation: Collective Including;
 - a. Two-Way Leveling
 - b. Fireman's Emergency Service, where required by code
 - c. Reverse Phase/Loss of Phase Protection
6. Car Platform Size: 7'-0" wide by 5'-6" deep
7. Cab Height: 7'-11" high
8. Clear Ceiling Height: 7'-5" high
9. Cab Construction: Steel Frame
10. Power Supply: 3-phase, 60 hertz, alternating current - Verify volts
11. Machine Room Location: Adjacent to Shaft
12. Travel: 13'-8"
13. Stops: Two (2)
14. Openings: Two (2) In Line

15. Hoistway Doors: Automatic Operation
 - a. Type: Single Slide
 - b. Opening Size: 3'-6" wide by 7'-0" high
16. Finish Schedule:
 - a. Cab Floor: Vinyl Composition Tile
 - b. Car Door: Steel Sheet Painted
 - c. Front Return:
 - d. Handrail: At Rear of Cab
 - e. Cab Walls: Laminated Plastic Panels
 - f. Columns and Header:
 - g. Hoistway Doors: Steel Sheet Painted
 - h. Hoistway Frames: Painted
 - i. Car Sill: Aluminum
 - j. Hoistway Sills: Aluminum
 - k. Fixture Plates: Stainless Steel
17. Additional Features:
 - a. T-rails - 15 lbs. per foot
 - b. Roller Guides - 6" diameter
 - c. Ventilation fan Two speed
 - d. Low Oil Feature
 - e. Emergency Lighting
 - f. Telephone Cabinet
 - g. Sill Angles
 - h. Dual Beam Photo Eye Protection
 - i. Braille and Raised Arabic Engraved on All Faceplates
 - j. California Seismic Compliance

- k. Gate Valve in Pit
- l. PVC Casing with Sealed Bottom
- m. Fiberglass Ram Protection

18. Term of Contract Maintenance: Three (3) Months

C. Hoistway Entrances:

- 1. Doors: Shall be of the hollow metal horizontal sliding type and shall be furnished in place at each landing opening; minimum 16 gage material with two door gibs per panel.
- 2. Frames: Shall be constructed of 14 gage material with design and finish as specified.
- 3. Door Hardware: Shall include sills, hangers, hanger supports, hanger covers, facia plates, and miscellaneous hardware as required for proper installation.
- 4. Hangers and Tracks: Complete with two-point suspension; steel sheaves with resilient insert-type riding surfaces; ball bearing type rollers.
- 5. Sill Support Angles: As required for flush hoistway construction.

D. Car Enclosure:

- 1. Interior Design: of ornamental appurtenances as described below unless otherwise indicated in contract drawings.
- 2. Exterior Wall Structure: Fabricated of 14 gage CRS or minimum 3/4 inch 7-ply plywood backing as specified.
- 3. Roof Structure: Fabricated of 12 gage HRS or minimum 3/4 inch 7-ply plywood and properly reinforced.
- 4. Ventilation: Provide fan as specified and adequate vents as required by local codes.
- 5. Sills: Extruded material as specified.
- 6. Front Return and Header: As specified. Header shall be of similar design.
- 7. Ceiling: Selected from manufacturer's standard suspended ceilings.

8. Stand-Off Panels: If specified, will be 3/4 inch thick light-weight panels faced and edged with approved finish as specified.
 9. Car Doors: With finish as specified.
 10. Base and Panel Reveals: With finish as specified.
 11. Hand Rails: As specified.
 12. Emergency Lighting: Per local code.
- E. Machine Room and Hoistway Equipment:
1. Controller: Enclosed in NEMA 12 metal cabinet with lockable access doors.
 2. Plunger and Cylinder: The plunger and cylinder shall be mounted under the car platform. The length of the plunger shall be sufficient to lift the car the required amount of floor travel plus normal overtravel. The cylinder shall be factory pressure tested and the structural strength shall be sufficient to lift the weight of the elevator as well as the elevator load with legal factor of safety as determined by applicable elevator codes. The assembly shall be installed true and plumb.
 3. The hydraulic cylinder shall be provided with a protective coating to guard the buried cylinder against corrosion. This material shall consist of applications of polyester resin and heavy fiberglass. Provide diameter large enough to allow future sleeve. In addition, provide PVC casing with a sealed bottom.
 4. Automatic two-direction leveling: Provide elevator with a self-leveling feature that will automatically level the car to the floor landing. When the elevator is traveling in the up direction and approaches a landing, it shall level to the floor in the up direction. When the elevator is traveling in the down direction and approaches a landing, it shall level to the floor in the down direction. An anti-creep device shall also be provided, arrange to relevel the elevator to the floor landing if it should creep down from any floor beyond a predetermined distance.
 5. Power Unit: Power unit shall be incorporated in a cabinet including the motor, pump, valves, oil reservoir and other related items. The unit shall be factory-adjusted and tested before shipment to the jobsite.

- a. The pump and valves shall be specifically designed for elevator applications; the pump shall be of the positive displacement type.
 - b. A muffler shall be installed. The design shall be such that it shall contain no degradeable parts.
 - c. Hydraulic oil shall be 150 SSU at 150 F.
6. Platform and Sling: Shall have a fabricated frame of formed or structural steel shapes, gusseted and rigidly welded. Platform decking shall be HR steel.
- a. The sling shall consist of heavy steel stiles properly affixed to a steel crosshead and bolsters with adequate bracing members, to remove all strain from the car enclosure.
 - b. Steel bumper plates shall be affixed to bottom of bolster channels and a platen plate with clamps and cap screw shall be furnished for fastening sling to plunger.
7. Guide Rails: Shall be steel tees; minimum weight per foot as specified.
8. Rail Brackets: Designs and shapes as required for adaptation to the building system.
9. Spring Buffers: Per code with supports.
10. Performance:
- a. Minimum speed in the up direction: not less than 92% of specified speed; maximum down speed not greater than 133% of up speed.
 - b. Hydraulic Pressure: Factory test at maximum working pressure.
 - c. Car Leveling: Within 1/4 inch from floor level.

2.02 Materials:

- A. Aluminum: Alloy and temper best suited to specified finish.
- B. Brass, Sheet: ASTM B36, 260 Alloy.
- C. Bronze:

1. Extrusions: Architectural grade bronze, CDA Alloy 385.
 2. Sheet: Muntz Metal, CDA Alloy 280.
 - D. Plywood: PS-1-83, A-D Interior Grade Douglas Fir. Fire treat per AWWPA with a suitable water soluble fire retardant formulation; U.L. FR-S fire hazard classification.
 - E. Cold Roll Sheet: ASTM A366.
 - F. Stainless Steel: ASTM A240, Type 304.
 - G. Steel Shapes: ASTM A36.
 - H. Plastic Laminates: FS LF-508 Style D, 050 thick, Type I, general purpose Grade HP, Class I.
- 2.03 Finishes:
- A. Aluminum: Clear anodized clear finish, or as specified.
 - B. Brass: Polished or brushed finish or as specified.
 - C. Bronze: Polished or brushed finish or as specified.
 - D. Muntz: Polished or brushed finish or as specified.
 - E. Machinery and Equipment; Degrease and shop paint with rust inhibiting primer.
 - F. Steel Sheet:
 1. Shop Prime: Clean, prepare and sand smooth between each coat.
 2. Finish Paint: Three coats low sheen lacquer; sand each coat smooth; color as selected.
 - G. Stainless Steel: No. 4 satin finish unless otherwise specified.
 - H. Hoistway Hardware: Except as required for proper operation, all hardware not exposed to public view shall be painted with rust inhibiting primer in manufacturer's standard color.
- 2.04 Automatic Operation:
- A. Single Button Collective Operation: The controller shall be of the Collective type and will be controlled from the car station and pushbuttons located in the hall call stations. The pushbuttons in the car operating station shall be numbered to correspond to the landings of the elevator.

- B. To operate the elevator, press one or more call buttons on the car operating panel and the car will travel to the first call in line of the direction of travel in which the elevator is traveling. The car will then answer all calls in that direction and then reverse direction and answer all calls in the new direction in proper mechanical order. The calls will be answered in proper mechanical order without regard to time sequence of call registration.
- C. The registration of one or more hall calls will cause the car to answer the calls in proper order without regard to sequence of call registration. The control will accept both hall calls and car calls without priority to either and automatically select the proper order of car dispatch. The dispatch of the car will be such that the car will answer all calls in one direction and at the last call in that direction will reverse itself and answer the calls registered in the other direction, etc.
- D. An adjustable time delay relay will be provided to delay the car a predetermined time at each landing to enable passengers to enter or leave the car. Pressure to a car button for another landing before this time elapses shall cause the car to start. When the car has answered the farthest call, this interval shall permit a car or hall button call to be registered to continue the direction of car travel.
- E. An emergency switch shall be provided on the car operating station to allow the stopping of the elevator should an emergency arise. The use of the stop switch will not cancel the sequence of calls and the elevator will continue in the proper order of calls when the switch is closed.

2.05 Signals and Fixtures:

- A. General: Provide manufacturer's standard designs as approved; buttons shall be flush with parent surface; provide illuminating pushbuttons with floor number indications; include door open and door close buttons; characters shall be 5/8 inch minimum height.
- B. Car Operating Stations: Shall be separately mounted on, or integrally constructed with swing front return, as specified and shall include:
 - 1. Braille-Arabic per code: Characters engraved on or recessed flush with the parent surface; back mounted mechanical fastenings required if recessed design is used, glue or decals not acceptable; located adjacent to each public use button.

2. Floor Indication Buttons: Provide one for each floor served and blank inoperative buttons for future floors, as specified.
 3. Emergency Stop Switch and Emergency Alarm: Per code.
 4. Door Open: And door close buttons.
 5. Key Switches: As required for specific functions and operation.
 6. Fireman's Keyswitch and Phone Jack: If required per code.
- C. Car Position Indicator: As specified.
1. Individual Indications: Corresponding to each floor and illuminating UP and DOWN direction indicators.
 2. Mount in cab header.
- D. Telephone Cabinet: Unless otherwise specified; include handle, Braille indication and minimum 1 inch radiused corners for safety; mount flush with adjacent surface.
- E. Hall Button Fixtures: Provide buttons as required for operation as specified; buttons light to indicate hall calls.
- F. Hall Lanterns or Car Direction Indicators: Up and down illuminating lenses with two stroke audible signal, single stroke for up and double stroke for down.
- G. Signs: In each elevator lobby which read:

IN CASE OF FIRE
USE STAIRWAY FOR EXIT
DO NOT USE ELEVATOR

2.06 Door Operation:

- A. General: Provide G.A.L. heavy-duty master-type operators with DC motor.
- B. Door Protection: Per code but including;
 1. Photo-eye Protection: Shall be electronic sensing device of the dual photo-eye type and shall project across the entrance to prevent the car and hoistway doors from closing if a passenger or object interrupts the light ray.

- a. When a stop is made, the door shall remain in the open position for a predetermined interval unless the closing is initiated by interruption and re-establishment of the light ray, by registration of a car call, or pushing the door close button.
- b. The doors shall be prevented from closing as long as either the light ray is interrupted or the mechanical safety edge is activated. If the doors are closing and either the light ray or the mechanical safety device is activated, the doors will stop and re-open. After an adjustable length of time, the doors will proceed to close. If the device fails, a key-operated switch shall be mounted in the car operating panel to de-activate the system.

2.07 Handicap Accessibility:

- A. General: Provide in compliance with local codes or as described below.
- B. Car Operating Panel: Braille indications of recessed or engraved design. Locate adjacent to each publicly used button; fasten mechanically.
- C. Hoistway Entrance Frames: Braille shall be mechanically attached to each jamb to indicate floor number.

ARTICLE 3 - EXECUTION

- 3.01 Preparation: Obtain and verify field measurements before proceeding with the work; notify the contractor of any discrepancies found.
- 3.02 Installation: In accordance with code and as directed in the contract documents.
- 3.03 Field Quality Control:
 - A. Inspection: Shall be performed by a representative of the owner to insure level of quality complies to specifications.
 - B. Tests: Shall be conducted by the elevator contractor to verify that performance criteria were met in the following areas:
 1. Contract Speed
 2. Leveling

3. Door Operation
 4. Motor Control
 - a. Full Load Test
 - b. Starting
 - c. Shutdown
 5. Demonstrate all special operation functions.
- C. Correct or remedy defects at no additional cost to Owner.
- 3.04 Instructions: Instruct Owner in proper equipment use.

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DIVISION 14 CONVEYING SYSTEMS

SECTION 14300 - CRANES AND HOISTS

ARTICLE 1 - GENERAL

The General provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the work specified in this Section.

1.01 Work Included:

A. Equipment items as listed below by Equipment Mark Number:

1. 5090 Crane, Jib, Compression, 14', 1 Ton (Ref. Article 2.01)
2. 5385 Hoist, Chain, Electric, 1 Ton (Ref Article 2.02)

B. Roughing-in and installation of equipment with necessary labor, services, and incidentals necessary for complete and operational equipment installation.

C. Wiring and switching between equipment and utilities.

1.02 Related Work:

A. Division 3: Concrete

B. Division 16: Electrical

1.03 Quality Assurance:

A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.

1.04 Submittals:

A. Product Data:

1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.
2. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

B. Operation and Maintenance Manual:

1. Provide complete parts, operating, and maintenance manual covering equipment at time of installation but not limited to:
 - a. Description of system and components.
 - b. Schematic diagrams of electrical wiring.
 - c. Instructions: Manufacturer's printed operating and maintenance literature.
 - d. List of original manufacturer's parts, recommended spare parts stockage quantity and local parts and service source.

- C. Shop Drawings: Submit shop drawings in accordance with Division 1 - General Requirements of these specifications.

1.05 Warranty:

- A. Warrant work specified herein for one year from substantial completion against defects in materials, function and workmanship.
- B. Warranty shall include materials and labor necessary to correct defects.
- C. Defects shall include, but not be limited to:
 1. Operation: Noisy, rough, or substandard operation.
 2. Parts: Loose, damaged, and missing parts.
 3. Finish: Abnormal deterioration.
- D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.
- E. Availability: All parts shall be readily available locally in the United States.

1.06 Product Delivery, Storage, and Handling:

- A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid, dusty conditions.
- B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Mark Number of this specification.

- C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.07 Labeling:

- A. Nameplate: Manufacturer shall securely attach in a prominent location on each major item of equipment a noncorrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.
- B. Crane capacity shall be painted with letters and numbers 3 inches high minimum on both sides of the boom web.

ARTICLE 2 - PRODUCTS

2.01 Crane, Jib, Compression, 14', 1 Ton
Equipment Mark Number: 5090

A. Capacities and Dimensions:

1. Capacity: 2,000 pounds.
2. Dimensions:
 - a. Span (hinge pins to boom end): 14 feet.
 - b. Length (bracket face to boom end): 14 feet, 4-1/4 inches.
 - c. Boom depth: 15 inches.
 - d. Overall depth (center to center of brackets): 51 inches.
 - e. Clearance under boom: 120 inches.
3. Swing: 180 degrees, minimum.
4. Weight: 860 pounds.

B. Features and Construction:

1. Design: Knee type, compression jib crane for bracket mounting to wall or column.
2. Construction: Welded structural steel I-beam assembly.
3. Hinging: Bronze bearings and steel pins with load bearing thrust washers.

4. Safety: End stop on boom to limit trolley travel.
- C. Finish: Durable enamel in manufacturer's standard color.
- D. Manufacturers Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
 - a. Air Technical Industries
7501 Clover Avenue
Mentor, Ohio 44060
Telephone: (216) 951-5191
 - b. Model: KC-214
 2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
 - a. Duff-Norton Company
P. O. Box 32605
Charlotte, North Carolina 28232
Telephone: (704) 588-0300
 - b. Dresser Industries
P. O. Box 769
Muskegon, Michigan 49443
Telephone: (616) 733-0821

2.02 Hoist, Chain, Electric, 1 Ton
Equipment Mark Number: 5385

A. Capacities and Dimensions:

1. Hoist:
 - a. Capacity: 2,000 pounds.
 - b. Motor: 1/2 HP.
 - c. Lifting speed: 8 FPM.
 - d. Lifting range: 10 feet.
 - e. Headroom, with trolley: 20 inches.

2. Trolley:

- a. Capacity: 2,000 pounds.
- b. Motor: 1/4 HP.
- c. Travel speed: 35 FPM.
- d. Control cable length: 9 feet.
- e. I-Beam size range: 7 to 18 inches, American Standard Section.

B. Features and Construction:

1. Drive: Needle and ball type bearings with gears running in oil bath.
2. Frame: Cast aluminum alloy.
3. Load hook and chain: Forged steel hook with safety clip attached to cadmium plated chain by bearing type swivel.
4. Safety: Ratchet pawl mechanical load brake, factory preset load limit slip clutch to prevent overloading and motor overheating, and positive limit switches.
5. Hoist mounting: Lug mounted to trolley for minimum headroom.

C. Controls: Four pushbutton pendant with cord strain relief bushings, for hoist UP/DOWN and trolley FORWARD/REVERSE.

D. Accessories:

1. Electrification kit: Tagline system sized for 14 foot, 180 degree swing wall or column mounted jib crane, one each.
2. Lug suspension bracket kit: 1 ton rating, one each.

E. Utilities Available: 460 VAC, 3 phase.

F. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

- a. Air Technical Industries
7501 Clover Avenue
Mentor, Ohio 44060
Telephone: (216) 951-5191
 - b. Model: ECH-2008 hoist with MET-20035 low speed
trolley and accessories.
2. Other manufacturers: Contingent upon compliance
with these specifications and documentation
requirements set forth in SUBMITTALS, equipment
produced by other manufacturers, including the
following, may be considered as equal.
- a. Duff-Norton Company
P. O. Box 32605
Charlotte, North Carolina 28232
Telephone: (704) 588-0300
 - b. Dresser Industries
P. O. Box 769
Muskegon, Michigan 49443
Telephone: (616) 733-0821

ARTICLE 3 - EXECUTION

3.01 Inspection:

- A. Check location of rough-in work and utility stub-outs
to assure match with equipment to be installed.
- B. Inspect delivered equipment for damage from shipping
and exposure to weather. Compare delivered equipment
with packing lists and specifications to assure receipt
of all items.
- C. Report in writing to the District or authorized
representative any damaged, missing or incomplete
scheduled equipment and improper rough-in work or
utility stub-outs.

3.02 Installation:

- A. Perform work under direct supervision of Foreman or
Construction Superintendent with authority to
coordinate installation of scheduled equipment with
District.
- B. Install equipment in accordance with plans, shop
drawings and manufacturer's instructions:
 1. Positioning: Place equipment in accordance with
any noted special positioning requirements

generally level, plumb and at right angles to adjacent work.

2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
3. Anchorage: Attach equipment securely to prevent damage resulting from inadequate fastenings. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
4. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.03 Testing:

- A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specification in the presence of the District.

3.04 Cleanup:

- A. Touch-up damage to painted finishes.
- B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.
- C. Clean area around equipment installation and remove packing or installation debris from job site.
- D. Notify District for acceptance inspection.

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DIVISION 14 - CONVEYING SYSTEMS

SECTION 14450 - VEHICLE LIFTS

ARTICLE 1 - GENERAL

The General provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the work specified in this Section.

1.01 Work Included:

A. Equipment items as listed below by Equipment Mark Number:

1. 5601 Lift Power Unit, 358 gallon (Ref. Part 2.01)
2. Lifts, General (Ref. Part 2.02)
3. 5640 Lift, Axle, 2 Post (Ref. Part 2.03)
4. 5670 Lift, Drive-on, 2 Post (Ref. Part 2.04)
5. 5680 Lift, Drive-on, 3 Post (Ref. Part 2.05)

B. Roughing-in, installation of equipment and final connection of utilities, with necessary labor, services, and incidentals necessary for complete and operational vehicle lift installation including charging of systems and reservoirs with appropriate hydraulic oil.

C. Piping, wiring, and switching between equipment and utilities.

1.02 Related Work Specified Elsewhere:

A. No other work shall be considered unrelated, however, particular reference is made to the following:

1. Division 2: Sitework.
2. Division 3: Concrete.
3. Division 15: Mechanical.
4. Division 16: Electrical.

1.03 Reference Work Specified Elsewhere:

A. In case of conflict between these Specifications and any applicable law or reference, the more restrictive requirements shall apply.

1. National Electrical Manufacturers Association (NEMA).
2. Underwriters' Laboratories (UL).
3. Occupational Safety and Health Administration (OSHA).
4. American National Standards Institute (ANSI):
Applicable provisions of ANSI B1.153.1

1.04 Quality Assurance:

- A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.
- B. Manufacturer's Representative:
1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out and startup.
 2. Training: Provide technical representative to train District's maintenance personnel in operation and maintenance of specified equipment.

1.05 Submittals:

- A. Product Data:
1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.
 2. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.
- B. Operation and Maintenance Manual:
1. Provide complete parts, operating and maintenance manual covering equipment at time of installation including, but not limited to:
 - a. Description of system and components.
 - b. Schematic diagrams of electrical and plumbing systems.

- c. Instructions: Manufacturer's printed operating and maintenance literature.
 - d. List of original manufacturer's parts, recommended spare parts stockage quantity and local parts and service source.
- C. Shop Drawings: Submit Shop Drawings in accordance with Division 1 - General Requirements of these specifications.

1.06 Warranty:

- A. Warrant work specified herein for one year from substantial completion against defects in materials, function and workmanship.
- B. Warranty shall include materials and labor necessary to correct defects.
- C. Defects shall include, but not be limited to:
 - 1. Noise: A decibel level of 90 dB shall not be exceeded by any portion of lift equipment during normal operation.
 - 2. Equipment operation: Manufacturer and Contractor shall supply certification that all parts necessary for proper and complete operation of equipment are present and operating properly.
- D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.
- E. Availability: All parts shall be readily available locally in the United States.

1.07 Product Delivery, Storage, and Handling:

- A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid or dusty conditions.
- B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Mark Number of this specification.
- C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.08 Labeling:

- A. Nameplate: Manufacturer shall securely attach in a prominent location on each major item of equipment a noncorrosive nameplate with stamped figures showing manufacturer's name, address, model number, serial number and pertinent utility or operating data.
- B. ALI label: Manufacturer shall securely attach the A.L.I. label of the Automotive Lift Institute.

ARTICLE 2 - PRODUCTS

2.01 Lift Power Unit, Electric/Hydraulic, 358 Gallon:
Equipment Mark Number: 5601

A. Capacities and Dimensions:

- 1. Motor: 7-1/2 HP, 1,800 RPM, two each.
- 2. Delivery pump: 40 GPM, two each.
- 3. Tank capacity: 358 gallons.
- 4. Overall dimensions:
 - a. Width: 54 inches.
 - b. Depth: 38 inches.
 - c. Height: 54 inches.

B. Features and Construction:

- 1. Configuration: Unit powered by two each pump/open drip proof motor assemblies mounted on vibration-free base on top of fluid reservoir. Pump/motor assembly suitable for above grade installation.
- 2. Standard equipment: Equip with two each bypass valves and suction pipes with foot valves and strainers.
- 3. Plumbing: Contractor to provide valving for hydraulic line and electrical switchover for operation of all associated lifts should one of the two pump/motor assemblies fail.

C. Controls:

- 1. Remote push button station with Start/Stop buttons and red light to indicate power unit is On shall be provided at each control box location.

2. Shut-off timers, magnetic starters and disconnect switches shall be provided and installed under Division 16 - Electrical.

D. Utilities Available: 460 VAC, 3 phase.

E. Finish: Durable enamel in manufacturer's standard color.

F. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

a. Dover Corporation/Rotary Lift Division
P.O. Box 30205 Airport Station
Memphis, Tennessee 38130
Telephone: (901) 345-2900

b. Model: DU-80

2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

a. Weaver Corporation
Fords Mill Road
Paris, Kentucky 40361
Telephone: (606) 987-2240

b. Western Manufacturing Company
2200 Haffly Avenue
National City, California 92050
Telephone: (619) 474-3361

2.02 Lifts - General:

A. Each jack shall be equipped with a manual air bleeder and a control orifice to insure controlled speeds during up and down cycles. Lowering speed shall not exceed 20 feet per minute under any circumstance, with or without load to full rated capacity. Unloaded jack plungers shall return to fully lowered position. Ballasting is required. Lead shot or steel scrap punchings (protected against corrosion with 90 weight oil) shall be used. Jacks shall be complete with one piece combination packing and wiper assembly not requiring adjustment or lubrication.

1. Jack plungers shall be manufactured of seamless steel pipe turned and polished over entire surface, with positive stops to prevent overextension. Plunger shall be removable for inspection and/or replacement.
2. Outer casings shall be steel pipe with electrically welded bulkheads and flanges and fitted with babbitted bearings. Bearing span for eccentric loaded plungers shall be not less than 34 inches. Bearing span for center loaded plungers shall be not less than 21-1/2 inches.
3. Jacking units shall be hydrostatically tested at 300 PSI and shall not leak at this pressure.
4. Corrosion protection: Encase each in-ground jacking assembly and outer pipe assembly in rigid, fiberglass reinforced polyester with an insulation value per ASTM Test D149 dielectric strength-short time of 380 to 500 volts per mil or 125,000 volts per 1/8 inch. Coating shall be factory applied and tested under proper quality control procedures.

B. Control valves:

1. Unless otherwise specified, lifts shall be operated from control valves recessed in the floor at the locations shown on the plans. Valve handles shall be accessible without use of hinged covers. Control valves shall be arranged such that each post in a lift can be raised and lowered individually, or any combination of posts can be operated simultaneously, except where otherwise specified. All valves shall be rated for 400 PSI minimum. Shop drawings for valves are mandatory and shall be submitted as specified in Division 1 - General Requirements.
2. Controls shall be one-piece valve body design containing directional and independent lift controls. Directional valves shall be of the locked-in-position type. Independent lift valves shall be spring return-to-close. Directional valve handle positions (raise and lower) shall be permanently marked on the valve box cover. Control valves shall be "Deadman" type.
3. Valve cores and seals shall be replaceable without removal of body from control box.
4. Piping from control valves to jacks and mounting valves shall be provided by manufacturer.

5. All in-floor control boxes shall include explosion-proof start/stop remote push button stations with pilot light. In-floor control enclosures shall be sized to permit installation of accessible shut-off valves in supply and return lines by installing Contractor, where shown in Drawings. Push button stations shall be provided by lift manufacturer. Wiring and connections to start/stop stations shall be furnished under Division 16 - Electrical. Control boxes to be located as indicated in Drawings.
- C. Locking legs: All lifts except Model D08 (Item 5680) in steam clean area shall be provided with multi-position locking legs. Locks shall be remote operated with spring locking and air release. Locking shall be at 3 inch increments. Floor recess for locking mechanism shall be drained to nearby area to drain with 2" Schedule 40 G.I. drain pipe. Model D08 shall be provided with automatic locking legs to lock only at full rise.
 - D. Superstructures: Superstructures shall be designed to prevent rotation horizontally. Superstructures which recess into floor frames shall fit squarely within frames and shall not come in contact with floor frames.
 - E. Runways: Manufacturer's shop drawings shall show maximum wheel load and maximum deflection at 1'-0" from edge of runway.
 - F. Wheelbase adjustment:
 1. Where applicable, lifts shall be supplied with all components required for the wheelbase adjustment ranges as shown on Drawings and as indicated in these specifications.
 2. Hydraulic wheelbase adjustment mechanism shall be designed to position movable jack of adjustable lift models fore and aft to desired wheelbase setting.
 3. Adjustment shall be accomplished by means of a hydraulic motor operated by oil supplied from lift power unit.
 4. Hydraulic motor shall drive chain and sprocket mechanism to move front jack and cover plates to desired setting. Hydraulic motor shall have bypass valve to prevent damage from overload conditions.
 5. Hydraulic motor shall be controlled by a four-way directional control valve, located in the same floor recess as lift control valves.

6. Drive torque motor shall be rated at minimum 160 pound/inch and shall be connected to a sprocket on drive shaft by a permanently lubricated roller chain.
 7. Wheelbase adjustment control valve shall provide forward and reverse positions with spring return to open position.
- G. Finish:
1. All lifts and lift power units shall be finish painted with not less than one primer coat and two finish coats of semi-gloss enamel.
 2. Color for items or parts of items which by their installation or operation are considered to be physical hazards, shall be color-identified in accordance with the requirements of the applicable state codes.
 3. Where an option exists, base color for above equipment and all other items in this Section shall be selected by the District.
 4. All painting shall be as specified in Section 09900 - Painting.
 5. Jacks in each lift shall be numbered for identification, consecutively from the number "1" assigned to the front jack. Control valve handles for each jack shall be marked with the corresponding number. Marking shall be clearly visible and shall be neatly and permanently stamped or engraved on valve handles or valve box cover or on number plates permanently attached to valve box cover. Jack and lift identification numbers shall be painted on the floor opposite each jack with 10 inch numerals neatly stenciled at a uniform distance outboard of bus body on control valve side of lift. Each lift inside Maintenance Building shall be numbered from 1 to 12 on center line of lift at entrance to Building. Paint shall be traffic enamel yellow. Floor surface shall be cleaned and free of oil or other residue before painting. Painting of floor markings shall be performed under Division 09900 - Painting.
- H. System shall be filled with hydraulic oil as recommended by manufacturer. Each lift shall be tested with a bus (furnished by District). Lift manufacturer and/or installer shall leave the following with the District.

1. 55 gallons of hydraulic fluid for each power unit reservoir.
2. Two handles to manually operate wheel ratchet for wheel base adjustment mechanism for each mechanism.

I. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
 - a. Rotary Lift Division, Dover Corporation
P. O. Box 30205 Airport Station
Memphis, Tennessee 38130
Telephone: (901) 345-2900
 - b. Model numbers shall be as delineated in Parts 2.03 through 2.05 of this specification.
2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
 - a. Weaver/Kidde
Fords Mill Road
Paris, Kentucky 40361
Telephone: (606) 987-2240
 - b. Western Manufacturing Company
2200 Haffly Avenue
National City, California 92050
Telephone: (714) 474-3361

2.03 Lift, Axle, Adjustable, 2 Post:
Equipment Mark Number: 5640

A. Capacities and Dimensions:

1. Lift capacities:
 - a. Front: 18,000 pounds.
 - b. Rear: 25,000 pounds.
 - c. Total: 43,000 pounds.
2. Lift rise:

- a. Front: 66 inches.
- b. Rear: 69 inches.
3. Plunger diameter:
 - a. Front: 10.625 inches.
 - b. Rear: 12.625 inches.
4. Wheelbase range: 166 to 316 inches.

B. Features and Construction:

1. Front and rear superstructures shall be of the saddle type with axle-engaging supports that shall be laterally adjustable to handle various suspension systems. Necessary accessory adapters shall be furnished for each lift to properly engage pick-up points of buses operated or currently on order by District having a wheelbase within specified range lift.
2. Rear superstructure shall recess into housing and be covered automatically to provide an unobstructed floor area when fully lowered. Hinged floor plates shall be designed to prevent binding on plunger as it is lowered. Floor plates shall be 1/4 inch minimum non-skid plates.
3. Concave wheel dishes in floor surface shall be located on each side of rear superstructure, within a frame in floor bordering superstructure, to position rear dual tires of vehicles such that axle is centered over lift superstructure. Depressions shall be a maximum of 13/16 inch deep along transverse axis of superstructure as shown on Drawings.
4. Wheelbase adjustment shall be accomplished by moving front jack and floor cover plates to desired position by means of hydraulic motor.
5. Rear jack assembly shall be encased in fiberglass protective coating for prevention against rust and corrosion.
6. Recessed track assembly, necessary attachments, and assembly hardware shall be provided by manufacturer.
4. Wheelbase adjustment: Two way valve controlling front jack fore and aft movement.

- C. Operating controls: Jacks operated from control box recessed in floor with valve handles installed on top of box.
 - 1. Both jacks: Locking type, combination raise/lower valve controlling hydraulic fluid to individual jack controls.
 - 2. Individual jacks: Spring-return, combination raise/lower control for each jack permitting individual operation.
 - 3. Locking legs: Air control valve to apply air pressure to release locking legs and permit lowering.
 - 4. Wheelbase adjustment: Two way valve controlling front jack fore and aft movement.

D. Utilities Available:

- 1. Air: 90 PSI.
- 2. Hydraulics: Supplied by lift power unit. (Ref. Part 2.01).

E. Acceptable Product: Rotary Model No. AT1012E.

2.04 Lift, Drive-On, 2 Post
Equipment Mark Number: 5670

A. Capacities and Dimensions:

- 1. Lift capacities:
 - a. Front, center loaded: 18,000 pounds.
 - b. Rear: 21,000 pounds.
 - c. Total capacity, centered load: 39,000 pounds.
- 2. Lift rise, each jack: 60 inches.
- 3. Plunger diameter: 12.625 inches.
- 4. Wheelbase range: 225 to 300 inches.
- 5. Runway, front jack:
 - a. Length: 90 inches.
 - b. Width, each runway: 28 inches.
 - c. Width, overall: 106 inches.

d. Height: 4.5 inches.

B. Features and Construction:

1. Front superstructure shall be all-welded, wheel engaging, drive-on type reinforced with structural steel beams and decked with 1/4 inch minimum non-skid plate.
2. Front wheel superstructure shall consist of two rigidly connected wheel supporting runways.
3. Rear superstructure assembly shall be constructed of structural steel beams covered with 1/4 inch minimum non-skid plate.
4. Front and rear superstructures shall be flush with floor in fully lowered position. Contractor shall provide floor opening frame.
5. All jack assemblies shall be encased in fiberglass protective coating for prevention against rust and corrosion.
6. Piping from control valves to jacks and necessary attachments and assembly hardware shall be provided by manufacturer.

C. Controls: A pedestal-mounted push button control console shall be furnished. Controls shall be such that any one post or combination of vehicle lift posts can be raised and lowered at one time. Lift control valves shall be operated from push button control console, which shall be located at position shown on Drawings. Console shall be oriented such that operator faces lift. Depth of console shall be kept to a minimum (less than 8 inches) and push buttons and valving shall be arranged so that operator can safely and conveniently control and synchronize travel of lift posts. Push button controls shall be mounted in an oiltight enclosure. A remote push button station with pilot light controlling the lift power unit shall be located on the control console.

D. Utilities:

1. Hydraulics: Supplied by lift power unit. (Ref. Part 2.01)
2. Air: 90 PSI.

E. Acceptable Product: Rotary Model No. RF1212DDRE-90

2.05 Lift, Drive-On, 3 Post
Equipment Mark Number: 5680

A. Capacities and Dimensions:

1. Lift capacities:
 - a. Fronts: 18,000 pounds.
 - b. Rear: 25,000 pounds.
2. Lift rise:
 - a. Fronts: 60 inches each.
 - b. Rear: 60 inches.
3. Plunger diameter:
 - a. Fronts: 10.625 inches.
 - b. Rear: 12.625 inches.
4. Wheelbase range: 180 to 300 inches.
5. Runways:
 - a. Length: 14 feet.
 - b. Width: 28 inches.

B. Features and Construction:

1. Front superstructure: Designed to support two drive-on runways. Superstructure, runways and heads are welded structural steel construction. Runways shall be non-skid metal plate.
2. Wheel position ribs: Welded to each end of runways at maximum and minimum wheelbase position.
3. Front lift jacks: Cable and sheave or rack and pinion equalized to maintain level superstructure during raising and lowering cycles.
4. Wheel lift rear jack: Designed so that rear wheels are automatically centered over rear jack.
5. Superstructures: Recess into housings providing unobstructed floor area.
6. Corrosion protection: Front and rear jacks shall be encased in fiberglass protective coating for prevention against rust and corrosion.

- C. Controls: A pedestal-mounted push button control console shall be furnished. Controls shall be such that any one post or combination of vehicle lift posts can be raised and lowered at one time. Lift control valves shall be operated from push button control console, which shall be located at position shown on Drawings. Console shall be oriented such that operator faces lift. Depth of console shall be kept to a minimum (less than 8 inches) and push buttons and valving shall be arranged so that operator can safely and conveniently control and synchronize travel of lift posts. Push button controls shall be mounted in an oiltight enclosure. A remote push button station with pilot light controlling the lift power unit shall be located on the control console.
- D. Utilities Available:
 - 1. Air: 90 PSI.
 - 2. Hydraulics: Supplied by lift power unit (Ref. Part 2.01).
- E. Acceptable Product: Rotary Model No. D08.

ARTICLE 3 - EXECUTION

3.01 Inspection:

- A. Check location of rough-in work and utility stub-outs to assure match with equipment to be installed.
- B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all items.
- C. Report in writing to the District any damaged, missing or incomplete scheduled equipment and improper rough-in work or utility stub-outs.

3.02 Installation:

- A. Perform work under direct supervision of Foreman or Construction Superintendent with authority to coordinate installation of scheduled equipment with District.
- B. Install equipment in accordance with plans, shop drawings and manufacturer's instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level, plumb and at right angles to adjacent work.
 2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
 3. Anchorage: Attach equipment securely to prevent damage resulting from inadequate fastenings. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
 4. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.
 5. Flush system prior to filling with oil in a manner acceptable to Engineer.
- 3.03 Testing: After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the District.
- 3.04 Cleanup:
- A. Touch-up damage to painted finishes.
 - B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.
 - C. Clean area around equipment installation and remove packing or installation debris from job site.
 - D. Notify District for acceptance inspection.

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DIVISION 15 - MECHANICAL

SECTION 15010 - MECHANICAL GENERAL PROVISIONS

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Requirements specified govern applicable portions of Mechanical Sections as follows:
 - 15010: Mechanical General Provisions.
 - 15250: Insulation of Mechanical Systems.
 - 15300: Special Systems.
 - 15400: Plumbing Systems.
 - 15500: Fire Protection Sprinkler System.
 - 15800: Heating, Ventilating and Air Conditioning Systems.
 - 15900: Controls and Instrumentation for Mechanical Systems.

1.02 Requirements

- A. Inspection of Conditions: Examine related work and surfaces before starting work of this Section. Report to Engineer, in writing, conditions which will prevent proper provision of this work. Beginning work of this Section without reporting unsuitable conditions to Engineer constitutes acceptance of conditions by Contractor. Perform any required removal, repair, or replacement of this work caused by unsuitable conditions at no additional cost to District.

1.03 Permits, Fees, Connection Charges

- A. Obtain and pay for all permits, and temporary service charges required for execution of work included in

Divisions 2 and 15. The District will pay all service charges, meter charges, and connection charges to public utilities. The Contractor shall be responsible for the coordination and payments by the District.

B. Reference Utility Payment Schedule, Sheet No. F-101.

1.04 Locations

- A. Drawings show pipe and ductwork diagrammatically.
- B. Adhere to drawings as closely as possible in layout out work.
- C. Vary run of piping, run and shape of ductwork and make offset during progress of work as required to meet structural and other interferences as approved by the Engineer.
- D. Install piping and ductwork in furred spaces unless indicated otherwise. Run exposed piping and ductwork parallel to or at right angles to building walls.
- E. Keep horizontal lines as close to the floor slab above or roof structure as possible.
- F. Conform to ceiling heights established on architectural drawings.

1.05 Regulatory Agencies and Definitions

- A. Requirements of Regulatory Agencies:
 - 1. Materials and installations shall comply with applicable local, state, and national codes and ordinances.
 - 2. In case of conflict between the referenced codes and ordinances, more stringent requirements shall govern.
- B. Definitions:
 - 1. A "main" of any system of continuous piping is the principal artery of the system, to which branches may be connected.
 - 2. A "riser" is vertical waterline supplying two or more fixtures, or batteries of fixtures located in different rooms.

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3. A "battery" of fixtures is two or more fixtures served from same branch.
4. "Concealed", where used in connection with insulation and painting of piping, ducts, and accessories indoors, shall mean hidden from sight in trenches, chases, furred spaces, pipe shafts, or hung ceilings.
5. "Exposed", where used in connection with insulation and painting of piping, ducts, and accessories indoors, shall mean not "concealed" as defined above.
6. "Wide", as used for duct cross-section, shall mean the greater of the two dimensions.
7. "Provide" shall mean furnish and install.

1.06 Coordination

- A. Coordinate with other trades to avoid construction delays and maintain required clearances.
- B. Equipment foundations and bases: Provide certified details and drawings for approval before fabrication. Provide all parts necessary for each foundation subbase and support.
- C. Ducts, pipe sleeves and inserts: Provide all ducts, pipe sleeves and pipe support inserts before concrete is poured.
- D. Roof, wall and floor openings: Provide shop drawings showing exact locations and sizes of openings through roofs, walls, and floors.
- E. Buildings structure and roof are prefabricated and Contractor shall include in his bid all required structural elements, beams and bracing for support of overhead pipes and mechanical equipment. Piping or equipment shall not be supported from roof decking.

1.07 Design Changes Caused by Product Substitution

- A. Contractor shall pay costs of design and installation for changes resulting from substitution of alternate products.
- B. Acceptance of alternate products by Engineer does not change this requirement.

1.08 Cleaning

- A. Cleaning operations are supplemented by detailed instruction for specific systems in Mechanical Systems.
- B. Piping, ductwork and equipment to be insulated: Clean exterior thoroughly to remove rust, plaster, and dirt before insulation is applied.
- C. Piping, ductwork and equipment to be painted: Clean exterior of piping, ductwork and equipment, exposed in completed structure, removing rust, plaster and dirt by wire brushing. Remove grease, oil and similar materials by wiping with clean rags and suitable solvents.
- D. Motors, pumps and other items with factory finish: Remove grease and oil and leave surfaces clean and polished.
- E. Plumbing fixtures: Clean and polish fixtures immediately prior to final inspection and/or District's occupancy.
- F. Site: Remove from site packing cartons, scrap materials and other rubbish resulting from operations by mechanical trades.

1.09 Cutting

- A. Cutting, when required, subject to prior approval by Engineer.
- B. Cutting shall cause minimal damage to structure.

1.10 Shop Drawings, Product Data and Instructions

- A. General:
 - 1. Refer to Division 1, General Conditions for requirements governing submittals.
 - 2. No product will be accepted on job site without prior approval.
 - 3. Prepare shop drawings on transparencies at a scale suitable to clearly delineate the subject. Sheet sizes: multiples of 8-1/2" x 11". Scale shall be

same as the Contract drawings.

4. Drawing legend shall contain project title, drawing title, drawing number and number of drawings to set.
 5. Reference catalog cuts and brochures of products to proper paragraph in the Specifications. Furnish numerical index by Specification paragraph number listing product name, catalog number and reference to page number of submittal brochure.
 6. Cross reference individual catalog numbers of substitute products to numbers of specified materials.
 7. Bind submittal in booklet form, otherwise the submittals will be rejected.
- B. Installation instructions: Submit manufacturer's printed installation instructions for products specified to be installed in accordance with manufacturer's instructions.

1.11 Guarantee:

- A. In addition to the guarantees required in General Requirements, all materials and equipment provided and/or installed under this Division of the specifications shall be guaranteed for a period of one year from the date of final completion of the work, or longer where specified herein. Should any trouble develop during this period due to defective materials or faulty workmanship, the Contractor shall furnish all necessary labor and materials to correct the trouble without any cost to the District. Any defective materials or inferior workmanship noticed at the time of installation and/or during the guarantee period shall be corrected immediately to the entire satisfaction of the District and the Engineer.
- B. Standard warranty of manufacturer shall apply for replacement of parts after expiration of other warranty periods stated in Specifications if they are for shorter time than standard manufacturer's warranty. Manufacturer shall furnish and replace parts to District. Furnish Engineer printed manufacturer's warranties complete with material included and expiration dates upon completion of project.

ARTICLE 2 - PRODUCTS

2.01 Standards of Quality

- A. Materials and equipment shall be new and in good condition. The commercially standard items of equipment and the specific names mentioned herein are intended to establish the standards of quality and performance necessary for the proper functioning of the mechanical work.

2.02 Equipment Guards

- A. Provide equipment with exposed moving parts with coupling guards, fan guards/or other enclosures conforming to Title 8 of the California Administrative Code "General Industry Safety Orders", Sub-Chapter 7, Group 4.

2.03 Pipe Sleeves

- A. Provide pipe sleeves for all mechanical piping.
- B. Size pipe sleeves to permit placing pipe and specified isolation material for pipes passing through concrete or masonry walls or concrete slabs.
- C. Sleeve for pipes through floor slabs standard weight black steel pipe with top of sleeve projecting 3" above finished floor. For waterproof sleeves, use J. R. Smith Fig. 1725 or equivalent by Zurn or Josam.
- D. Sleeves for pipes through walls standard weights black steel pipe or 20 gage galvanized sheet metal with ends flush with wall surfaces.
- E. Seal pipes passing through fire rated walls or floors. Use Dow Corning 3-6548 Silicone RTV Foam in the annular space between pipes and sleeves.
- F. Insulated pipe shall be insulated in sleeves, caulked and sealed as above. Use type CS-CW inserts as manufactured by Pipe Shields, Inc.
- G. Pipes passing through exterior walls and concrete walls shall be sealed watertight with Linkseal as manufactured by Thunderline Corp. Method of installation as recommended by the manufacturer.

2.04 Pipe Isolators and Covering Protection:

- A. Pipe isolators: Provide each hanger or clamp for uninsulated piping with an isolation material, having metal backing, to isolate sound vibration and electrolysis, and similar to Elcen "Isolator". Isolator not required for fire protection automatic sprinkler piping, waste, vent, and natural gas piping.

2.05 Identification of Valves, Piping and Equipment:

- A. General: Trademarks and numbers used for reference are products of Seton Name Plate Corp., 592 Boulevard, New Haven, Conn.
- B. Valve identification:
1. All valves shall be provided with "Style 250BL" numbered valve tag with abbreviation "PLBG" or "HTG", complete with "S" mounting. The abbreviations shall be extensive enough to cover all mechanical and plumbing systems and the valve number shall correspond to valve list.
 2. Provide a typed valve identification list mounted in a No. A-11G metal frame under glass, located as directed by the Engineer.
- C. Piping identification:
1. Identify all above-ground piping including piping located in suspended ceiling spaces, shafts, tunnels.
 2. Identify with "Setmark" pipe markers located in accordance with ASME Standards and ANSI A13.1-1956 color standards. Size of letters determined by outside diameter of pipe or if insulated by outside diameter of insulation as follows:
 - a. Up to 1-1/4" diameter: Style 9 or 18 for specific service; letter size: 1/2".
 - b. 1-1/2" diameter through 2-1/2": Style 4x or 6x for specific service; letter size: 1".
 - c. 3" diameter and over: Style 2 or 1x for specific service; letter size: 2".
 3. All concealed piping shall have a 2" wide band of tape in applicable color as specified in Section 09900 for exposed piping.

4. Pipes in Inspection Area and Running Repair shall be labeled with name of pipe usage. Label shall be large enough to be easily readable (not less than 1/4" block letters).
5. Location: Space tape and labels at 20 feet on center at each take-off and at each change in direction and at each side of wall. Provide flow direction arrows at each marker style and size to correspond to marker style and size. Provide two identification charts designating color and function. Frame one chart in metal frame with glass front. Secure to walls as directed.

D. Equipment Identification:

1. Equipment labels: All equipment furnished and installed under this section shall be provided with manufacturer's metal labels securely attached to each individual piece of equipment and showing complete and comprehensive performance characteristics, size, model, serial number, etc.
2. Install bakelite nameplates with white letters 3/4" high for all new equipment, switches, controls, principal valves, zones and at room stats, damper motors, indicating zone, etc.
3. Submit to the Engineer for approval a list of items to be tagged within two (2) weeks after award of the Contract.

2.06 Escutcheons, Plates:

- A. Fit pipes passing through finished walls, floors, and ceiling with wall plates of proper size to cover opening around pipes. Plates not required at floor slabs where sleeves project above floor and space between pipe and sleeve is caulked and sealed. Plates shall be Beaton and Cadwell No. 10. Floor plates and plates at tile walls chromium plated. Wall and ceiling plates prime coated. Equivalent plates by Frost are acceptable.

2.07 Piping Specialties

- A. Automatic air vents: Install at high points of hydronic systems or as indicated. Pressure rating to be compatible with service with iron body, stainless steel trim. Provide shut-off valve and pipe overflow to floor drain or receptor. Products by Armstrong, Bailey, Clark or Strong are acceptable.

- B. Strainers: Install "Y" type strainers ahead of each temperature control valve, pressure reducing valve, and elsewhere as indicated. Strainers shall have perforated stainless steel or monel elements with No. 20 mesh, steel cast iron or brass bodies as required by the service pressure rating. Strainer service rating shall match that of the respective valves in the system in which they are to operate. Strainers 2" and smaller screwed, and strainers 2-1/2" and larger flanged. All strainers shall be furnished with globe valve blowdown of proper pressure rating, sized to match the strainer plug. Pipe to a waste receptor. Products by Crane, Bailey, Strong, Clark or Armstrong are acceptable. During construction period, the strainer elements shall be periodically checked and cleaned and upon completion, left clear and free of residue.
- C. Pressure gauges: Install pressure gauges as indicated. Gauges to be 4-1/2" phenol or cast aluminum case, phosphor bronze bourdon, bronze bushed rotary movement, non-reflecting white metal dial face with black figures and balanced adjustable pointer. Pressure range compatible with service and no less than twice normal operating pressure. Accuracy 1/2% of scale range. Furnish gauge cocks on all and stem siphons for steam service. Acceptable manufacturers: U.S., Marsh, Ashcroft, or Terrice.
- D. Pressure and/or Vacuum Gauges for Special Systems:
1. Provide gauges where shown on the drawings, and in all motor oil, torque oil, grease, gear oil, air lines and diesel fuel lines whether shown on drawings or not.
 2. Gauges: Gauges shall be of high quality within 2% accuracy in the middle third of the dial range. All gauges shall be 3-1/2" minimum middle third of the dial range. All gauges shall be 3-1/2" minimum dial size. Where not shown on schedule dial range shall be 2 times operating pressure. Gauges reading pressure over 1000 psi shall be 6" dial size. All diesel and lubricating oil and chassis grease gauges shall be liquid filled gauges. Diesel fuel gauges shall be 316 stainless steel tube steel socket U.S. gauge. Solfrunt Model 1911 T or equal.

All diesel fuel gauges shall have a snubber, Operating and Maintenance Specialties Model 1,0 3000 psi range, brass construction.

3. Gauge Cocks: Supply a needle point globe valve Crane No. 88 or equal at each gauge connection.
 4. Unless otherwise noted, gauges on package equipment, such as air compressors, steam and high pressure hot water cleaner, pumps, etc. shall comply with the specification for general gauges specified above. Gauges on air pressure reducing sets may be standard supplied with set.
- E. Thermometers: Industrial type, brass case, glass front 9" scale straight from 3-1/2" stem range. Weiss separable socket or equal by Trerice, Marshall, or U.S. All thermometers shall be installed to be readable from the floor. The normal operating temperature reading shall be at middle of the full scale.
- F. Flexible pipe hoses (water): Provide two flexible pipe hoses at each expansion joint as shown on the drawings. The flexible pipe hoses shall be connected at 90 degrees to each other or to an elbow. The combined assembly shall be fabricated of adequate lengths of the hoses to handle + 5 in movement in the same planes in all directions. The hoses shall be corrugated metal double braided hoses. For copper piping, use hoses fabricated from bronze to withstand pressures from full vacuum to 300 psig minimum working pressure and 200° F temperatures. For steel piping, use hoses fabricated from Type 321 stainless steel to withstand pressures from full vacuum to 300 psig minimum working pressure and 1500 F temperature. Steel flanged ends, 150#, ASA or soldering ends. Suitable for the services intended. Provide hangers at the elbows connected between the hoses. Flexonics or equivalent products by U.S. Flex.
- G. Flexible Pipe Connectors (Water): Provide flexible connectors in water systems as indicated on the drawings. The connectors shall be Type 321 stainless steel braided with 300 lb. ASA steel flanged ends, and shall be suitable for the services intended. Nelson-Dunn Series ND F or equivalent by U.S. Flex.

2.08 Pipe Hangers and Supports

A. General:

1. Hold piping in place by approved hangers, supports and anchors, designed to support weight of pipe weight of fluid and weight of pipe insulation.
2. Arrange hangers to prevent transmission of vibration from piping to building structure and allow for expansion and contraction in hangers and supports.
3. Clearances for application of specified insulation without cutting pipeline covering or fitting covering in installation of pipe hangers.
4. Uninsulated copper or brass pipe or buting shall be isolated from ferrous hangers or supports.
5. Piping shall not be supported from roof decking. Prefabricated building manufacturer shall furnish and install structural members to span steel purline to distribute load. Refer to roof shop drawings for location of beams purlins and additional structural members for hangers.
6. Hanger spacing: Shall comply with guides for seismic restraints of mechanical system and plumbing piping systems published 1982, by SMACNA and PPIC, California.
7. Prepare piping shop drawings and submit to the Engineer for review. These drawings shall show anticipated expansion and contraction at each support point, initial and final forces on the building structure. It shall be the responsibility of the Contractor to coordinate the selection of piping supports with equipment supports to provide for a carefully engineered system designed to accommodate expansion and contraction without creating excessive stresses at equipment connections or in any portion of the piping. Submittal data shall include certification by the hanger and support manufacturer that the piping system has been examined for excessive stresses.

- B. Floor supports: Provide one of the following for supporting horizontal piping from floors:
1. Cast iron pipe rests, "Super Strut" Fig. R-786, "Grinnell" Fig. 264, "Elcen" Fig. 50 with pipe nipples to suit. Fasten to floor.
- C. Wall supports: Provide one of the following for supporting horizontal piping from wall.
1. Steel J-hook for pipe located close to wall up to 3" pipe, "Grinnell" Fig. 168, "Elcen" Fig. 45, "Super Strut" Fig. C-711.
 2. For hanger suspension, 1500 pound maximum loading, welded steel bracket "Grinnell" Fig. 195.
- D. Vertical piping supports:
1. Support cast iron soil pipe at every floor and at base of stack; other pipes at every floor.
 2. Support vertical pipe with steel extension pipe clamps, "Grinnell" Fig. 261, "Elcen" Fig. 4-N for copper use 339 clamp. Refer to manufacturer's rated maximum loading for each size pipe. Bolt clamp securely to pipe; rest clamp-end extension on building structure.
 3. Place pipe clamps above slab.
- 2.09 Seismic Restraint of Mechanical Equipment:
- A. The manufacturer of prefabricated or field-fabricated equipment shall be responsible for the engineering of the equipment and of all bracing and anchorage to the foundations or building structure. Contractor shall retain a licensed Structural or Civil Engineer shall provide signed design calculations, and bracing and anchorage details. The calculations showing all loads transmitted to the building structure and the related anchorage details shall be submitted for review to the Engineer to verify that the foundation or the building structure is capable of supporting these loads. Design of the equipment, bracing and anchorage shall be in conformance with the loads as specified herein.

B. Seismic restraint of vibration isolated equipment:
All vibration isolated equipment shall be provided with seismic restraints. A dynamic stress analysis shall be made by a licensed Civil or Structural Engineer responsible to the isolator equipment to meet the specified load requirements. The weight of the equipment established in the analysis shall include the equipment supporting base and all piping and the liquid content therein. The analysis shall accompany the manufacturer's installation details for each piece of equipment to be isolated.

1. General properties of seismic restraints:

- a. Restraints shall permit adjustment during installation to ensure sufficient clearance between vibration isolated element and rigid restraining device.
- b. Restraints shall not be installed until vibration isolators have been loaded and adjusted to achieve the specified static deflection and clearances.
- c. Restraints shall be capable of restraining seismic forces in any direction.
- d. Restraints at base supported equipment shall include resilient neoprene pads at all potential contact areas between isolated equipment and rigid restraining element.

2. Seismic restraint description:

- a. Restraining devices at all base supported vibration isolated equipment shall be separate units as manufactured by Mason Industries, Inc., Los Angeles, California, type "All Directional Double Acting Earthquake Snubber", or equal.
- b. Restraints at all suspended piping and equipment shall consist of stainless steel cables together with neoprene snubbers arranged to achieve the required all-directional restraint and sized to resist the seismic forces as required. Shop drawings shall indicate proposed method for achieving vertical restraint for suspended piping. Cables shall have sufficient slack to avoid circuiting the vibration isolators.

C. Seismic bracing of piping and ductwork:

1. General:

- a. Provide supports for seismically bracing piping and ductwork. An acceptable method is that described in "guidelines" for seismic restraints of mechanical systems and plumbing piping systems published 1982 by SMACNA and PPIC, California.
- b. Where piping and ductwork cross structural separations, provide for proper movement of structural elements without damage to piping, ductwork, or their supports.
- c. Where temperature changes cause expansion or contraction of piping, etc., provide for changes without damage to anchorage and supports or equipment.

2. Ductwork bracing.

- a. Brace all rectangular ducts 6 sq. ft. of area and larger. Brace all round ducts 28" in diameter and larger.
- b. Transverse bracing shall be installed at each duct turn and at each end of a duct run and at maximum 30'-0" o.c. of straight duct run.
- c. Provide longitudinal bracing at 60'-0" o.c. maximum. Transverse bracing for one duct selection may also act as longitudinal bracing for a duct section connected perpendicular to it, if the bracing is installed within four feet of the intersection of both ducts and bracing is sized for the larger duct. Duct joints shall conform to SMACNA duct Construction standard. All joints in duct sections shall provide a positive fastening together of the section.
- d. No bracing is required if the top of duct is suspended 12" or less from the supporting structural member and attached to top of duct.
- e. Walls (including gyp-board non-bearing partitions) which have ducts running through them may replace a typical transverse brace. Provide solid blockings around duct penetration at stud wall construction.

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3. Piping bracing.

- a. Brace all piping 1" and larger
- b. Seismic braces may be omitted: (1) when the top of the pipe is suspended 12" or less from the supporting structure member and the pipe is suspended by an individual hanger. (2) on all piping 3/4" and smaller.
- c. Vertical Piping
 - (1) Attachment - Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and carry the weight of the pipe and contents. Stacks shall be supported at the top and bottom by approved metal floor clamps.
 - (2) Screwed pipe and copper tubing shall be supported at each story for piping 1-1/2" and larger diameter, and at not more than 6 foot intervals for piping 1-1/2" and smaller in diameter.
 - (3) Pipes of other approved material shall be supported in accordance with their approved installation standards.
- d. Horizontal Piping
 - (1) Supports - Horizontal piping shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.
 - (2) Screwed pipe - Screwed pipe (I.P.S.) welded or flanged pipe shall be supported at approximately 10 foot intervals.
 - (3) Copper tubing - Copper tubing shall be supported at approximately 6 foot intervals for tubing 1-1/2" and smaller in diameter and 10 foot intervals for tubing 1-1/2" and smaller in diameter and 10 foot intervals for tubing 2" and larger in diameter.

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- (4) Pipes of other approved materials shall be supported in accordance with their approved installation standards.
- e. Provide transverse bracings at 40'-0" o.c. maximum unless otherwise noted.
 - f. Provide longitudinal bracings at 80'-0" o.c. maximum unless otherwise noted. When thermal expansion or contraction is involved, provide longitudinal bracings at anchor points. The longitudinal braces and the connections must be capable of resisting the force induced by expansion and contraction.
 - g. Transverse bracing for one pipe section may also act as longitudinal bracing for the pipe section connected perpendicular to it, if the bracing is installed within 24" of the elbow or tee of similar size.
 - h. For threaded piping the flexibility may be provided by the installation of swing joints. In welded or solder joint piping the flexibility shall be provided by expansion loops.
 - i. Do not use branch lines to brace main lines.
 - J. Trapeze hangers may be used. Provide flexibility in joints where pipes pass through building seismic or expansion joints, or where rigidly supported pipes connect to equipment with vibration isolators.
 - k. A rigid piping system shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an earthquake. Example: Wall and a roof; solid concrete wall and a metal deck with lightweight concrete fill.
 - l. Provide large enough pipe sleeves through walls or floors to allow for anticipated differential movements.
 - m. At vertical pipe risers, wherever possible, support the weight of the riser at a point or

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points above the center of gravity of the riser. Provide lateral guides at the top and bottom of the riser, and at intermediate points not to exceed 30'- 0" on center.

- n. Cast iron pipe of all types, where the top of the pipe is 12" or more from supporting structure shall be braced on each side of a change in direction of 90° or more. Riser joints shall be braced or stabilized between floors.
- o. For gas piping, transverse bracing shall be at 40' - 0" o.c. maximum. No bracing is required for pipes 3/4" diameter and smaller.
- p. Proprietary bracing systems approved by the OSA may be used.
- q. The seismic bracing and support of fire sprinkler piping shall be completed in accordance with NFPA #13.

D. Seismic loads:

- 1. When resting on the ground, rigidly mounted equipment, vessel or machinery plus effective mass of its contents shall be designed for ground acceleration of 0.3g acting at center of gravity of equipment, vessel or machinery.
- 2. When resting on roof or suspended floor or connected to building, rigidly mounted equipment or machinery and ducts or piping shall be designed for seismic load due to 0.3g acting at center of gravity.
- 3. Multiple-legged elevated tanks plus effective mass of contents shall be designed for seismic load of 0.30g at center of gravity.
- 4. Spring mounted equipment and machinery shall be designed for a 100% greater seismic load than that specified for rigidly mounted equipment or machinery.

E. Installation of seismic restraints:

- 1. Submit calculations and details for approval prior to commencing work. All restraint items shall be installed at time of installation of piping, ductwork, and equipment.

2.10 Roof Penetrations

- A. Locate roof penetrations for vents, pipes, drain and ducts, a horizontal distance of 12" minimum from edge of penetration to edge of vertical walls, curbs, or parapets above.

2.11 Motors

- A. General: This Section is applicable to all integral HP, induction motors, open dripproof, totally enclosed or explosion proof, for mechanical systems. Motors shall comply with applicable provisions of NEMA, IEEE, and Underwriters' Laboratories, Inc. when explosion proof is specified. Motors shall be rated for a 40°C (104°F) ambient with Class B insulation. All motors outdoors shall be TEFC type. All motors, 1 HP to 25 HP, which are connected to equipment by flexible couplings or V-belts and not built-in as integral parts of the equipment, shall be of high efficiency design, "Gould" Plus, "Westinghouse" MAC II, or approved equal. V-belt drive shall be rated at 150% of design load.
- B. Electrical Specifications: Winding insulation system shall be NEMA, Class B or better and motors would for standard voltages of 120 volts, 208 volts or 480 volts. Provide packaged capacitors in NEMA enclosure for each motor of 30 horsepower or larger. Enclosures and a related motor terminal box shall be designed for conduit and wire interconnection. Capacitors shall be selected to correct power factor to 95% with motor 75% loaded. Mount enclosure adjacent to motor. Exterior capacitor enclosures shall be weatherproof.
- C. Mechanical Specification: Frame dimensions conform to NEMA standards for "T-frame" motors. Frame construction of motors larger than NEMA from 145T. of cast iron or extruded aluminum construction and those of NEMA frame size 145T and small may be of fabricated steel type. Nameplates shall be stainless steel. Grease lubricated ball on roller bearings shall be supplied. On NEMA frame sizes 182T and larger make provisions for regreasing by use of removable grease plugs.

2.12 Wrapping of Pipe:

- A. Prior to delivery to the job site, wrap buried steel pipe with corrosion protection wrap of pressure sensitive polyvinyl chloride or polyethylene tape applied after pipe has been thoroughly cleaned. Tape shall be nominal thickness of 20 mils consisting of one layer of 20 mil tape or two separate layers of 10 mil tape. Apply with suitable primer adhesive recommended by manufacturer.
- B. Tightly apply tapes with 1/2 inch minimum uniform lap, free from wrinkles and voids. Use approved wrapping machines and experienced operators.
- C. Tapes: "Chasekote" No. 775, Plicoflex No. 340 25, Polyker 922 and 923, "Scotchwrap" No. 51, or equal. Apply tape after pipe is cleaned as recommended by the tape manufacturer.
- D. Cover filed joints and fittings by wrapping polyethylene or polyvinyl tape specified for wrapping pipe, except use two layers of 10 mil thick tape. Wrap joints to provide minimum of six-inches over adjacent pipe covering. Where fittings are wrapped, width of tape shall not exceed two inches. Apply adequate tension so tape will conform tightly to contours of fittings. Use putty tape insulation compounds such as "Scotchfil", or equal, to fill voids and provide smooth even surface for application of tape wrap.
- E. Alternate: In lieu of tape wrap, factory applied plastic coating on steel pipe will be acceptable. Use tapes for field joints, fittings, and valves same as specified above. Pipe Coating: "X-Tru-Coat" (20 mil thick) as manufactured by Standard Pipe Protection, Republic, Pipe Line Service Corp., Scotchkote 202 (12 mil thick) as manufactured by 3M Company, or equal, with "X-Try-Tape", or equal, for joints, fittings, and valves.
- F. Test wrapped or coated pipe, fittings, and field joints on job site, after assembly, with approved high voltage holiday detector Tinker and Razor, or equal, with positive signaling device to indicate any flaws, holes, or breaks in wrapping. Set peak voltage to 10,000 volts. If Scotchkote 202 is used set peak voltage to 1,000 volts. Place piping on temporary blocks to allow testing to run along underside of pipe. Repair defects before covering. Conduct testing in presence of Engineer

2.13 Access Covers and Access Doors

- A. Provide access covers over underfloor buried mechanical valves, controls, cleanouts, located in interior and exterior floor and grade areas.
- B. Provide access doors over concealed mechanical valves, controls, duct coils, dampers, fire dampers, pipe chases, concealed mechanical equipment through fire rated walls and ceilings.
- C. Provide fire rated doors for access to mechanical equipment and valves.
- D. Access covers - Interior concrete floors:
 - 1. Type: Square or rectangular frame with hinged and secured cover.
 - 2. Size: Nominal 10" x 10".
 - 3. Construction: Aluminum alloy frame and hinged scoriated XH cover with lifting device. Secure with vandalproof screws.
 - 4. Marking: Cast cover with word "Cleanout", "Gas Shut-Off", or "Water Shut-Off" when used for these services.
 - 5. Acceptable manufacturers: Smith No. 4925, Zurn, Josam.
- E. Access covers - interior vinyl/asbestor tile floors.
 - 1. Type: Square or rectangular frame with recessed cover.
 - 2. Size: Nominal 10" x 10".
 - 3. Construction: Aluminum alloy frame and tile recess XH cover with lifting device. Secure with vandalproof screws at each corner.
 - 4. Acceptable manufacturers: Smith No. 4920, Zurn, Josam.
- F. Access doors - walls and ceilings.
 - 1. Type: Flush or recessed panel.

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2. Size: Minimum 12" x 12" nominal door for hand access, minimum 16" x 20" nominal door for personnel access.
3. Location and style:

Masonry/concrete walls	Milcor "M" Standard
Gypsum wallboard walls and ceilings	Milcor "M" Standard
Plastered surfaces (except toilet and kitchen walls)	Milcor "K" Standard with casing bead
Tile/terrazzo/kitchen/toilet room walls stainless	Milcor "M"
Acoustical tile	Milcor "A" (check type of ceiling system)
General areas	Milcor "M" Standard
Fire rated shafts, rated walls and ceilings	Milcor "B" label
4. Material:
 - a. Stainless steel, No. 302 with No. 4 finish.
 - b. Standard manufacturer's standard construction and finish for type specified.
5. Locking:
 - a. Screwdriver: Flush screwdriver operated with case hardened cam.
6. Acceptable manufacturers: Milcor, Zurn, Miami Carey, Potter-Roemer.

ARTICLE 3 - EXECUTION

3.01 Tests

A. General:

1. Test systems as specified.
2. Tests are supplemented by detailed tests specified in each Section.

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3. Tests must be performed and systems approved prior to painting, covering, insulating, furring, or concealing piping.
 4. Provide all test equipment, instrumentation and labor in conjunction with tests.
 5. Prior to test, protect or remove all control devices, air vents, and other items which are not designed to stand pressures used in test.
 6. Accomplish testing of piping in sections so as not to leave any pipe or joint untested.
 7. Obtain prior approval for test procedures.
- B. Responsibility for damages: Bear costs of repair and restoration of work of other trades damaged by tests or cutting done in connection with tests.

3.02 Repairs and Retest

- A. Make other adjustments, repairs and alterations required to meet specified test results.
- B. Correct defects disclosed by tests or inspection; replace defective parts.
- C. Use only new materials in replacing defective parts; in case of pipe, replace with same length as defective piece.
- D. Repeat tests after defects have been corrected and parts replaced, until pronounced satisfactory.

3.03 Operating and Maintenance Manuals

- A. Furnish to Engineer in accordance with requirements of this Specification, an Operating and Maintenance Manual, which shall be an assembly of following information bound in durable binding:
 1. Complete table of contents.
 2. Page indicating name, address, telephone number, and name of person to be contacted regarding building and equipment maintenance at office of Contractor.
 3. Sectionalize manual by dividers with tab indexes indicating various sections.

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4. At front of each section, sheet indicating the name, address and telephone number of person to be contacted at office of major suppliers.
5. At each major subsection tab divider index listing of portions and materials within subsection.
6. Complete description of recommended operational procedures, maintenance, lubrication data, and spare replacement parts lists of equipment items. Include applicable catalog data, diagrams, cuts describing equipment, and sources from which replacement parts can be obtained.
 - a. Performance data (curves, charts, etc.) on all pumps, air handling equipment, motor ratings, and electrical single lines and wiring diagrams for motor control centers and major power circuit breakers and disconnect centers.
 - b. Complete nameplate data for each and every item of equipment provided under each section of the manual.
 - c. Complete "as-built" air conditioning controls diagram and written operating procedure with catalog literature describing each control instrument.
 - d. Complete and detailed "as-built" air balance log for the heating, ventilating and air conditioning systems identified by company doing balance work, their address and telephone number and signature of balance engineer that performed work.
 - e. Items specified in Paragraph 1.10 Shop Drawings Data and Instructions of this Section shall be included in manual.

3.04 Record Drawings

- A. Refer to Division 1 for requirements governing "as-built" record drawings. "As-built" drawings include:
 1. Principle shut-off valves plainly marked and identified.
 2. Position of buried or concealed pipe accurately dimensioned in both horizontal and vertical planes.

3. Changes from Contract Drawings in location of ductwork, piping, and equipment, drawn to scale.
4. Equipment layout drawings revised from shop drawings to reflect "as-built" conditions.

3.05 Preliminary Operations

- A. Should the District require that any portion of the systems or equipment be operated prior to the final completion and acceptance of the work, the Contractor shall furnish such operation. All the expense thereof will be paid by the District separate and distinct from any money paid on account of the Contract.
- B. For such preliminary operation or testing, payment shall not be construed as final acceptance of any of the work of this Contract.

3.06 Operating Instructions

- A. The Contractor shall provide the services of a competent Operating Engineer to supervise the operation of all equipment specified herein and to instruct the District operators during a one day operating period. The operating instruction period shall be defined as straight time working hours and shall not include nights and weekends.
- B. The District shall be notified in writing at least five days before each operating instruction period begins. The District must accept the instructional starting time in writing to the Contractor. Upon arrival, the various instructors shall report to the District.

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DIVISION 15 - MECHANICAL

SECTION 15250 - INSULATION OF MECHANICAL SYSTEMS

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Insulation of piping systems:
 - 1. Hot water, domestic (supply and return).
 - 2. Hot water, solar (supply and return).
 - 3. Steam and industrialized hot water (IHW).
 - D. Insulation of air duct systems:
 - 1. All supply air ducts which are concealed and all return air ducts which are not lined, shall be insulated with duct wrap as specified in paragraph 3.03.
 - 2. Lining of zone head supply air ducts, exposed supply air ducts, return air ducts ten feet from the air conditioning units, and transfer ducts, shall be as specified in paragraph 3.03.
- 1.02 Related work specified elsewhere:
- A. Finishes: Division 9.
- 1.03 Provisions and General Requirements:
- A. Documents affecting work of this section include but not necessarily limited to General Provisions, Division 1 General Requirements and Section 15010 - Mechanical General Provisions of these specifications.

- B. Inspection of conditions: Examine related work and surfaces before starting work of this Section. Report to Architect, in writing, conditions which will prevent proper provision of this work. Beginning work of this Section without reporting unsuitable conditions to Architect constitutes acceptance of conditions by Contractor. Perform any required removal, repair, or replacement of this work caused by unsuitable conditions at no additional cost to Owner.

1.04 List of Acceptable Manufacturers:

Manville	Armstrong
Owens-Corning	National Gypsum
CPS	Falcon Foam
PPG	

ARTICLE 2 - PRODUCTS

2.01 Materials:

A. Pipe insulation:

1. Hot water (domestic and solar) piping: Glass fiber, one-piece (HD) sectional pipe insulation with factory applied jackets. 3 PCF density minimum.
2. Steam piping and IHW: Calcium silicate pipe insulation (CS).
3. Jackets: All purpose (AP-T) laminate of white Kraft bonded to foil, reinforced with glass yard with self-sealing lap.

B. Air duct insulation:

1. Duct wrap, vapor barrier (Type A): Glass fiber flexible blanket insulation with vapor barrier facing of UL rated aluminum foil scrim Kraft. Insulation 0.75 PCF K factor of 0.29 at 75°F mean temperature.
2. Flexible duct lining (Type B): Glass fiber with a black coating. Insulation with a minimum density of 1-1/2 PCF K factor of .28 at 75°F mean temperature. The lined shall have an air friction correction factor of not more than 1.1 at 1000 fpm or the

Contractor shall oversize accordingly. Duct liner shall be applied with approved fire resistant adhesive and mechanical fasteners as per manufacturer's recommendation at stated velocities. Exposed edges, leading edges, cross joints and any damaged areas shall be heavily coated with approved fire resistant adhesive. For velocities above 4000 fpm, consult manufacturer for rated velocity and installation. Cover all leading edges with galvanized nosing strips. Class 1: Flame-spread rating for 25 maximum. Smoke-developed rating 50 maximum. Retard flame passage for at least 30 minutes.

C. Insulation accessories:

1. Hangers, mechanical: Pipe Shields Inc., CS-CW Series.
2. Wire, tie: 16 gauge soft, annealed, black or galvanized.
3. Emulsion, asphalt: Koppers No. 480 liquid asphalt emulsion.
4. Tape, vapor barrier: Scotch No. 473.
5. Angle, corner: 1-1/2" leg, aluminum or galvanized steel.
6. Foil aluminum: .02 mils thick.
7. Jacket, aluminum: .016" smooth jacket, weatherproof seal, factory applied vapor barrier for pipe exposed to weather. Ell and Tee jackets by Herren Metals Inc. or equal.
8. Adhesive, hanger: Benjamin-Foster No. 55; color: red-brown; Fire Safety, wet - Flash Point 55, dry - F.S. 5.
9. Adhesive, vapor barrier (lap): Benjamin-Foster No. 82-07; color: white, Fire Safety, wet - non flammable dry - F.S. 5.
10. Adhesive lagging: Benjamin-Foster No. 30-36; color: white, Fire Safety, wet - non-flammable, dry - F.S. 5, MIL-A-3326A, Type I.

11. Adhesive bonding: Benjamin-Foster No. 85-015; color: amber, Fire Safety, wet - Flash Point 30 F, dry - F.S. 10.
12. Adhesive, fire retardant (used in sealing duct lining): Benjamin-Foster No. 85-20, color: off-white; Fire Safety, wet - non-flammable, dry 0 F.S. 6.
13. Canvas: 8 ounce per square yard.
14. Fabric, glass membrane: Non-woven, jackstraw pattern of short cable strands of glass fiber.
15. Cement, insulating: Same material as insulation to which it is applied, but in cement form.

ARTICLE 3 - EXECUTION

3.01 Condition of Surfaces:

- A. Examine related work and surfaces before starting work of this Section. See 1.02B "Inspection of Conditions".

3.02 Insulation of Piping Systems:

- A. Piping insulation schedule:

<u>System</u>	<u>Class I Temp. Range</u>	<u>Insulation and Min. Thickness</u>	<u>Jacket Exposed Pipe</u>	<u>Concealed Pipe</u>
Domestic and Solar Hot water	to 180°F	1-1/2" (HD)	Aluminum	(AP-T)
Steam and IHW	to 1200°F	2" (CS)	Aluminum	

Urethane foam or polystyrene pipe insulation will not be acceptable.

HD = Heavy Density
 CS = Calcium Silicate

AP T= All purpose with foil

- B. Hot piping:

1. Insulate specified piping systems with material and material thickness shown in schedule.

2. Provide shields outside of insulation where pipe hangers or rollers are installed. Tape shields around insulation.
3. Provide aluminum jacket for pipes exposed to weather.
4. Fittings: Provide insulating cement for piping up to 3" and PVC molded fittings for larger piping.
5. Insulate fittings and valve bodies with insulating cement, hand molded to thickness equal to adjoining insulation, covered with smooth coat of insulating cement.
6. Cover exposed calcium silicate insulated pipe and fittings with 8 ounce canvas pasted in place with lagging adhesive. Finish by sizing with lagging adhesive. "Uni-Fit" or "Zeston" covers with glass fiber insulation may be used with specified temperature range installed as per manufacturer's recommendation.
7. Install insert section at hangers/rollers of waterproof calcium silicate impregnated with silicon of thickness equal to adjoining insulation. 360°F coverage along pipe, length of insert, 9" minimum. Cover to match adjacent pipe.
8. Acceptable manufacturer: Pipe Shields Inc. "CS-CW".

3.03 Insulation of Duct Systems:

- A. Ductwork insulation schedule: (Unless shown or specified otherwise)

Insulation Type-Key

Type A - Duct wrap, vapor barrier type.

Type B - Lined duct.

System Ductwork

Insulation Thickness

Supply air duct- (concealed) 1-1/2" type A

Supply air duct (in the first five feet of horizontal ducts from zone head ducts and within plenums).

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<u>System Ductwork</u>	<u>Insulation Thickness</u>
Zone head ducts	as indicated on drawings, type "B"
Duct (exposed to weather)	as indicated on drawings type "B"
Return ducts (in the first ten feet from the unit and within plenums).	1" type B
Return ducts (exposed above roof)	1-1/2" type B
Return ducts (all except otherwise noted)	1" type A
Transfer ducts (all)	1" type B

B. Air duct insulation, concealed Type A:

1. Wrap specified ducts with material and thickness shown in schedule. Cover all surfaces including standing seams with insulation joints lapped a minimum of 2". Fasten insulation with wire ties spaced 12" on centers maximum for straight runs and 3" on centers maximum for stright runs and 3" on centers for elbows and fittings. Flare door staples on 3" centers through laps. Tape all longitudinal and circumferential joints.
2. Additionally, secure insulation for ducts 24" or more in width by mechanical fasteners spaced 18" on center line of bottom of duct.
3. Two ducts wrapped together having a combined width of 48" or more shall have mechanical fasteners on center line of bottom of each duct spaced 18" on center in addition to wire.

C. Air duct and plenum insulation, lined type B.

1. Line specified ducts with material and tnickness as shown in schedule. Secure insulation to sneet metal surface with coated side toward air stream,

with minimum 50% coverage of bonding adhesive. Adhesive shall completely cover sheet metal at each end of section of ductwork.

2. Additionally, secure insulation for ducts over 2" wide, and on sides when width exceeds 24" with mechanical fasteners 12" on center maximum starting approximately 1-1/2" from every edge.
3. Apply fire retardant mastic to joints in liner and edges of the liner where sections of ductwork are joined.
4. Increase indicated size of ductwork to accommodate specified liner.
5. Protect leading edges per manufacturer's requirements.

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DIVISION 15 - MECHANICAL

SECTION 15300 - SPECIAL SYSTEMS

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Document 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which is required to be included as work under this section.
 - C. Compressed air system.
 - D. Emergency generator fuel oil system.
 - E. Gasoline system.
 - F. Diesel fuel system.
 - G. Motor oil system.
 - H. Gear oil system.
 - I. Torque oil system.
 - J. Chassis grease system.
 - K. Anti-freeze system.
 - L. Waste oil system.
 - M. Waste fuel system.
 - N. Hydraulic fluid piping system.
 - O. Solvent piping system.
 - P. Miscellaneous piping.
 - Q. Tank level sensing system.
 - R. Testing and initial operation.
 - S. Excavation, trenching and backfill.
 - T. Oil/water separator.

1.02 Provisions and General Requirements:

- A. Inspection of Conditions: Examine related work and surfaces before starting work of this Section. Report to Engineer, in writing, conditions which will prevent proper execution of this work. Beginning work of this Section without reporting unsuitable conditions to engineer constitutes acceptance of conditions by the Contractor. Perform any required removal, repair, or replacement of this work caused by unsuitable conditions at no additional cost to the District.
- B. Where the word "Provide" appears in equipment, it shall mean "Furnish and Install".

1.03 Related Work Specified in Other Sections:

- A. Site Work: Division 2.
- B. Concrete: Division 3.
- C. Finishes: Division 9
- D. Electrical: Division 16.

1.04 Submittals:

- A. General: Comply with provisions of Section 15010, Mechanical General Provisions.
- B. Product Data: Within 35 calendar days after receipt of Notice to Proceed, submit complete materials list and manufacturer's brochures of all items proposed to be furnished and installed. Submittal shall include but not be limited to:

Pipes and Fittings
Hangers and Supports
Valves
Specialties, Gauges, Thermometers
Air Compressors and Driers
Fuel Dispensers
Tank Level Sensing
Pumps
Tanks and Tank Supports
Valve Boxes and Manholes
Waste Fuel Separator and Clarifier
Waste Oil Separator
Tank Leak Monitors
Tank Leak Sensors
Automatic Valves

1.05 Product Handling:

- A. Protection. Use all means necessary to protect the materials of this section before, during and after installation and to protect the work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary and at no additional cost to the District.

ARTICLE 2 - PRODUCTS

2.01 Compressed Air System:

- A. Provide complete compressed air system including air compressors, accessories and piping.
- B. Air compressor -Symbol CA-1 and CA-2.
 - 1. Compressor: Lubricated, rotary screw type with intake unloader control capable of 100% "shut off" in unloaded condition. Compressor speed shall not exceed 3500 rpm.
 - 2. Lubrication and cooling system: Air cooled heat exchanger, full flow, disposable canister type oil filter, ASME Coded Oil separator/reservoir with safety valve, automatic blow down valve. Oil flow shall be maintained by pressure differential. All lubrication service points shall be easily accessible for filter cartridge change. Oil carry-over to air system shall not exceed 5 ppm.
 - 3. Motor: Open dripproof electric motor for V-belt drive and OSHA type V-belt safety guard, or direct drive.
 - 4. Air filter: Dry type.
 - 5. Aftercooler: Air cooled, radiator type, 15°F approach, mounted and piped to unit.
 - 6. Instruments: Receiver pressure guage, pressure switch, for automatic start-stop, high temperature shut down switch with reset. Provide an automatic timer adjustable from 0-15 minutes to limit the number of start/stop operations per hour. Provide

start/stop capacity control, hour meter, oil and maintenance gauge showing required filter change.

7. Mounting: Compressor and motor shall be mounted on a heavy steel base with motor, oil cooled, oil separator/reservoir, oil filter, oil piping, aftercooler and drive guard. Base bolted to air receiver, using rubber isolators, to a 200 gallon 200 PSIG ASME stamped horizontal air receiver with automatic drain valve, pressure relief valve and service outlet valve.
 8. Warranty: The compressor unit shall be warranted for two (2) years against mechanical defects in material and workmanship and loss of performance.
 9. Capacity and sizes as noted on the drawings.
 10. Manufacturer: Gardner-Denver Company, Model EDERG Ingersoll Rand Model SSR 1000, or approved equal.
- C. Air compressor Symbol CA 3.
1. Compressor: Two-stage, air cooled, v belt driven.
 2. Motor: open dripproof electric motor for V-belt drive guard.
 3. Mounting: Compressor and motor shall be mounted on a horizontal, 120 gallon, 200 PSIG ASME stamped air receiver with automatic drain valve, pressure relief valve and service outlet valve.
 4. Instruments: Pressure gauge and pressure switch for automatic start-stop operation.
 5. Capacity and sizes as noted on the drawings.
 6. Manufacturer: Gardner-Denver Company, Model ADS, Ingersoll-Rand Model Century II, Cambell Hausfed Model TK or approved equal.
- D. Air Dryer - Symbol AD-1 and AD-2
1. The dryer shall be installed on the downstream side of the receiver. The dryer shall be capable of

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drying the maximum anticipated air flow to an °F, atmospheric dewpoint not less than minus 10 with entering air at 95 F°, saturated. The compressed air dryer shall be refrigerated type, self-contained complete with heat exchanger, refrigeration compressor, automatic controls, trap for moisture removal, wiring, piping, and refrigerant charge.

2. Refrigeration unit shall be of hermetically sealed type and shall operate intermittently at all but maximum load conditions or shall have a not gas bypass system which permits noncycling operation between no load and full load.
3. Heat exchanger shall consist of air and refrigerant coils surrounded by heat conducting media of sufficient mass to insure adequate cooling capacity without causing excessive refrigeration cycling. Moisture separator shall be of centrifuge type located within the heat exchanger to provide for moisture separation at point of minimum air temperature. Heat exchanger temperature shall be thermostatically controlled and capable of adjustment. Means shall be provided to ascertain exchanger temperature.
4. Cabinet: The entire unit shall be housed in a suitable steel cabinet. Cabinet shall be provided with hinged accessdoor and front panel for easy access to all parts for maintenance and inspection. Cabinet shall be bonderized and finished with commercial enamel.
5. Unit shall be complete including the following:
 - a. Refrigerant analyzer gauge
 - b. Automatic drain
 - c. Power-on light
 - d. On off switch
 - e. High temperature warning light
 - f. Outlet air pressure gauge
 - g. Inlet air temperature gauge
6. Manufacturer: Pneumatech Model AD or equal.

2.02 Underground Storage Tanks

- A. Storage tanks shall be nonpressure type, horizontal, welded steel, suitable for underground installation. Specific tank requirements are listed for various services under this Section of the specifications.
- B. Tank shall comply with NFPA #30 and shall be double wall type as listed by Underwriters Laboratories, Inc. for hazardous fuel containment, Los Angeles Fire Department and UL label shall be affixed to tank.
- C. Tank shall be chemically inert to the product and service indicated on the Drawings.
- D. Tank shall have lifting lugs as recommended by manufacturer.
- E. Furnish and install hold down straps as recommended by the manufacturer. Hold down straps shall be set in concrete pad below the tank. All exposed steel related to straps as anchor bolt, turn-buckle, etc. shall be epoxy painted after installation and before backfilling.
- F. Tanks shall be of the size as indicated, allowance being made for manufacturer's fabrication. No internal bracing shall be used. Openings shall be provided as indicated. Tanks shall be shop tested and proved tight against leakage under a test using air at a gauge pressure of 5 pounds per square inch. Shop testing shall be performed after the various openings are installed. Leaks disclosed by tests shall be repaired, and each tank shall be retested. Tanks shall have leak detection system between walls wired to a central panel. Detector shall be capable of determining if fluid is water or hydrocarbon. Provide Adams Precision Instrumentation Company TRS-76 system or equal, as specified hereinafter.
- G. Following fabrication and leak testing, the exterior surface shall be sandblasted to white metal, and spray-coated with a glass-reinforced isophthalic polyester resin of sufficient thickness to show no holidays using a Tinker and Razor Model AP W Holiday Detector at 35,000 volts.
- H. Vent: Each tank shall be provided with a separate atmospheric vent conforming to the applicable requirements of NFPA 30. The vent pipe shall terminate

at least 2 feet above the roof of building and shall be so located that discharged vapors will not enter building openings. Vent pipe shall terminate with a flame arrestor (VAREC No. 7000). Install a check valve in the vent riser per code.

- I. **Fill Connection:** The fill line shall enter at the top of the tank. The fill line shall be a minimum size of 4" and shall extend to within 6" of the tank bottom. An anti-splash deflector shall be connected to the end of the fill line in the tank. From the top of the tank the fill line shall extend vertically, and shall be connected to a cast iron fill box installed in concrete pavement, OPW 84-D-1010. Provide gauge stick.
- J. **Manhole:** Where indicated on the Drawings tanks shall be provided with one 18" inside diameter access manway. Each manway shall be provided with a bolted and gasketed steel cover and a steel ladder to the bottom of the tank.
- K. **Suction Connection:** The suction line shall be located as shown on the Drawings and shall extend to within 6" of the tank bottom. The suction line shall extend vertically from the top of the tank connection.
- L. **Tank supplier shall provide a kit of preformed caps for lifting lugs and any unused fittings, along with glass matting and container of resin, for sealing all exposed metal after tank installation.**
- M. **Special Provisions:**
 - 1. **Tank Warranty:** Tanks shall be covered by a 30 year warranty against defects in materials and workmanship.
 - 2. **Services of Technical Representative of the Tank Manufacturer:** The Contractor shall provide services of a technical representative of the tank manufacturer, at the job site during each phase of unloading, installation, and testing. This technical representative shall certify in writing that the tanks have been installed as recommended by the manufacturer.
 - 3. **Furnish Red Jacket leak detector sensor in concrete pit where pump occurs below grade as indicated on drawings and as specified hereinafter.**

N. Manufacturer: Joor Manufacturing Co., Ace Bueller,
Owens-Corning or approved equal.

2.03 Diesel Fuel System:

- A. Provide complete and operating diesel fuel system including storage tanks, pumps, dispensers, accessories and piping.
- B. Underground storage tanks, Symbol TK-1, TK-2, TK-3 and TK-4 shall have capacities, sizes, openings, and fittings as specified in paragraph 2.02 and as shown on the Drawings.
- C. Diesel fuel pumps: Symbol DFP-1, DFP-2 and DFP-3.
 - 1. Pumps shall be of the rotary vane type incorporating non-metallic vanes, external anti-friction bearings, cartridge type mechanical seals (designed and supplied by the pump manufacturer), relief valve shall be integral with the pump case (set to relieve at 40 psi), and shall be the dashpot design. The speed reducer shall be integral with the pump incorporating "helical" steel gears with a service factor of 2.86 and a ratio of 4.2:1. Pump shall be mounted on a steel base and flexible coupled through Dodge Para-Flex PX280 coupling and covered with an OSHA type guard.
 - 2. The pumps shall be Blackmer GXS3C, or approved equal.
 - 3. Capacity and sizes as indicated on the Drawings.
- D. Diesel fuel filter separator: The unit shall be two-stage designed for the most efficient removal of water and solids from diesel fuels at 200 gpm, meeting the latest commercial and governmental specifications. The unit shall be supplied with a pressure gauge, three-way valve for reading inlet and outlet pressure, cover lift, sight glass to furnish visual indication of the water level, water drain, adjustable pressure relief valve in cover, automatic air eliminator in cover, coalescer element to remove solid contaminants and break emulsion of water in the product into droplets, separator element

to repel coalesced water droplets and prevent them from going downstream, flanged 4" inlet and outlet connections. Unit shall be ASME rated for 150 psig operating pressure and 225 psig hydrostatic test pressure and have an interior finish of epoxy, three-coat system. The fuel oil filter separator shall be Velcon Filters Inc. Model VV-2233-B filter/separator 1 6334TB coalescer elements, SO-614PLF separator elements. Provide automatic water drain and Gammon GOP-534-30A, differential pressure gauge.

E. Diesel Fuel Dispenser Assembly:

1. Noncomputing twin product fuel dispenser which shall incorporate two Veeder-Root 5 wheel registers and ticket printer, which shows gallons delivered. A lever switch shall be provided to select either automatic dispenser operating via attendant console to "Type 1 of Type 2" fuel during manual operation; two wide painted dials shall be located at attendant's eye level for ease of servicing and inspection; measuring units shall be two 1-1/2, 12-60 gpm meters with pressure differential of 1 psi at 20 gpm, 1.5 psi at 40 gpm, 3.0 psi at 55 gpm, maximum working pressure of 150 psi; frame construction shall be of heavy steel members welded and bolted to form one solid structure. The front and rear doors shall be removable to provide quick access for installation and inspection. Dispenser shall be 48" high, 25" x 18" base; dispenser hose shall be 12 ft. of 1" I.D. lightweight, heavy duty hose; chassis shall include normally closed solenoid valves on each product outlet to allow attendant to dispense either product with same hose and nozzle. Chassis shall include two pulse transmitters which shall provide a pulse every 0.1 gallon. The contact shall be 50 volt-amp max, non-inductive up to 3 amperes, up to 250 volts and rated for use in hazardous locations Class 1, Group C and D; inlet fittings shall be 1-1/2" ground joint union type with centerline location. (TOKHEIM 1250-1-RC-CET TWIN)
2. Heavy duty automatic shut-off, shockless closing nozzle. The nozzle shall have built-in outlet check valve and shall be provided with a straight hose swivel. The nozzle shall be rated at 40 gpm with a maximum pressure drop of 15 psi. (ACE 7H)
3. 1-1/2" pipe thread emergency valve to provide positive shut-off of product if dispenser is damaged due to collision or fire. (EBW660)

4. Nozzle hanger switch assembly to include 2 pole switch with 110 volt spring contact switch, 1 nozzle hanger assembly, 1 shear section on discharge line, special bracket to accommodate 2" tube to be extended to the ceiling and the pole will have an inlet to adapt to the TOKHEIM 1248-1-RC-CET-TWIN situated 12" from the pump with a height of 6'-6". (CETSP84R3)
5. Electric control panel to operate pumps with dispensers and also capable of interface with API Model TRS-76 Tank and Line Leak Monitor System. (CETFDS1248 Control Panel)

2.04 Gasoline System:

- A. Provide complete and operating gasoline fuel system including storage tank, pump, dispenser, accessories and piping.
- B. Underground storage tank - Symbol TK-6 shall have capacities, sizes, openings and fittings as specified hereinbefore in paragraph 2.02 and as indicated on the Drawings.
- C. Unleaded Gasoline Pump Assembly: Symbol GP-1.
 1. The pump assembly shall have carbon bearings, and stainless steel shaft. Product shall serve as lubricant and coolant. Provide thermal overload with automatic reset built into hermetically sealed stator housing and designed for continuous duty. The pump shall be a 2-stage centrifugal type submersible pump. The impellers and diffusers shall be made of anodized aluminum. The pump shall be easily installed through 4" tank opening. Pump inlet shall be chemically treated for corrosion resistance. Aluminum shell shall be sealed on both ends with elastomer, and mechanically locked to assembly. Cast iron inlet shall be provided to avoid risk of damage to pump shell during installation. Pump shall be rated as scheduled and shall provide uniform intake with pressure characteristics to assure smooth, quiet, vibration-free operation. The pump and motor shall be fully extractable with built-in check valve pressure relief valve, siphon system air eliminator, 2" discharge with water seal plug, conduit connection box accessible from top. Pump shall be furnished with 4" steel pipe.
 2. Manufacturer: Tokheim 550-34 with leak detector.

D. Twin gasoline dispenser:

1. Noncomputing twin product gasoline dispenser which shall incorporate two 4 wheel registers, which show gallons delivered, with two close coupled Veeder-Root ticket printers. Reading of register and use of printer shall be located in front panel of dispensing pedestal; a totalizing register shall be provided for each product; single step automatic reset, requiring a simple single movement by the attendant to reset both registers; hydraulic control valves shall be furnished on each product input line; frame construction shall be of heavy steel members welded and bolted to form one solid structure. The front and rear doors shall be removable to provide quick access for installation and inspection. The size shall be 50" high, 25" x 18" base; each product outlet shall be provided with 12 ft. of 3/8" I.D. lightweight, heavy-duty hose with a nylon cable retrieving reel for product and for vapor recovery. (TOKHEIM 1250A-2-RCE-CET)
2. Provide Underwriters' Laboratories listed automatic shut-off nozzle, size 1", with hold open clip and with built-in outlet check valve and large scuff guard. (OPW 7-V Model C for vapor recovery)
3. Provide one inch male pipe thread to 1" female pipe thread hose swivel with permanently lubricated bearing between body and tail sections. (OPW-43)
4. Provide 1-1/2" pipe thread emergency valve for positive shut-off of product if dispenser is damaged due to collision or fire. (EBW 660)
5. Provide anti-recirculation valve on vapor recovery pipe (OPW-78)

2.05 Solvent System:

- A. Provide complete and operating solvent system including underground storage tank, pump, accessories and piping.
- B. Underground storage tank - Symbol TK-12 shall have capacities, sizes, openings and fittings as specified herein before in paragraph 2.02 and as indicated on the Drawings.
- C. Solvent pump assembly: Symbol SOP-1
 1. The pump assembly shall have stainless steel journals with carbon bearings, and stainless steel shaft.

Product shall serve as lubricant and coolant. Provide thermal overload with automatic reset built into hermetically sealed stator housing and designed for continuous duty. The pump shall be a two-stage centrifugal type submersible pump. The impellers and diffusers shall be made of anodized aluminum. The pump shall be easily installed through 4" tank opening. Pump inlet shall be chemically treated for corrosion resistance. Aluminum shell shall be sealed on both ends of elastomer, and mechanically locked to assembly. Cast iron inlet shall be provided to avoid risk of damage to pump shell during installation.

2. Pump capacity shall be as shown on plans. The pump and motor shall be fully extractable with built-in check valve, pressure relief valve, siphon system, air eliminator, 2" discharge with water seal plug, conduit connection box (accessible from top). Pump shall be furnished with 4" stand pipe.
3. Manufacturer: TOKHEIM 550-13; RED JACKET CP 33R-1 or Wayne E4-33F.
4. Provide 1-1/2" pipe thread emergency valve with fusible link to shut-off valve when temperature exceeds 160°F.
5. Provide 3/4" Underwriters' Laboratories listed automatic nozzle without hold open clip, and with built-in outlet check valve and an easily replaceable spout. (OPW-1AK)
6. Provide 8 ft. of 3/4" I.D., 600 psi minimum burst pressure solvent hose with 3/4" male pipe thread both ends. (ARO 622671-08).
7. Provide 3/4" male pipe thread to 3/4" female pipe thread hose swivel with permanently lubricated bearing between body and tail sections. (TOKHEIM 646-5).

2.06 Anti-Freeze System:

- A. Provide complete and operating anti-freeze system including underground storage tank, pumps, mixing tank, accessories and piping.

- B. Underground storage tank - Symbol TK-9 shall have capacities, sizes, openings, and fittings as specified herein before in paragraph 2.02 and as indicated on the Drawings.
- C. Anti-freeze pump assembly - Symbol AFP-1 and AFP-2.
 - 1. Diaphragm pump, 1" inlet and outlet, self-priming, stainless steel housing, Buna "N" diaphragm, 1:1 ratio, to operate with 125 psi air. (ARO 666101-262 for AFP-1 and 613-115 3, 5:1 ratio for AFP-2).
 - 2. Piston pump, 1-1/4" inlet and 3/8" outlet, self-priming, stainless steel housing, 5:1 ratio, to operate with 125 psi air. (ARO 613-115 3, for AFP-2).
 - 3. 1/2" heavy duty filter-regulator-gauge-lubricator combination filter maximum pressure 200 psi with plastic 10 oz. bowl, 30-40 micron filter. The regulator range shall be adjustable from 5 to 125 psi. Pressure gauge 0-160 psi. (ARO 128241-300)
 - 4. Provide elongated suction tube to bottom of tank.
- D. Anti-freeze mixing tank:
 - 1. Provide a mixing tank fabricated from 12 gauge carbon steel with dimensions as indicated on the drawings.
 - 2. Before fabrication submit shop drawings as specified in this Section.
 - 3. Install tank and make final connections as indicated on the drawings.
 - 4. Provide high level and low level sensors with solenoid valves and flow control devices as specified on Drawings.

2.07 Waste Oil System

- A. Provide complete and operating waste oil system including storage tank, drains, accessories and piping.
- B. Underground storage tank Symbol TK-10 shall have capacities, sizes, openings and fittings as specified herein before in paragraph 2.02 and as indicated on the Drawings.

2.08 Waste Fuel System:

- A. Provide complete and operating waste fuel system including storage tank, separator, clarifier, drains, accessories and piping.
- B. Underground storage tank, Symbol TK-5 shall have capacities, sizes, openings and fittings as specified herein before in paragraph 2.02 and as indicated on the Drawings.
- C. Separator shall be as specified in plumbing section and modified as indicated on Drawings.

2.09 Emergency Generator Fuel Oil System:

- A. Provide a complete diesel oil system for the emergency generator engine unit including underground storage tank, submersible pump accessories and piping.
- B. Piping shall be schedule 40 black steel with malleable iron screw fittings. Underground piping shall be as specified hereinafter.
- C. Double wall underground storage tank Symbol TK-7 and shall have capacities, sizes, opening and fittings as specified in paragraph 2.03 and as shown on the Drawings.
- D. Submersible Diesel Pump Symbol DFP-4:
 - 1. The pump assembly shall have carbon bearings, and stainless steel shaft. Product shall serve as lubricant and coolant. Provide thermal overload with automatic reset built into hermetically sealed stator housing and designed for continuous duty. The pump shall be a two-stage centrifugal type submersible pump. The impellers and diffusers shall be made of anodized aluminum. The pump shall be easily installed through 4" tank opening. Pump inlet shall be chemically treated for corrosion resistance. Aluminum shell shall be sealed on both ends with elastomer, and mechanically locked to assembly. Cast iron inlet shall be provided to avoid risk of damage to pump shell during installation. Pump shall be rated up to 60 GPM and shall provide uniform intake with pressure characteristics to assure smooth, quiet, vibration-free operation. The pump and motor shall be fully extractable with built-in check valve pressure relief valve, siphon system, air eliminator, 2" discharge with water seal plug, conduit connection box accessible from top. Pump shall be furnished with 4" steel pipe.

2. Manufacturer: Tokheim 550-13.

2.10 Shop Systems

A. Provide complete automatic shop systems as follows:

1. Motor oil
2. Gear oil
3. Chassis grease
4. Torque oil

The systems shall include storage tanks, supply pumps, piping, overhead service hose reels, dispenser valves and other accessories to form complete operating systems.

B. Pumps:

1. Torque oil pump - Symbol TOP-1 and TOP-2 (mounted on storage tank TK-11).
 - a. Oil pump with 4" stroke and 9:1 ratio, 10.4 cubic inch displacement per cycle, 22 cycles per gallon, double acting stub type oil pump with outlet union check valve. (ARO 612.729 with elongated suction tube to bottom of tank).
 - b. Wall mounting bracket for 425 series pump unit. (ARO 66100)
 - c. 1/2" standard-duty lubricator. Maximum pressure of 200 psi, with plastic 6.25 oz. bowl, maximum temperature of 125°F, 2.5 cfm to 100 cfm maximum air flow range (ARO 126241.000).
 - d. 1/2" heavy duty filter-regulator-gauge combination. Filter maximum pressure to 200 psi with plastic 10 oz. bowl, maximum temperature of 125 degree Fahrenheit, 30-40 micron filter, 105 cfm through filter with 6 psi pressure drop. The regulator range shall be adjustable from 5 psi to 125 psi and have a 0-degree through 150°F temperature range. The regulator shall have an 0-160 psi air pressure gauge. (ARO 28344)
 - e. 3/4" male pipe thread to 3/4" female pipe thread hose swivel adapter union. (ARO 75367)

2. Torque oil pump - Symbol TOP-3 (wall mounted)

Torque oil pump (TOP-3) shall be the same as torque oil pumps (TOP-1 and TOP-2) except stub type wall mounted (ARO 612-729) and with the following items:

- a. 2" male pipe thread to 3/4" female pipe thread reducing bushing. (ARO Y45-24C)
- b. 1" male pipe thread to 3/4" female pipe thread street elbow. (ARO Y43-5C)
- c. 3/4" male pipe thread to 3/4" female pipe hose swivel adapter union. (ARO 75367)
- d. 6 ft. of 3/4" I.D., 600 psi working pressure material hose with 3/4" male pipe thread on both ends. (ARO 622651-06)
- e. Suction tube assembly for 55 gallon barrel with foot valve for positive priming, 2" bung adapter and 3/4" female pipe thread fluid outlet. (ARO 65109)
- f. Mounting brackets (ARO 66100)
- g. Muffler (ARO 91790)

3. Gear oil pump: - Symbol GOP-1 (wall mounted).

- a. 4-1/4" air motor, 6" stroke and 20:1 ratio, 7.4 cubic inch displacement per cycle, 32 cycles per gallon, double acting two-ball high volume stub type pump. (ARO 650-469)
- b. Wall mounting bracket for 600 series pump unit. (ARO 66101)
- c. 2" female pipe thread to 3/4" female pipe thread reducing elbow. (ARO Y129-7Z)
- d. 3/4" male pipe thread to 3/4" female pipe thread hose swivel adapter union. (ARO 75367)
- e. 6 ft. of 3/4" I.D., 600 psi working pressure material hose with 3/4" male pipe thread ends. (ARO 622651-06)

- f. Suction tube assembly for 55 gallon barrel with foot valve for positive priming, 2" bung adapter and 3/4" female pipe thread fluid outlet. (ARO 65109)
- g. Super quiet exhaust muffler assembly for 6" air motor pump. (ARO 91790)
- h. 1/2" male pipe thread to 1/2" male pipe thread nipple. (ARO 70749)
- i. 1/2" standard-duty lubricator. Maximum pressure of 200 psi, with plastic 6.25 oz. bowl, maximum temperature of 125°F, 2.5 cfm to 100 cfm maximum air flow range. (ARO 126241.000)
- j. 1/2" capacity air line connector with 1/2" male pipe thread. (ARO 23904-410)
- k. 1" capacity air line coupler with 1/2" female pipe thread. (ARO 23104-400)
- l. 6 ft. of 1/2" I.D., 800 psi working pressure air hose with 1/2" male pipe thread both ends. (ARO 622553-06)
- m. 1/2" heavy duty filter-regulator combination. Filter maximum pressure to 200 psi with plastic 10 oz. bowl, maximum temperature of 125 degree Fahrenheit, 30-40 micron filter, 105 cfm through filter with 6 psi pressure drop. The regulator range shall be adjustable from 5 psi to 125 psi and have a 0-degree through 125°F temperature range. The regulator shall have a 0-160 psi air pressure gauge. (ARO 28344)
- n. 3/4" male pipe thread to 3/4" male pipe thread nipple. (ARO Y27-155-C)
- o. 3/4" female pipe thread outlet union check valve assembly. (ARO 2486)
- p. 6 ft. of 3/4" I.D., 2,250 psi working pressure material hose with 3/4" male pipe thread both ends. (ARO 624601-06)
- q. 3/4" male pipe thread to 3/4" female pipe thread hose swivel adapter union. (ARO 75367)

4. Motor oil pump - Symbol MOP 1 and MOP-2 (installed on tank TK-8)
 - a. 4-1/4" air motor, 4" stroke and 9:1 ratio. 11 cubic inch displacement per cycle, 21 cycles per gallon, double acting stub oil pump with outlet union check valve. (ARO 612 729 with elongated suction tube to bottom of tank) with 3-1/2" I.D. air hose, 4 3/4" I.D. two fabric discharge hose, air coupler and connector.
 - b. 1/2" heavy duty filter-regulator-gauge combination. Filter maximum pressure to 200 psi with plastic 10 oz. bowl, maximum temperature 125°F, 30 40 micron filter, 105 cfm through filter with 6 psi pressure drop. The regulator range shall be adjustable from 5 psi to 125 psi and have a 0-degree through 125°F temperature range. The regulator shall have a 0-160 psi air pressure gauge. (ARO 28344)
 - c. 3/4" male pipe thread to 1/2" female pipe thread reducing bushing. (ARO Y45-9XC)
 - d. 900 psi relief valve with 1/2" male pipe thread inlet. 3/4" female pipe thread outlet and 1/8" female pipe thread bleed. (ARO 61117)
 - e. 3/4" male pipe thread to 3/4" female pipe thread hose swivel union. (ARO 75367)
 - f. 1/8" male pipe thread to 5/16" seamless steel tube flareless connector. (ARO Y38-5)
 - g. 3 ft. of 5/16" plastic tubing. (ARO 76708)
 - h. 5/26" rubber drum gromet. (ARO 76908)
 - i. Wall mounting bracket. (ARO 66100)
5. Motor oil pump - Symbol MOP-3 (wall mounted)

Motor oil pump (MOP-3) shall be the same as motor oil pumps (MOP-1 and MOP-2) except for pumping from 55 gallon drums and with the following items:

- a. 2" male pipe thread to 3/4" female pipe thread reducing bushing. (ARO Y45-24C)
 - b. 3/4" male pipe thread to 3/4" female pipe thread street elbow. (ARO Y43-5C)
 - c. 3/4" male pipe thread to 3/4" female pipe thread hose swivel adapter union. (ARO 75367)
 - d. 6 ft. of 3/4" I.D., 600 psi working pressure material hose with 3/4" male pipe thread on both ends. (ARO 622651-06)
 - e. Super quiet exhaust muffler assembly for 4-1/4" air motor. (ARO 91790)
 - f. Suction tube assembly for 55 gallon barrel with foot valve for positive priming, 2" bung adapter and 3/4" female pipe thread fluid outlet. (ARO 65109)
6. Chassis grease pump - Symbol CGP-1 (Floor Mounted)
- a. 4-1/4" air motor, 4" stroke and 50:1 ratio, 2.31 cubic inch displacement per cycle, 12.5 cycles per pound, double acting high volume pump with 400 lb. drum cover and outlet union check valve. (ARO 612-805)
 - b. Follower plate for 400 lb. drum and 1-7/8" O.D. pump tube. Follower plate shall have rubber lips, lifting handle and vacuum breaking screw. (ARO 640-015-2)
 - c. Super quiet exhaust muffler assembly for 4-1/2" air motor pump. (ARO 91790)
 - d. 1/2" standard-duty lubricator. Maximum pressure of 200 psi, with plastic 6.15 oz. bowl, maximum temperature of 125°F, 2.5 cfm to 100 cfm maximum air flow range. (ARO 126241.000)
 - e. 1/2" heavy duty filter-regulator-gauge combination. Filter maximum pressure to 200 psi with plastic 10 oz. bowl, maximum temperature of 125°F, 30 - 40 micron filter, 105 cfm through filter with 6 psi pressure drop. The regulator range shall be adjustable from 5 psi to 125 psi and have a 0° through 125°F temperature range. The regulator shall have a 0 - 160 psi air pressure gauge. (ARO 28344)

- f. 1/2" male pipe thread nipple (ARO 70749)
- g. 1/2" female pipe thread tee. (ARO Y-43-34)
- h. 1/2" male pipe thread to 1/2" male pipe thread nipple. (ARO 70749)
- i. 1/2" pipe nipple x 6" long.
- j. 1/2" male pipe thread to 1/2" female pipe thread street elbow. (ARO Y-43 204)
- k. 1/2" heavy duty regulator with gauge. The regulator range shall be adjustable from 5 psi to 125 psi and have a 0-degree through 180 degree Fahrenheit temperature range. The regulator shall have a 0-160 psi air pressure guage. (ARO 27344 010)
- l. 1/2" male pipe thread to 1/4" female pipe thread reducing bushing. (ARO 6788)
- m. 1/4" male pipe thread to 1/4" male pipe thread nipple. (ARO 1950)
- n. Air operated pump lift shall be attached to the drum cover to raise the pump and drum cover for drum change over. Mounting of the lift shall be by a base plate with three 9/16" diameter holes. Lift height extended shall be 102" down to 60". Air line connectors shall be furnished for 85 cfm and 35 cfm. (ARO 640-067)
- o. 5 ft. of 1/4" I.D., 250 psi working pressure air hose with 1/4" male pipe thread both ends. (ARO 622201-05)
- p. 1/4" female pipe thread air line connector. (ARO 2609)
- q. 1/2" male pipe thread to 1/2" female pipe thread hose swivel union. (ARO 75366)

C. Underground Storage Tanks:

- 1. Underground storage tanks shall have capacities, sizes, openings, and fittings as specified herein before in paragraph 2.02 and as indicated on Drawings as follows:

- a. Motor oil tank - Symbol TK-8.
- b. Torque oil tank - Symbol TK-11.

D. Overhead Hose Reels:

1. Motor, Oil Hose Assembly:

- a. Heavy duty low pressure open hose reel which shall be designed to meet the strictest requirements of the most rugged service. The reel shall be heavily reinforced with heavy duty mounting brackets, rolled edge sheaves and extra-large rollers. Reel shall have a dual needle bearing supporting hub. The fluid hub shall be rated at a minimum pressure of 3,000 psi. This heavy duty low pressure reel shall have a hose capacity of 50 ft. of 1/2" I.D. hose for motor oil service. (ARO 614 232)
- b. 30 ft. of 1/2" I.D., 2,000 psi working pressure motor oil hose with 1/2" male pipe thread both ends. (ARO 623501-30)
- c. Hose stop for 1/2" I.D. hose described above. (ARO 5668)
- d. 1/2" female pipe thread with built-in swivel motor oil pre-set control nozzle. Nozzle shall indicate amount of oil delivered in quarts. Totalizer shall record amount delivered in gallons. Nozzle shall have manual non-drip, tip assembly (ARO 72692), trigger shall lock open and shut off automatically. (ARO 635 364)
- e. Provide 1/2" shut-off valves at inlet of hose reel. (ARO 66592)
- f. Provide ARO 61418(S) pulser, 24V, with shut-off valve. Occurs in Fuel and Vacuum Building only.

2. Water Hose and Anti-freeze Hose Assembly:

- a. Heavy duty low pressure open hose reel which shall be designed to meet the strictest requirements of the most rugged service. The reel shall be heavily reinforced with heavy duty mounting brackets, rolled edge sheaves and extra large rollers. Reel shall have a dual needle bearing supporting hub. The fluid hub shall be rated at a minimum pressure of 3,000 psi. This

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heavy duty low pressure reel shall have a hose capacity of 50 ft. of 3/8" I.D. water hose described below. (ARO 614-232)

- b. 30 ft. of 3/8" I.D., 300 psi working pressure water hose with 1/2" male pipe thread on one end and 1/4" male pipe thread on other end. (ARO 622401-30)
 - c. Hose stop for 3/8" I.D. water hose described above. (ARO 5671)
 - d. 1/4" female pipe thread, positive lever control, smooth flow, non-drip, neoprene rubber spout radiator bibb. (ARO 635-131)
 - e. Water and anti-freeze pulsers shall be Neptune type "A" Green Seal meter 3/4" size with Model 106 register. Impulse switch shall be a Neptune Model 31 with 1/10 gallons per pulse.
 - 1. Oil pulser shall be 24 V.D.C. 1/2" N.P.T.(f) with US pints pulsemeter.
3. Chassis grease hose assembly with reels:
- a. Heavy duty high pressure open hose reel which shall be designed to meet the strictest requirements of the most rugged service. The reel shall be heavily reinforced with heavy duty mounting brackets, rolled edge sheaves and extra large rollers. Reel shall have a dual needle bearing supporting hub. The fluid hub shall be rated at a minimum pressure of 10,000 psi. This heavy duty high pressure reel shall have a hose capacity of 50 ft. of 3/8" I.D. hose described below. (ARO 614-231)
 - b. 1/2" male pipe thread inlet and 1/2" female pipe thread outlet at 90 degrees angle high pressure (10,000 psi maximum) shut off valve. (ARO 636-043)
 - c. Hose stop (ARO 5668)
 - d. 3/8" male pipe thread to 3/8" female pipe thread high pressure "Z" type swivel. (ARO 636 088)
 - e. 30 ft. of 3/8" I.D., 4,000 psi working pressure chassis grease hose with 3/8" male pipe thread both ends. (ARO 624401 30)

- f. 3/8" male pipe thread to 3/8" female pipe thread high pressure "Z" type swivel. (ARO 636 088)
 - g. 3/8" female pipe thread metered shot control handle with 7" hydraulic nozzle with coupler. Trigger action (with half or full stroke) gives single shot or continuous flow of lubricant at line pressure. (ARO 636 104, 636 030)
4. Gear oil hose assembly with reels:
- a. Heavy duty low pressure open nose reel which shall be designed to meet the strictest requirements of the most rugged service. The reel shall be heavily reinforced with heavy duty mounting brackets, rolled edge sheaves and extra large rollers. Reel shall have a dual needle bearing supporting hub. The fluid hub shall be rated at 3,000 psi working pressure. This heavy duty low pressure reel shall have a hose capacity of 50 ft. of 1/2" I.D. hose described below. (ARO 614-232)
 - b. Hose stop (ARO 5668)
 - c. 1/2" FPT pipe thread inlet and 1/2" female pipe thread outlet with 1/2" ball valve, 2,000 psi working pressure. (ARO 66592)
 - d. 30 ft. of 1/2" I.D., 2,000 psi working pressure gear oil hose with 1/2" male pipe thread both ends. (ARO 623501.30)
 - e. 1/2" female pipe thread with built-in swivel, non-metered gear oil control handle with trigger type manual control and flexible rubber nozzle with non-drip tip. (ARO 635-399)
5. Torque oil hose assembly:
- a. Heavy duty low pressure open hose reel which shall be designed to meet the strictest requirements of the most rugged service. The reel shall be heavily reinforced with heavy duty mounting brackets, rolled edge sheaves and extra-large rollers. Reel shall have a dual needle bearing supporting hub. The fluid hub shall be rated at a minimum pressure of 3,000 psi. This heavy duty low pressure reel shall have a nose capacity of 50 ft. of 1/2" I.D. hose described below. (ARO 614-232)

- b. 30 ft. of 1/2" I.D. 2,000 psi working pressure engine or turbine oil hose with 1/2" male pipe thread both ends. (ARO 623501-30)
 - c. Hose stop for 1/2" I.D. hose described above. (ARO 5668)
 - d. 1/2" female pipe thread with built-in swivel turbine oil control nozzle. Nozzle shall indicate amount of torque oil delivered in quarts. Nozzle shall have a manual non-drip assembly. (ARO 635-383)
6. Air hose assembly:
- a. Heavy duty low pressure open hose reel which shall be designed to meet the strictest requirements of the most rugged service. The reel shall be heavily reinforced with heavy duty mounting brackets, rolled edge sheaves and extra-large rollers. Reel shall have a dual needle bearing supporting hub. The fluid hub shall be rated at a minimum pressure of 3,000 psi. This heavy duty low pressure reel shall have a hose capacity of 50 ft. of 3/8" I.D. air hose described below. (ARO 614-232)
 - b. 30 ft. of 3/8" I.D., 300 psi working pressure air hose with 1/2" male pipe thread on one end and 1/4" male pipe thread on other end. (ARO 622401-30)
 - c. 1/4" female pipe thread air line coupler. 34 cfm full flow at 100 psi line pressure. (ARO 210)
 - d. 1/2" shut off valve at inlet of hose reel. (ARO Y25-2)
 - e. Air hose assembly of deodorizing system shall be provided with the Bus Interior Cleaning and Deodorizing System.
7. Air outlets:
- a. 1/4" female pipe thread air line coupler, 34 cfm full flow at 100 psi line pressure, maximum inlet pressure 250 psi. (ARO 210)

- b. 1/4" male pipe thread male to male nipple.
(ARO 1950)
- c. 1/4" male pipe thread air line connector. 34
cfm full flow at 100 psi line pressure. (ARO
2608)
- d. 1/4" female pipe thread air line connector.
34 cfm full flow at 100 psi line pressure.

E. Waste Oil Drain Arm:

- 1. Waste oil drain arm shall be as shown on plumbing
drawings. Drain shall include extension leg and
caster. Reach 98", funnel diameter of 18", height
adjustment - 20". (Reach to 125", Wall Bracket.
Large capacity bowl for bus engine drain.) Balcrank
#45120.

2.11 Piping

A. Compressed Air - Symbol CA

- 1. Pipe and fittings: All piping shall be Schedule
40 galvanized steel pipe with galvanized 150 lb.
malleable iron screwed or flanged fittings.

B. Emergency Generator Diesel Fuel System - Symbol FO

- 1. Pipe and Fittings: Corrosion resistant fiberglass
reinforced plastic pipe and fittings (FRP), Red
Thread II - UL label, as manufactured by A.O. Smith -
Inland Inc.

C. Gasoline - Symbol G-1.

- 1. Pipe and Fittings: Corrosion resistant fiberglass
reinforced plastic pipe and fittings (FRP), Red
Thread II - UL label, as manufactured by A.O. Smith
- Inland Inc.

D. Diesel Fuel System - Symbol DF

- 1. Pipe and Fittings:
 - a. Above Ground: Schedule 40 black steel with 150
lb. malleable iron fittings. Use threaded
joints with petroleum resistant cement joint
compound.
 - b. Below Ground: Corrosion resistant fiberglass
reinforced plastic pipe with T.A.B. Joint and
fittings (FRP), Red Thread II - UL label, as
manufactured by A.O. Smith - Inland Inc.

E. Anti-freeze - Symbol AF and Solvent - Symbol SO Systems

1. Pipe and Fittings:

- a. Above Ground: Schedule 40 black steel with 150 lb malleable iron fittings. Use threaded joints with petroleum resistant cement joint compound.
- b. Below Ground: Corrosion resistant fiberglass reinforced plastic pipe and fittings (FRP), Red Thread II - UL label, as manufactured by A.O. Smith - Inland Inc.

F. Shop Systems Piping:

1. Pipe and fittings:

- a. Motor oil - Symbol MO, gear oil - Symbol GO, and torque oil - Symbol TO:

- 1) Above Ground: Schedule 80 black steel ASTM A106 Grade B seamless with 3000 lbs. forged steel socket weld fittings and welded joints.
- 2) Below Ground: Schedule 80, ASTM A106, Grade B, seamless steel pipe with welding type fittings, all wrapped, and surrounded by a secondary containment pipe shell of Hy-Trel plastic manufactured by Du Pont Co., with the annular space between the pipes completely filled with pea gravel.

- b. Chassis grease - Symbol CG: Schedule 160 black steel pipe ASTM A106 Grade B seamless with 6000 lb. forged steel socket weld fittings and welded joints.

2. Special fittings, accessories and valves. (ARO)

G. Hydraulic fluid system

1. Schedule 80 black steel pipe ASTM A106 Grade B seamless with 3000 lb. forged steel socket welded fittings.

H. Waste oil Symbol WO and waste fuel Symbol WF

1. Piping shall be service weight, coated hubless cast iron pipe and fitting with stainless steel coupling manufactured and installed in accordance with Cast Iron Soil Pipe Institute Standard No. 301-78.

- I. Vent piping for all systems - Symbol WFV, WOV, DFV, AFV, GV, MOV, TOV, SOV
 1. Corrosion resistant fiberglass reinforced plastic pipe and fittings (FRP), Red Thread II - UL label, as manufactured by A.O. Smith - Inland Inc.

2.12 Valves

A. Compressed Air System:

Ball valves:	Nibco T-580
Check valves:	Nibco T 413-Y
Gate valves:	Nibco T-180

B. Engine Diesel Fuel Oil System:

Gate valves:	Crane No. 424 or 426
Globe valves:	Crane No. 7
Check valves:	Crane No. 132, lift check

C. Gasoline System:

Gate valves:	Crane No. 424 or 426
Globe valves:	Crane No. 7
Check valves:	Crane No. 132, lift check

D. Anti-Freeze and Solvent System:

Gate valves:	Crane No. 424 or 426
Globe valves:	Crane NO. 7
Check valves:	Crane No. 132, lift check

E. Diesel Oil System:

1. Shut-off valves shall be butterfly or plug valves. Plug valves shall be full port rated at 200 psi W.O.G. Valves shall be made of semi-steel. Valves shall be A.C.F. Fig. R1431. Rockwell Nordstrom Fig. 115 or equal. Butterfly valves shall be center line Series A or equal. Butterfly valves shall have a mechanite body. 304 s.s. stem 304 s.s. disc. glass filled teflon bushings Viton seal.
2. 3 way, 3 port, 2 position valves shall be Rockwell Nordstrom semi-steel multi port Fig. 3475 for 3" and Fig. 3413 for 2". Arrangement to match plans. Valves shall be 200 lbs. lubricated valves with button head lubrication fittings, coated plug and adjustment gland.
3. Provide L-9 and P-2 wrenches, one each for 3" valves and one each for 2" valves.

4. Rockwell 4000 high pressure hydraulic hand gun with 1 box of 6 "J" size #555 sealant.
 5. Diesel fuel strainer shall be Mueller Steam Specialty #155 cast iron body top removal basket. Basket shall be stainless steel of 80 mesh.
- F. Motor oils, gear oil, torque oil and chassis grease systems.
1. Motor oil, torque oil and gear oil shut-off valves shall be Clayton Mark Pacific valves Petro 790K union end ball valves. 1" valve shall be rated at 3500 psi. Vogt SW-1871 forged steel globe valve may be used as an option.
 2. Chassis grease shut-off valves shall carbon steel full port globe valve, or equal.
- G. Hydraulic fluid system
1. Shop lift hydraulic oil shut-off valves - Jamesbury butterfly valves. Valves shall have stainless steel shaft, rated at 350 psi minimum.

2.13 Tank Level Sensing System

- A. Provide a tank level sensing system including:
1. Sensing probe in each fuel tank.
 2. Manhole with manhole cover for sensing probe.
 3. Wall mounted computerized inventory monitor with integral printer and LED display with 5 digits and low inventory and water in tank warning.
- B. Provide individual tank level sensing probe for the following tanks:
1. Diesel (4 tanks and 1 emergency generator diesel fuel tank).
 2. Gasoline (1 tank).
 3. Motor oil (1 tank).
 4. Anti-freeze (1 tank).
 5. Torque oil (1 tank).

6. Solvent (1 tank).
 7. Waste fuel (1 tank).
 8. Waste oil (1 tank).
- C. Provide inventory monitor with integral printer and LED display as follows:
1. One monitor for 4 diesel tanks, gasoline tank, motor oil, tank, anti-freeze tank and waste fuel tank.
 2. One monitor for solvent tank, torque oil tank, waste oil tank, and emergency generator diesel fuel tank.
- D. Manufacturer: Veeder-Root Model TLS-250. Provide two boxes of 50 paper rolls for printer.
- E. Install in accordance with manufacturer's instructions technical manual 14-007 dated 8/82.

2.14 Piping Leak Detectors:

- A. Provide piping leak detectors which will restrict the pumped fluid flow in the event of a loss of pipe pressure due to a leak, as shown on the drawings.
- B. Locate one each in the pump discharge piping in the tank mounted pump manholes, one each for each of the following tanks and pumps:

<u>Tank No.</u>	<u>Pump No.</u>
TK-6	GP-1
TK-7	DFP-1
TK-9	AFP-1
TK-12	SOP-1

- C. Locate two large-flow pipe-mounted leak detectors in the two diesel oil piping discharge mains, ahead of the oil filters in the diesel oil pump room as shown on the drawings.
- D. Leak detector shall be as manufactured by Red Jacket Pump Co.

2.15 Tank and Piping Leak Sensing Equipment:

- A. Provide tank and piping leak sensing equipment and system Model TRS-76-6-12 as manufactured by Adams Precision Instrumentation Company (API) with 5-year extended warranty and Bi-annual calibration.
- B. There shall be one alarm and control panel for each of the tanks and piping systems.
- C. The sensing equipment shall include API sensors for the following tanks and piping systems:

<u>Tank No.</u>	<u>Tank Leak Sensor Located in Annular Space Between inner and Outer Tanks</u>	<u>Piping Leak Sensor (Model TRS)</u>
TK-1 (Diesel)	X	X
TK-2 (Diesel)	X	
TK-3 (Diesel)	X	X
TK-4 (Diesel)	X	
TK-5 (Waste Fuel)	X	---
TK-6 (Gasoline)	X	X
TK-7 (Diesel Emergency)	X	X
TK-8 (Motor Oil)	X	---
TK-9 (Antifreeze)	X	X
TK-10 (Waste Fuel)	X	---
TK-11 (Torque Oil)	X	---
TK-12 (Solvent)	X	X
(Separator)	X	---

- 2.16 Oil/Water Separator: Enquit (Engineered Products, Inc.) Model M-1. Separator shall be double wall construction with monitoring well and leak detector sensor. (Tel (918) 599-8111)

ARTICLE 3 - EXECUTION

3.01 Piping Installation, General

- A. Installation of piping shall be made substantially as indicated on drawings, installed in accordance with the ANSI Standard Code for Pressure Piping B31.1, latest issue, including anchorage of piping guides and supports for such piping.
- B. Horizontal and vertical positions and arrangement of pipelines as shown on drawings shall be confirmed at the site of work prior to fabrication and installation. The accompanying drawings are intended for the

Contractor's guidance, and Contractor shall verify their accuracy and immediately notify the Engineer of any discrepancies so that such discrepancies may be resolved prior to actual fabrication or installation of work. Minor changes in position of piping, as necessary to meet job conditions, shall be anticipated by the Contractor, and shall not be made the basis for change order. Changes affecting accessibility to or clearance about equipment or accessories shall be promptly communicated to the Engineer.

- C. Sizes and arrangement of piping shall be as shown on the drawings; in case of inconsistency of details for final connections, resulting in conflict, such conflict shall be resolved by the Engineer.
- D. Attention is called to the inclusion of the flow diagrams in the list of working drawings. These flow diagrams are not for the purpose of giving physical dimensions or locations, but rather to make clear the interconnections, by the piping, of the various units of the process. If an item is shown on either the flow diagram or the piping plan or detail drawings, but not on both, it will be assumed that the Contractor has included such item in his estimate of the cost of the work.
- E. In the assembly of the piping system, the longest available commercial standard lengths of piping shall be utilized to minimize number of piping joints. Piping shall be accurately cut to field measurement to permit placement without forcing or springing, except where requirements for cold springing are shown.
- F. All piping shall be run straight and parallel with adjacent walls and shall present a uniform and neat appearance.
- G. Each piece of pipe, fitting and valve shall be carefully inspected on the inside and outside to see that there is no defective workmanship or obstructions in the pipes, fittings or valves.
- H. During construction, open ends of piping shall be protected with temporary closures to prevent entry of dirt and debris into lines. Piping size reductions shall be made with eccentric fittings, with flow lines of piping in alignment. No bullhead connections will be permitted, except where specifically shown. Piping shall be plumb and square and arranged for venting or drainage as designated.

- I. Provide dielectric insulation at points where copper or brass piping and equipment comes in contact with ferrous piping or equipment. This requirement does not apply to brass valves in ferrous piping where such valves are not externally grounded. Provide on each ferrous pipe connected to underground piping system a flange insulator for complete electrical isolation. Pipeline Seal and Insulator Company, P.S.I., Type "D", full sleeve, double washers, or equal.

3.02 Wrapping of Pipe:

- A. Prior to delivery to the job site wrap buried steel pipe with corrosion protective wrap of pressure sensitive polyvinyl chloride or polyethylene tape applied after pipe has been thoroughly cleaned. Tape shall be nominal thickness of 20 mils consisting of one layer of 20 mil tape or two separate layers of 10 mil tape. Apply with suitable primer adhesive recommended by manufacturer.
- B. Tightly apply tapes with 1/2 inch minimum uniform lap, free from wrinkles and voids. Use approved wrapping machines and experienced operators.
- C. Tapes: "Chasekote" No. 775, Plicoflex No. 340-25, Polyker 922 and 923, "Scotchwrap" No. 51, or equal. Apply tape after pipe is cleaned as recommended by the tape manufacturer.
- D. Cover filed joints and fittings by wrapping polyethylene or polyvinyl tape specified for wrapping pipe, except use two layers of 10 mil thick tape. Wrap joints to provide two full thickness of tape over joint and extend minimum of six-inches over adjacent pipe covering. Where fittings are wrapped, width of tape shall not exceed 2". Apply adequate tension so tape will conform tightly to contours of fittings. Use putty tape insulation compounds such as "Scotchfill", or equal, to fill voids and provide smooth even surface for application of tape wrap.
- E. Alternate: In lieu of tape wrap, factory applied plastic coating on steel pipe will be acceptable. Use tapes for field joints, fittings, and valves same as specified above. Pipe Coating: "X-Tru-Coat" (20 mil thick) as manufactured by Standard Pipe Protection, Republic, Pipe Line Service Corp., Scotchkote 202 (12 mil thick) as manufactured by 3 M Company, or equal, with "X-Tru-Tape", or equal, for joints, fittings, and valves.

- F. Test wrapped or coated pipe, fittings, and field joints on job site, after assembly, with approved high voltage holiday detector Tinker and Rasor equal, with positive signaling device to indicate any flaws, holes, or breaks in wrapping. Set peak voltage to 10,000 volts. If Scotchkote 202 is used set peak voltage to 1,000 volts. Place piping on temporary blocks to allow testing to run along underside of pipe. Repair defects before covering. Conduct testing in presence of Engineer.

3.03 Underground Storage Tanks:

- A. Tank storage handling and placing: Shall be done with care and in a manner that will minimize damage to the coating and will not reduce its effective protective value. The coated tanks shall be placed in position carefully and with a minimum of handling. All damaged surfaces shall be repaired and tested as specified herein before.
- B. Tank installation: The top of the tanks shall be set as shown. The tanks shall be so located that the fuel discharge pipe slopes up uniformly toward the fuel outlet, and the pipe shall not be embedded in the concrete pavement. The tank fill, cleanout and gauge connections, and access manways shall be as shown. Tanks shall be set dead level and held securely in place with steel anchor straps as indicated. Metal straps and anchors, except for the portions embedded in concrete, shall be coated with tar epoxy except that no testing will be required.
- C. Backfilling: Initial backfill shall be sand as elsewhere specified in this Section of the Specifications. The sand backfill shall be placed in 8" lifts up to an elevation of 6" above the top of the tanks. The backfill material shall be brought to optimum and mechanically compacted to a relative density of 90% before pipes, fittings and equipment are attached to the tanks.
- D. After inspection testing and approval of the piping by the Engineer, the final backfill shall be completed.
- E. Handling and installation of tank shall follow strict manufacturer recommendation.

- F. Sand: Sand used for backfilling underground tanks shall be free from organic material, clay ball, or other deleterious substances, and shall not have a sand equivalent less than 75 as determined by Test Method ASTM D2419.
- G. Coating testing: The coating shall be examined for flaws and tested for thickness and holidays. The Contractor shall provide the facilities, personnel and equipment for testing for holidays and thickness. Thickness of coating shall be measured by commercial film thickness gauge. Coating shall be tested for pinholes, holidays, and other defects directly prior to placement with an electric flaw detector, equipped with a bell, buzzer, or other type of audible signal that operates when a holiday is detected.
- H. Check of the holiday detector potential may be made by the Engineer at any time to determine the suitability of the detector. Damaged areas, including areas damaged by thickness testing, shall be repaired with materials identical with that used originally and, after drying, shall be retested electrically as specified above.
- I. Tank cleaning: Before the Contractor withdraws from the job, the interior of each tank that is accessible shall be cleaned and made free from all foreign matter, such as dirt, debris, grease, and oils that might later interfere with the operation of the system, or that might be a source of contamination of the product to be stored in the tank. The cleaning shall be done to the satisfaction of the Engineer.
- J. After installation and cleaning underground tanks shall be filled with petroleum products or other products as listed on the drawings. All products for tank filling will be provided by the District.

3.04 Excavation and Backfill:

- A. Comply with the requirements for trenching, backfilling and compaction as specified in Section 02.221 entitled Trenching, Backfilling and Compaction for Utilities.
- B. Temporary unshored excavations should not be cut steeper than 1:1.
- C. Provide Dewatering of tank excavations as required.

D. The existing fill soils, which contain debris and are not uniformly well compacted, are not considered suitable for tank support. Existing fill soils shall be excavated and replaced with uniformly well compacted fill. The tank pads shall be supported on either the compacted fill or the undisturbed natural soil.

E. Flooding of the backfill will not be permitted.

3.05 Cleaning and Flushing of Piping Systems:

A. Flush all piping systems with a solution of approximately 10% inhibited HCL solution, or equivalent, to clean the inside of all pipes. Then flush systems with fresh water until no residue of solution is detected.

3.06 Tests

A. General:

1. Tests must be performed and systems approved prior to painting, covering, insulating, furring, or concealing piping.
2. Provide all test equipment, instrumentation and labor in conjunction with tests.
3. Prior to test, protect or remove all control devices, air vents, and other items which are not designed to stand pressures used in test.
4. Accomplish testing of piping in sections so as not to leave any pipe or joint untested.
5. Obtain prior approval for test procedures.
6. Responsibility for damages: Contractor shall pay for costs of repair and restoration of work of other trades damaged by tests or cutting done in connection with tests.

B. Waste fuel and waste oil systems: Cap or plug all outlets and fill entire waste and vent system with water to level of highest vent stack. System shall hold water for two hours. Tests of portions of system shall be similarly conducted except that stack of 15 feet above highest horizontal line to be tested shall be filled with water to maintain required head.

- C. Test each piping system with the service product for at least one hour at 150% of the operating pressure but not less than specified below:

<u>System tested</u>	<u>Gauge Pressure at Start of the test (PSIG)</u>	<u>Test with</u>
Compressed air system.	175	Air
Emergency generator and fuel oil system	100	Air
Gasoline system	175	Air
Diesel fuel system.	175	Air
Motor oil system.	1,500	Oil
Gear oil system.	3,000	Oil
Torque oil system.	1,500	Oil
Chassis grease system.	10,000	Oil
Anti-freeze system.	175	Water
Hydraulic fluid system.	500	Hydraulic fluid
Solvent piping system	175	Air
All vent pipes	100	Air

- D. Test wrapped or coated pipe, fittings, and field joints on job site, after assembly, with approved high voltage Holiday detector, "Tinker and Razor", or equal, with positive signaling device to indicate any flaws, holes, or breaks in wrapping. Set peak voltage to 10,000 volts. If Scotchkote 202 is used set peak voltage to 1,000 volts. Place piping on temporary blocks to allow testing to run along underside of pipe. Repair defects before covering. Conduct testing in presence of Engineer.

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DIVISION 15 - MECHANICAL

SECTION 15400 - PLUMBING SYSTEMS

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as built and all other applicable requirements of Document 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Soil, waste, and vent systems.
 - D. Domestic, hot and cold water systems.
 - E. Plumbing fixtures and trim.
 - F. Water heaters and steam generator.
 - G. Plumbing services and connection to equipment fixtures furnished and installed under other Sections.
 - H. Sump pump system.
 - I. Industrial waste system including clarifier.
 - J. Industrialized water system.
 - K. Steam system.
 - L. Water softener and deionizer.
 - M. Fuel gas system.
 - N. Storm water disposal system including roof drains and interior downspouts.
 - O. Tests.
 - P. Disinfecting water systems.
 - Q. Excavation, trenching and backfill.

1.02 Requirements:

- A. Codes and standards: Comply with all pertinent recommendations contained in latest edition of Los Angeles Plumbing Code.

1.03 Related Work Specified Elsewhere:

- A. Site Work: Division 2.
- B. Moisture Protection: Division 7.
- C. Finishes: Division 9.
- D. Electrical: Division 16.

1.04 Submittals:

- A. General: Comply with provisions of Section 15010, Mechanical General Provisions.
- B. Product data: Within 35 calendar days after receipt of Notice to Proceed, submit complete materials list and manufacturer's brochures of all items proposed to be furnished and installed. Submittal shall include but not be limited to:

- Pipes and Fittings
- Hangers and Supports
- Valves
- Plumbing Fixtures
- Water Heaters
- Pumps
- Water Softeners Brine Tank and Deionizer.
- Gas Pressure Regulators
- Cleanouts
- Drains
- Backflow Preventors
- Clarifier

1.05 Product Handling

- A. Protection: Use all means necessary to protect the materials of this section before, during and after installation and to protect the work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary and at no additional cost to the Owner.

ARTICLE 2 - PRODUCTS

2.01 General

- A. Pipe, valves, fixtures and appurtenances referred to herein by trade name and model number are intended as descriptive guidance and not as definitive specifications. All such references shall imply "or Approved Equal", by listed manufacturers.

2.02 Piping:

- A. Soil, waste, vent and storm drain piping (Symbols S,W,V,SD): Two inches and larger, above or below ground, inside of building to a point 5"-0" outside of building, shall be service weight, coated, hubless cast iron pipe, and fittings with stainless steel couplings in accordance with Cast Iron Soil Pipe Institute Standard No. 301-78.
- B. Waste and vent piping (Symbols W,V): Inside buildings, above ground, 1-1/2 inches, shall be galvanized steel, Schedule 40, or hubless cast iron pipe with stainless steel couplings in accordance with Cast Iron Soil Pipe Institute Standard No. 301-78.
- C. Domestic hot, cold water and industrialized cold water piping above ground (Symbols CW,HW,HWR,ICW): Shall be Type "L", hard drawn copper tubing, ASTM B-88. Joints in copper tubing shall be made up with 95-5 tin/antimony solder in accordance with manufacturer's recommendations. Wrought copper fittings shall be used, and, where necessary, combination of fittings reducers, and adapters shall be employed in making up the piping.
- D. Domestic water piping, below ground (Symbol CW): Shall be Type "K", hard drawn copper tubing, ASTM B-88. Joints in copper tubing shall be made up with 95-5 solder and Nokorode Flux, in accordance with manufacturer's recommendations. Wrought copper fittings shall be used, and where necessary, combination of fittings, reducers, and adapters shall be employed in making up the piping. Cast fittings will not be permitted.
- E. Discharge from air vent or relief valve: Shall be seamless carbon steel ASTM A53 grade B, galvanized, schedule 40. Fittings shall be class 150 maleable iron, galvanized.

F. Gas piping (Symbol G,MPG)

1. Gas piping above ground: Shall be Schedule 40 black steel ASTM A-120 as manufactured by National Tube, Republic, LTV, or approved equal. Pipe thickness shall be in accordance with ANSI B36.10, latest edition. All gas piping shall be welded construction. Screwed fittings will be permitted in lieu of welded construction provided all screwed joints must be accessible for repair. Screwed fittings will not be permitted in furred ceilings or chases. Screwed fittings will not be allowed on pipe larger than 2 1/2".
2. Gas pipe fittings: Shall be of materials as follows:
 - a. All welding fittings shall be factory made butt welded conforming to ANSI B16.971 and shall be used full line size, except as specified herein, for each and every tee, branch, elbow, etc., with reducers after fittings if required.
 - b. All screwed fittings shall be "Crane", or approved equal, class 150 malleable iron and shall conform to ANSI B16.3-71. Screw joints shall be made up with teflon tape. Screwed threads shall be in accordance with ANSI B2.1-68.
3. Gas piping below ground: Shall be of the same materials and shall meet the same working pressure requirements specified for gas piping above ground, except that it shall be protected with tape wrap or plastic factory applied coating as specified hereafter. Threaded pipe will not be allowed below grade.

G. Pumped Drain Piping - Symbol PD: Shall be galvanized steel, Schedule 40, ASTM A-120 with cast iron screwed fittings class 125 or flanged fittings.

H. Industrialized hot water (Symbol IHW) and steam (symbol ST) piping from steam generator: Shall be Schedule 80 black steel pipe ASTM A106 Grade B seamless with 3000 lb. steel socket welded fitting.

I. Condensate Drain (Symbol CD): Type "M" copper with 50/50 solder and wrought copper fittings.

J. Wrapping of pipe:

1. Prior to delivery to the job site wrap buried pipe with corrosion protection wrap of pressure sensitive polyvinyl chloride or polyethylene tape applied after pipe has been thoroughly cleaned. Tape shall be nominal thickness of 20 mils consisting of one layer of 20 mil tape or two separate layers of 10 mil tape. Apply with suitable primer adhesive recommended by manufacturer.
2. Tightly apply tapes with 1/2 inch minimum uniform lap, free from wrinkles and voids. Use approved wrapping machines and experienced operators.
3. Tapes: "Chasekote" No. 775, Plicoflex No. 340-25, Polyker 922 and 923, "Scotchwrap" No. 51, or equal. Apply tape after pipe is cleaned as recommended by the tape manufacturer.
4. Cover field joints and fittings by wrapping polyethylene or polyvinyl tape specified for wrapping pipe, except use two layers of 10 mil thick tape. Wrap joints to provide two full thickness of tape over joint and extend minimum of six-inches over adjacent pipe covering. Where fittings are wrapped, width of tape shall not exceed two inches: Apply adequate tension so tape will conform tightly to contours of fittings. Use putty, tape insulation compounds such as "Scotchfil", or equal, to fill voids and provide smooth even surface for application of tape wrap.
5. Alternate: In lieu of tape wrap, factory applied plastic coating on steel pipe will be acceptable. Use tapes for field joints, fittings, and valves same as specified above. Pipe Coating: "X-Tru-Coat" (20 mil thick) as manufactured by 3M Company, or equal, with "X-Tru-Tape", or equal, for joints, fittings, and valves.
6. Test wrapped or coated pipe, fittings, and field joints on job site, after assembly, with approved high voltage holiday detector Tinker and Razor, or equal, with positive signaling device to indicate any flaws, holes, or breaks in wrapping. Set peak voltage to 10,000 volts. If Scotchkote 202 is used at peak voltage to 1,000 volts. Place piping on temporary blocks to allow testing to run along underside of pipe. Repair defects before covering. Conduct testing in presence of Engineer.

2.03 Valves:

A. General:

1. Valves in each group and pressure class shall be of one manufacturer.
2. Use rising stem gate valves wherever space permits. If not enough space, non rising stem gate valves will be acceptable.
3. Butterfly valves used as isolation valves or for future points of connection shall be equipped with manufacturer's flanged spools, be furnished with tapped lugs, or be of flanged body design.
4. All manually operated butterfly valves, ball valves and plug valves shall be fitted with adjustable stops for use as balancing valves.
5. All valves on copper pipe 2" and small shall have threaded ends.

B. Acceptable manufacturers:

<u>Valve Type</u>	<u>Manufacturer</u>
1. Gate, globe, angle and swing check	Crane, Walworth, Fairbanks, Lunkenheimer, Grinnell, Stockham, Nibco, or Jenkins
2. Wafer check valves	Mission, Nibco, Grinnell, or Centerline
3. Plug Valves	Nordstrom, Walworth, DeZurik or Homestead
4. Ball Valves	Jamesbury, Grinnell, Crane, Nibco, or Stockham
5. Butterfly valves	Nibco, Jenkins, Centerline, Keystone, Grinnell, Demco, DeZurik, Stockham or Lunkenheimer
6. Relief valves	Farris, Crane or C.M. Bailey
7. Needle valves	Crane, Dragon, Whitey

C. Valves Schedule (Nibco Plate Numbers shown for reference unless otherwise identified):

<u>Service</u>	<u>Size</u>	<u>Description</u>	<u>Plate No.</u>
Gate Valve	2" and smaller	Union bonnet, bronze	T-111
		Rising stem, solid Threaded Wedge, Class 125	T-111
	2 1/2" and larger	Bolted bonnet, NRS Class 125 Flanged	F-619
Check Valve (swing type)	2" and smaller	Y-pattern bronze Class 125	T-413
Check Valve (non slam)	All sizes	Globe Type	Muessco #105 BP
Butterfly Valves	4" and larger	Lug type cast iron body, bronze disc,	NL 082 150 PSI WOG

Steam

Globe Valve

Industrialized Hot Water

Ball Valve		Carbon steel Class 300	Jamesbury Style AF-305-22
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Gas

Gate Valve	2-1/2" & smaller	Union Bonnet Bronze, screwed ends, Rising Stem, Class 125	T-111
	3" and larger	Bolted bonnet,	F 619
Plug Valve	1" and smaller	Semi-steel body screwed	DeZurik 425
	1-1/2" -	Semi-steel body	DeZurik 425

<u>Service</u>	<u>Size</u>	<u>Description</u>	<u>Plate No.</u>
Plug Valve	2" 2-1/2" & smaller	screwed Semi steel body flanged ends	DeZurik 425
<u>Industrialized Cold Water</u>			
Gate Valve	3" and smaller	Union Bonnet, Rising Stem, Class 125	T-111
	4" and larger	Bolted Bonnet OS&Y, Class 125, Flanged	F 617-0
Check Valve (swing type)	2" and smaller	Bronze screwed ends, Y-pattern Class 125	T-413-B
	2-1/2" & larger	Iron body bolted bonnet, Class 125 flanged	F-918

2.04 Flanges:

A. General: Provide where indicated and/or specified. Flanges connecting to cast iron valves or equipment shall be flat faced. Extend flange bolts through nut four full threads when made up.

B. Flange Schedule:

	<u>Service</u>	<u>Size</u>	<u>Description</u>
1.	Service using black steel pipe	All	ANSI 150 pound weld-neck or slip-on as indicated or required.
2.	Service using galvanized pipe	All	ANSI 150 pound galvanized cast iron screwed or Victaulic flange
3.	Service using copper tubing	All	150 pound bronze
4.	Copper to steel	All	Dielectric flanges 300 pound working pressure

2.05 Gaskets

- A. Services using steel 1/16" thick stainless steel inserted spiral asbestos Flexitalic CG, Garlock-Guardian, Crane or Goetze, Style 912
- B. Other Services 1/16" thick asbestos ring or full face gaskets, as required.

2.06 Bolts and Nuts

- A. Services using cast iron or steel flanges Regular unfinished carbon steel machine bolts with unfinished hexagon nuts, ASTM A307, Grade B
- B. Services using brass or copper flanges Square head brass machine heavy semi-finished brass hexagon nuts.

2.07 Unions

- A. General: Unions shall be provided where indicated and/or required for proper installation and maintenance of the systems. They shall conform to the following schedule:

	<u>Service</u>	<u>Size</u>	<u>Description</u>
1.	All services using black steel pipe	All	Class 150, malleable iron, screwed, Stockham 698
2.	All services using galvanized steel pipe	All	Class 150, malleable iron, screwed, galvanized
3.	All services using copper tubing	All	Wrought copper tail piece with red bronze nut, Nibco No. 733
4.	Steel to copper	All	Dielectric unions, Class 150 Stockham 693-1/2

In addition to specified manufacturers, products by "Nibco", "Stockham", "Lunkenheimer" or "Crane" will be acceptable if they comply with specifications.

2.08 Drop-Ear Elbows:

- A. Drop-ear elbows, 90-degrees, shall be "Nibco", No. 707-5, copper to-copper, or "Nibco", No. 707-3-5, for use at counter and wall, trim connection.

2.09 Piping Specialties and Piping Hangers:

See Section 15010 Mechanical General Provisions.

2.10 Cleanouts:

- A. Cleanouts shall be furnished for various locations and shall be similar and approved equal to the J.R. Smith catalog numbers listed. If it complies with these specifications one of the following manufacturers will be acceptable: Zurn, J.R. Smith, Josam or Tyler.

B. Cleanouts for outside of buildings - Symbol COTG:

1. Cast iron ferrule with brass plug brought up to 3" below grade and located in an access box. Access box shall be with cast iron double flanged body and secured, acoriated cast iron cover, lettered "Cleanout". Provide 24 square inch concrete ring for lower flange when access box is located in areas surfaced with asphalt paving or in non surfaced areas. Cleanout shall be:

J.R. Smith No. 4258

C. Floor Cleanout - Symbol FCO:

1. Finished Areas (Tile):

Cast iron cleanout with brass plug and square nickel bronze top adjustable to finished floor. Cleanout shall be:

J.R. Smith No. 4048

2. Finished Areas (Concrete):

Cast iron cleanout with brass plug and round extra heavy duty, scoriated cast iron top adjustable to finished floor. Cleanout shall be:

J.R. Smith No. 4258

D. Wall Cleanout - Symbol WCO:

1. Plastered Wall:

Cast iron cleanout tee with brass plug complete with square chrome plated wall access cover and flush with the wall frame. Cleanout shall be:

J.R. Smith No. 4558

2. Tiled Wall:

Cast iron cleanout tee with brass plug complete with square chrome plated wall access cover and flush over-wall frame. Cleanout shall be:

J.R. Smith No. 4553

2.11 Drains:

A. Floor drains shall be furnished for various locations and shall be similar and approved equal to the J.R. Smith catalog numbers listed. If it complies with these specifications one of the following manufacturers will be acceptable: Zurn, J.R. Smith, Josam, or Tyler.

B. Floor Drain - Symbol FD-1: Type - cast iron body, 5" square, polished nickel bronze grate with square holes, adjustable strainer head, caulk, bottom outlet, and trap primer connection.

J.R. Smith #1010-B-P

C. Floor Drain - Symbol FD-2: Type - cast iron 12" round top, medium duty bar grate with sediment bucket.

J.R. Smith #2360

D. Floor Drain - Symbol FD-3: Type - cast iron heavy duty, tractor grate.

J.R. Smith #2340

E. Floor Drain - Symbol FD-4: Type. cast iron body with 5" diameter nickel bronze low dome grate.

J.R. Smith #2005 A

F. Floor Sink - Symbol FS-1: Type - cast iron body, porcelain enameled interior, dome bottom strainer, polished nickel bronze rim and grate with square holes, caulk type, with flashing flange half grate.

J.R. Smith #3150-12

G. Floor Sink - Symbol FS-2: Type - cast iron body, with solid water dam collar, cast iron dome bottom strainer and underdeck clamp.

J.R. Smith #3960-Y

H. Trap primer - Symbol TP: As manufactured by Precision Plumbing Products or E & S Inc. and shall be approved by Los Angeles Testing Lab.

I. Roof Drain - Symbol RD-1: Type - cast iron body with flashing clamp, gravel stop and polyethylene dome.

J.R. Smith #1010

J. Overflow Drain - Symbol OD-1: Type - cast iron body with flashing clamp, gravel stop, polyethylene dome, cast iron 2" water dam collar.

J.R. Smith #1080

2.12 Backflow Preventers:

A. Type: Reduced pressure type backflow preventors, as approved by local authorities.

B. Acceptable manufacturers: Cla-Val Co., Hersey, Watts, or Neptune.

2.13 Water Hammer Arrestors:

A. Properly sized water hammer arrestors, designed and sized in accordance with Plumbing and Drainage Institute, Standard WH-201..

Zurn: Z-1700 Series
Josam: #1485 Series
Smith: #5000 Series
Precision: PPP Series

2.14 Hose Bibbs

- A. HB-1: 3/4 faucet, vandalproof lockshield bonnet, removable wheel handle chrome-plated casting with chrome plated vacuum breaker. "Acorn" No. 8121, or approved equal.

2.15 Domestic Hot Water Circulating Pump - Symbol CP-1:

- A. Type: In-line mounting, all bronze construction.
- B. Capacity: As shown.
- C. Construction: All bronze, mechanical seal, bronze sleeve type bearings, resilient mounted motor spring type coupler, centrifugal impeller, alloy steel shaft machined and hardened thrust collar.
- D. Motor: Standard housing, dripproof, voltage, phase, and current as shown.
- E. Acceptable Manufacturers: Bell & Gossett, Armstrong, or Taco.

2.16 Pressure and Temperature Relief Valves:

- A. Type: ASME rated, bronze body; Watts Series No. 40, 140, 240 or 340.
- B. Acceptable Manufacturers: Watts, or McDonnell Miller.

2.17 Plumbing Fixtures and Trim

- A. General:
 - 1. Each fixture shall be installed at the height and location shown on Architectural Drawings.
 - 2. Fixtures shall be set level.
 - 3. Joints between fixture and floor or wall shall be smoothly grouted with G.E. Silicone grout.
 - 4. Fixtures shall be white, except as otherwise specified.
 - 5. Supplies, traps and trap arms shall be set square with the wall and in line with fixture outlets.

6. All brass work and exposed piping used in conjunction with fixtures shall be polished chromium-plated, unless otherwise specified.
 7. All supplies and wastes shall have chromium plated escutcheons.
 8. All fixture P-traps shall be cast brass, solid or adjustable, L.A. pattern. Tubing traps will not be permitted.
 9. Exposed supply connections to fixture supply stops, flush valve and exposed waste connections from traps shall be made with chrome-plated I.P.S. brass nipples. Tubing sleeve covers will not be permitted.
- B. Acceptable manufacturers. Manufacturers shall be as listed below, except as otherwise specified for specific items.
1. Fixtures. Eljer, Kohler or American-Standard.
 2. Faucets, supply controls and drains: Eljer, Kohler, American-Standard, Chicago Faucet or T & S Brass.
 3. Supplies: Brass Craft, Harcraft or Chicago Faucet.
 4. Electric water coolers. Halsey Taylor, Haws, Sunroc.
 5. Flush valves: Sloan, Watrous or Delany.
 6. Closet seats: Beneke, Olsonite or Church.
 7. Fixture carriers: Smith, Zurn, Josam, or Wade.
 8. Showers: Kohler, Acorn, American Standard.
 9. Emergency eye wash and showers: Haws, or Western.
- C. Fixtures are scheduled on drawings, and are indicated by symbols. Carefully check drawings and furnish everything indicated and/or required for a complete installation. No extra will be allowed for omission or misinterpretation. Manufacturer's models and fixture numbers specified are intended as descriptive guidance for quality, size and type. All such references shall imply "or approved equal" by listed manufacturers.

D. Water Closet - Symbol WC-1:

1. Fixture: Kohler No. K-4430 ET, white vitreous china, water saver (3 Gal.) siphon jet, elongated bowl, wall hung, 1-1/2" top spud.
2. Flushometer valve: Sloan "Royal" No. 115-3 with center line of supply 24" above fixture.
3. Seat: Beneke No. 527 SS, white, open front less cover, self sustaining check hinges.
4. Supports: Floor mounted carrier shall be suitable for service intended, J.R. Smith 200 series.

E. Water Closet - Symbol WC-2

1. Fixture: Kohler No. K-4250 - ET, white, vitreous china, water saver (3 Gal.) siphon jet, elongated bowl, floor mounted, 1-1/2" top spud.
2. Flushometer valve: Sloan "Royal" No. 115-3 with centerline of supply 24" above fixture.
3. Seat: Beneke No. 527 SS, white, open front less cover, self sustaining check hinges.
4. Bolt caps Kohler No. K-4562.

F. Urinal - Symbol UR-1:

1. Fixture: Kohler No. K-4980-T "Bardon", white, vitreous china washout action jet, integral extended shields wall hung, 3/4" top spud, 2" outlet.

G. Urinal - Symbol UR-2:

1. Fixture: Kohler No. K-5007-T "Derry", white, vitreous china blow-out action integral extended shields wall hung, 3/4" top spud, 2" outlet.

2. Flushometer valve: Sloan "Royal" No. 186
3. Support: Floor mounted carrier shall be suitable for service intended, J.R. Smith 600 Series.

H. LAVORATORY - Symbol L-1

1. Fixture: Kohler No. K-2032 "Greenwich" wall nung, white, vitreous china, with splash lip, soap depression concealed hanger.
20" x 18",
2. Faucet: Kohler No. k-7408-T faucet and perforated grid strainer.
3. Supplies: Brass Craft No. SST-R3712A.
4. Trap: 1-1/4" x 1-1/2" cast brass L.A. pattern P-trap.
5. Support: Floor mounted carrier shall be suitable for service intended, J.R. Smith 700 Series.

I. Lavatory - Symbol L-2

1. Fixture: Kohler No. K 2900 Farmington, counter mounted, enameled cast iron with 4" faucet centers.
2. Faucet: Kohler No. K-7408-T faucet and perforated grid strainer.
3. Supplies: Brass Craft No. SST-R3712A.
4. Trap: 1-1/4" x 1-1/2" cast brass L.A. pattern P trap.
5. Metal frame: Stainless steel.

J. Lavatory - Symbol L-3:

1. Shall be same as specified for L-2 except faucet shall have 4" wrist control handles for handicapped.

K. Wash Fountain - Symbol WF-1

1. Fixture: Bradley Type CFC 54" stainless steel semi-circular wash fountain, with integral back splash, powder soap dispenser (MPSD), Thermostatic mixing valve, water saver spray head and stainless steel scuff base pedestal. Supplies and vent through wall.
2. Trap: Code approved "P"-trap.

L. Service Sink - Symbol SS-1

1. Fixture: Kohler K-6718 enameled cast iron service sink with blank back, 22" x 18" depth 12", with K8936 SS rim guard.
2. Fittings: Kohler K8928 chrome plated faucet with vacuum breaker, K-0146 perforated strainer, 3" I.P.S.
3. Trap: Code approved "P"-trap.

M. Service Sink - Symbol SS-2

1. Fixture: Kohler K-6710 "Whitby" enameled cast iron service sink, corner floor type, 28" with K8940 coated wire rim guard.
2. Fittings: Kohler K-8928 chrome plated faucet with vacuum breaker, K-9146 perforated strainer, 3" I.P.S.
3. Trap: Code approved "P"-trap.

N. Shower - Symbol SH-1

1. Shower Head: Acorn No. 821-K-Y shower head with 3.0 GPM restrictor.
2. Valve: Kohler 6914 pressure balance mixing valve with integral stops.

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3. Drain: J.R. Smith #2010-A (2").
 4. Trap: Code approved "P" trap.
- O. Shower - Symbol SH-2:
1. Aerated hand shower, Speakman VS-101, with VS-120 swivel connector, VS-123-24" slide bar, VS-145-64" square lock chrome plated brass hose with rubber liner and VS-111 shower arm diverter.
 2. Shower Head: Acorn No. 800 K-Y shower head with 3.0 GPM restrictor.
 3. Valve: Kohler 6914 pressure balance mixing valve with integral stops.
 4. Drain: J.R. Smith #2010-A (2").
 5. Trap: Code approved P trap.
- P. Electric Water Cooler - Symbol EWC-1:
1. Fixture: Sunroc dual purpose stainless steel wall hung Model HCWC-8-S, 7.5 GPH at Standard Rating Conditions.
 2. Supply: Provide supply and loose key stop.
 3. Trap: 1-1/4" Code approved P trap.
- Q. Emergency Eyewash and Shower - Symbol ES-1
1. Fixture: Sunroc - Western No. 9231, combination eyewash and shower, stainless steel with stay open ball valve on shower, and hand and foot operated ball valve on eyewash.
- R. Sink - Symbol S-1
1. Fixture: Just No. DL2233-A-GR self-rimming, 18 gauge stainless steel double compartment sink, 3 faucet hole drillings, left compartment with garbage disposer.

2. Trim: Kohler K-7761-T, Triton II, sink faucet with 8" swing spout, aerator, K-8801 Duostrainer.
3. Trap: 1-1/2" cast brass P-trap.
4. Garbage Disposer: In-Sink-Erator Model 77, 1/2 hp/115v/1ph/60hz.

S. Waste Oil Basin - Symbol WOB-1

1. Fixture: Rectangular terrazzo floor mounted receptor 36"x24"x12" with 6" floor drop with stainless steel cap.
2. Drain shall be cast brass with removable bronze strainer.
3. Cap of one piece 20 gauge of 302 stainless steel cast integral on front side.
4. Provide a 12" high stainless steel splash in the back of receptor.
5. Install as indicated on the drawings.
6. Manufacturer: Stern-Williams Company Model HL-2100.

2.18 Water Softener

- A. General: The unit shall have the flow rate and capacity as indicated on the drawings. The unit shall have a softener tank, a water meter, brine maker, a control panel and all necessary components for automatic operation of the unit.
- B. The unit shall be Bruner 150 HBR-1 or equivalent by O & G or Culligan.
- C. Equipment:
 1. Softener Tanks: Shall have 60% of more freeboard, 100 psi working pressure and 150 psi test pressure, with structural steel legs welded to tank, and shall be hot dipped galvanized inside and out after fabrication. Lower distribution system should consist of a radial network of full flow non-clogging individual strainers evenly spaced on the cross sectional area of the tank.

2. Brine system shall be Capaci-Trol type with dry salt storage compartment, sufficient for at least four regenerations at full salting and a saturated brine compartment. It shall be equipped with a float operated plastic fitted brine valve and allow for simple adjustment of the salt dosage without removing the brine valve. Tank shall be constructed of 3/16" thick fiberglass with cover. Brine tank shall be furnished filled with salt.
 3. Main operating valve on softener shall be automatic multiport diaphragm type slow opening and closing and free of water hammer. Valve seats shall be Noryl. Valve shall be equipped with an automatic self-adjusting brine injector to draw in brine and rinse at a constant rate regardless of water pressure in the range 30 to 100 psi. The unit shall have an internal automatic bypass of hard water during regeneration. Valve shall have a soft water sampling cock.
 4. Provide a complete change of salt and/or other chemicals required for the softener and the brine system.
- D. Regeneration sequence shall be in this order: Backwash, brine, slow rinse, and fast down-flow flush.
- E. Controls shall have adjustable duration of the various steps in regeneration, shall allow for push-button start, and also provide complete manual operation. Regeneration shall be initiated by an automatic reset water meter providing fully automatic operation; electrical lockouts as required shall be furnished. Flow controls for backwash and flush shall be fully automatic requiring no field adjustment.
- F. Water testing set shall be furnished for hardness test, complete with metal container for wall mounting.
- G. Instructions and "Start-up":
1. A complete set of operating instructions covering the installation, maintenance, and operation of the softener system shall be furnished bound in booklet form.
 2. Contractor shall provide for the service of a competent supervising agent from the water softener

manufacturer to inspect the completed installation, start the water softening system in operation, and acquaint the operators with the proper operation and maintenance of the equipment.

- H. Guarantee: The manufacturer shall guarantee that under actual operating conditions the effluent shall contain zero gpg hardness as determined by soap test, that the loss of on exchange resin through attrition during the first three years of operation shall not exceed 3% per year; that the resin shall not be washed out of the system during the service run or backwashing period; that the turbidity and color of the effluent, by reason of passing through the softener system, shall not be greater than the incoming water. The manufacturer shall also guarantee that any mechanical equipment proving defective in workmanship or materials within one year after installation shall be replaced F.O.B. factory.
- 2.19 Deionizer: This will be a rental unit furnished by the Owner, and connected up by the Contractor.
- 2.20 Water Heaters:
- A. Water Heater (Gas) - Symbol WH-1:
1. Type: Automatic gas fired storage heater with power burner.
 2. Capacities: As indicated on the drawings..
 3. The tank shall be constructed in accordance with ASME Code and stamped with appropriate symbol for 160 psi working pressure. After complete fabrication, the tank shall be completely glass lined forming a non-ferrous, corrosion-resistant protective barrier.
 4. The water heater shall be insulated with heavy density fiberglass insulation and trimmed with a baked enamel steel jacket.
 5. Provide lower operating thermostat, upper operating thermostat, ASME pressure and temperature relief valve, temperature limiting device and a drain valve.
 6. Install a combination high and low pressure and low water protective device shall be factory installed.
 7. The power burner shall be designed so that all components are outside the fire box. A multivane

blower shall be included to supply precise amount of air for complete combustion. The burner shall be listed by Underwriters Laboratories.

8. The standard control shall provide direct spark ignition with minimum 30 second prepurging of chamber, 120V combination gas control valve with manual shutoff and pressure regulator.
9. The water heater shall include all standard equipment as shown on manufacturer s specification sneet, shall fit properly into the space provided for it, and shall conform to the drawing requirements. The complete installation shall be in accordance with all applicable state and local codes and installation drawings.
10. Provide anodes for cathodic protection and ASME rated temperature and pressure relief valve.
11. Provide draft regulator.
12. Entire unit shall be listed by California Energy Commission for efficiency and stand by losses.
13. Manufacturers: Pressure Vessel, Inc., or A.O. Smith.

B. Water Heater (Electric) - Symbol WH-2:

1. Type: Electric, storage type, automatic.
2. Capacity: As shown on the drawings.
3. Construction: The heater shall be Underwriters' Laboratories, Inc. approved. The storage tank shall be glass lined and equipped with magnesium anode protection. The heater shall be complete with fiberglass insulating jacket, heating elements, thermostat, high-limit control, and drain valve with hose connection. A temperature-pressure relief valve ASME rated, shall be provided for the heater and shall be drained to floor sink. The heater shall be 5-year warranty from the manufacturer.
4. Temperature setting: 105°F.
5. Acceptable manufacturers. Lochivar, A.O. Smith or American Appliance Manufacturing Company.

2.21 Steam Generators:

A. Steam Generator - Symbol SG-1

1. The generator shall be a gas fired, electric motor drive, stationary high pressure steam cleaner. The unit shall be complete with all standard equipment and shall include the following features and accessories:
 - a. Motor driven pump with 7.5 HP TEFC motor suitable for operation with 230 volt, 3 phase, 60 Hz power supply; magnetic starter with start-stop switch; FMC Bean 4 cylinder piston pump producing a constant volume of 1100 gallons per hour, with bypass valving to adjust flow to cleaning guns and automatic bypass regulator which maintains a constant system pressure level with guns either opened or closed.
 - b. A 1,350,000 BTU input gas burner with air mixing blower; Model RA 890 automatic ignition feature; burner controls to include gas thermo-control valve, nozzle control, temperature limit switch, blower air pressure switch, water supply flow switch, steam pressure switch; a 3/4" I.D. ASME inspected heating coil; and a stainless steel ASME approved relief valve for steam.
 - c. A stainless steel solution tank (approximately 20 gallon capacity), and a Dema syphoning device for blending water with controlled amount of additive drawn from a product drum.
 - d. Three full swivel steam guns, each with 50 ft. of 3/4", 200 psi wire-braided hose, all guns complete with extensions, insulated handle grips and trigger control; one straight nozzle and one fan nozzle for each gun. Hose quick disconnects shall be 3/4" for steam guns.
2. The unit shall produce thermal pressure as follows:
 - a. Steam cleaning: 550 gallons per hour up to 150 psi, up to 340°F.
3. Discharge from the unit shall be connected to piping with valved outlets, as indicated on the

Drawings. The manufacturer's steam and high pressure hoses and guns shall be attached to the above piping.

4. Manufacturer: "Pacer-Kelite".

2.22 Sump Pump

- A. Pumps: Provide duplex, screenless submersible sump pumps with cast iron shell and semi open bronze impeller to handle solid size up to 2" diameter. Pump shaft shall be stainless steel with mechanical seal. Motor and bearings shall be sealed for continuous operation while running dry at no load condition, and shall be explosion proof for Class 1, Group D hazardous locations.
- B. Quick removal system shall consist of a steel plate with stationary discharge fittings and spool support for each pump, two cast iron discharge elbows and two galvanized steel guide poles with connecting bars and stainless steel wire rope, complete with fittings.
- C. Control panel for duplex pumps shall be in NEMA 1 enclosure mounted on free standing frame and shall include: Two fusible disconnect switches, two magnetic starters with overload and low voltage protection, test-off-automatic selector switches, control circuit transformer, electric alternator, green pump running lights, alarm bell for high water level with auxiliary contacts (one normally open and one normally closed) for remote monitoring of alarm, alarm silencing switch, and complete wiring including power cables to pumps and control cables to level controls.
- D. Level Control: Duplex pumping system shall be automatically controlled by mercury float switches and electric alternator. Working and standby pumps shall be alternated at the end of each pumping cycles. When working pump is operating and level continues to rise, standby pump shall start up in parallel. An emergency float switch shall also be provided to operate both pumps in the event that the alternator fails to function. An additional float switch shall be provided to operate high water level alarm. Each float switch shall consist of mercury switches with contacts as required, complete with mounting brackets. Provide brass support pole and mounting plate.
- E. Provide gasketed sump cover and frame as indicated on drawings and as required for proper maintenance and operation of pumps.

F. Manufacturer: Weil/Paco.

2.23 Clarifier

A. Type: Precast reinforced concrete, 3 compartment, meeting all Code requirements. Add extensions to bring the unit to grade. Provide manhole covers, sample box, and fittings as shown on the drawings.

B. Capacities: As shown on the drawings.

C. Materials:

D. Certification: Manufacturer shall provide calculation signed by a registered structural Engineer to certify that the clarifier and extensions are designed to withstand heavy traffic load (H 20).

E. Manufacturer: M.C. Nottingham, or Brooks.

1. Concrete: Portland cement Type II minimum compressive strength 3000 psi at 28 days.

2. Reinforcing bar: Intermediate grade ASTM A 615.

3. Reinforcing welded wire mesh: ASTM A 615.

2.24 Gas Regulators:

A. Type: Balancing diaphragm type with internal relief valve, strainer, vent and automatic shut off.

B. Capacities: As indicated on the drawings.

C. Manufacturers: Fisher, Reliance, or Rockwell.

ARTICLE 3 - EXECUTION

3.01 Piping, General:

A. Installation of piping shall be made indicated on drawings, installed in accordance with the local codes and regulations.

B. Horizontal and vertical positions and arrangement of pipe lines as shown on drawings shall be confirmed at the site of work prior to fabrication and installation. The accompanying drawings are intended for the

accuracy and immediately notify the Engineer of any discrepancies so that such discrepancies may be resolved prior to actual fabrication or installation of work. Minor changes in position of piping, as necessary to meet job conditions, shall be anticipated by the Contractor and shall not be made the basis for change order. Changes affecting accessibility to or clearance about equipment or accessories shall be promptly communicated to the Engineer.

- C. Sizes and arrangement of piping shall be as shown on the drawings; in case of inconsistency of details for final connections resulting in conflict, such conflict shall be resolved by the Engineer.
- D. Attention is called to the inclusion of the flow diagram in the list of working drawings. These flow diagrams are not for the purpose of giving physical dimensions or locations, but rather to make clear the interconnections, by the piping, of the various units of the process. If an item is shown on either the flow diagram or the piping detail drawings, but not on both, it will be assumed that the Contractor has included such item in his estimate of the cost of the work and that he shall install same.
- E. In the assembly of the piping system, the longest available commercial standard lengths of piping shall be utilized to minimize number of piping joints. Piping shall be accurately cut to field measurements to permit placement without forcing or springing, except where requirements for cold springing are shown.
- F. All piping shall be run straight and parallel with adjacent walls and shall present a uniform and neat appearance.
- G. Each piece of pipe, fitting and valve shall be carefully inspected on the inside and outside to see that there is no defective workmanship on the pipe or obstructions in the pipes, fittings or valves.
- H. During constructions, open ends of piping shall be protected with temporary closures to prevent entry of dirt and debris into lines. Piping size reductions shall be made with eccentric fittings, with flow lines of piping in alignment. No bull head connections will be permitted, except where specifically shown. Piping shall be plumb and square and arranged for venting or drainage as designated.

- I. Pressure gauges: Mount pressure gauges in locations where they can be read easily from floor.
 - J. Thermometers: Mount thermometers in locations where they can be read easily from floor.
 - K. Relief Valves: Pipe from relief valves to waste receptors or to atmosphere as required.
- 3.02 Soil, Waste, and Vent Systems:
- A. Cleanouts: Install cleanouts at ends of soil, waste, sewer, at bends, changes in direction, and as shown with maximum spacing of 50 feet on straight runs inside building. Set covers flush with adjacent finished surface.
 - B. Floor Drains, Waste Receptors: Install as shown and connect to cast iron, P-trap. Anchor waterproof membrane to flange with clamping collar and rustproof bolts when used.
- 3.03 Domestic Hot and Cold Water Systems, and Industrialized Water Systems:
- A. General: Install supply connections to fixtures through wall as high under fixtures as possible and take off hot water lines from top of main.
 - B. Unions: Install on each branch from horizontal main, adjacent to each screwed valve and on connections to equipment. Installation of concealed unions not approved.
 - C. Shut-Offs: Install gate valve in each branch line where branch takes off main, at connections to equipment, and as shown to isolate sections of piping and fixtures for repairs.
 - D. Dielectric Insulators: Provide dielectric insulators between dissimilar metals.
 - E. Water Hammer Arrestors: Install arrestors in upright position in hot and cold water lines at quick closing valves and at plumbing fixtures. Location, size, and quantity per PDI Standard No. WH 201.
 - F. Air eliminators: Install air eliminators in high points of hot water lines and install shut off valve between line and eliminator. Pipe air vent to drain.

- G. Backflow Preventers: Install as shown.
- H. Hot Water Pump: Install pump dead level and align and check motor and coupling per manufacturer s instructions. Fit and erect connecting piping so pump can be installed.
- I. Expansion Hot Water Supply and Return Piping: Provide swing or swivel joints on connections from mains to riser from risers to branches.
- J. Water Heaters: Install heater as shown with pipe from relief valve to waste receptor. Furnish and install anchor bolts for installation of heater on slab.

3.04 Clarifier:

- A. The precast clarifier unit shall be placed on natural soil or well tamped compacted fill. The ground water seal shall be either Butyl rope mastic or cement mortar.

3.05 Tests

A. General:

1. Tests must be performed and systems approved prior to painting, covering, insulating, furring, or concealing piping.
2. Provide all test equipment, instrumentation and labor in conjunction with tests.
3. Prior to test, protect or remove all control devices, air vents, and other items which are not designed to stand pressures used in test.
4. Accomplish testing of piping in sections so as not to leave any pipe or joint untested.
5. Obtain prior approval for test procedures.
6. Responsibility for Damages: Contractor shall pay for costs of repair and restoration of work to other trades damaged by tests or cutting done in connection with tests.

- B. Drainage systems: Cap or plug all outlets and fill entire waste and vent system with water to level of highest vent stack. System shall hold water for two

hours. Tests of portions of system shall be similarly conducted except that stack of 15 feet above highest horizontal line to be tested shall be filled with water to maintain required head.

- C. Test each piping system for at least one hours.

<u>System Tested</u>	<u>Gage Pressure At Start of Test (psig)</u>	<u>Test With</u>
Domestic Hot and Cold Water	150	Water
Gas	60	Air
Industrialized Cold Water	150	Water
Steam and industrialized hot water	750	Water
Pumped Drain	100	Water

- D. Test wrapped or coated pipe, fittings, and field joints on job site, after assembly, with approved high voltage Holiday detector, Tinker and Razor, or equal, with positive signaling device to indicate any flaws, holes, or breaks in wrapping. Set peak voltage to 10,000 volts. If Scotchkote 202 is used set peak voltage to 1,000 volts. Place piping on temporary blocks to allow testing to run along underside of pipe. Repair defects before covering. Conduct testing in presence of Engineer.

3.06 Pipe Cleaning and Disinfection for Domestic Water Piping:

- A. Pipe cleaning and disinfection applies to hot and cold domestic (potable) water systems and shall be performed after all pipes, valves, fixtures and other components of the systems are installed, tested and ready for operation.
- B. All domestic water piping shall be thoroughly flushed with clean potable water prior to disinfection, to remove dirt and other contaminants. Screens of faucets shall be removed before flushing and reinstalled after completion of disinfection.

- C. Disinfection shall be done using chlorine, either gas or liquid. Calcium or sodium hypochlorite may be used as approved in AWWA C601-69 procedures.
- D. A service cock shall be provided and located at the water service entrance. The disinfecting agent shall be injected into and through the system from this cock only.
- E. The disinfecting agent shall be injected by a proportioning pump or device through the service cock slowly and continuously at an even rate. During disinfection, flow of disinfecting agent into main water supply is not permitted.
- F. All sectional valves must be operated during disinfection. All outlets must be fully opened at least twice during injection and the residual checked with ortholidin solution.
- G. When the chlorine residual concentration, calculated on the volume of water the piping will contain, indicates not less than 50 ppm (parts per million) at all outlets, then all valves must be closed and secured.
- H. The residual chlorine shall be retained in the piping systems for a period of not less than 24 hours.
- I. After the retention, the residual shall be not less than 5 parts per million. If less, then the process shall be repeated as described above.
- J. If satisfactory, then all fixtures shall be flushed with clean potable water until residual chlorine by orthotolidin tests shall be not greater than the incoming water supply (this may be zero).
- K. All work and certification of performance shall be performed by approved applicators or qualified personnel with chemical and laboratory experience. Certification of performance shall indicate:
 - 1. Name and location of the job and date when disinfection was performed.
 - 2. Material used for disinfection.

3. Retention period of disinfectant in piping system.
 4. Ppm chlorine during retention.
 5. Ppm chlorine after flushing.
 6. Statement that disinfection was performed as specified.
 7. Signature and address of company/person performing disinfection.
- L. Upon completion of final flushing (after retention period), the Contractor shall obtain minimum one water sample and submit samples to a State approved laboratory.
1. Name and address of approved laboratory testing the samples.
 2. Name and location of job and date the samples were obtained.
 3. The coliform organism count. An acceptable test shall show absence of coliform organisms.
- M. If analysis does not satisfy the above minimum requirements, the disinfection procedure must be repeated.
- N. Before acceptance of the systems, the Contractor shall submit to the Engineer for his review, three (3) copies of laboratory report and three (3) copies of Certification of Performance as specified above.
- O. Under no circumstances shall the Contractor permit the use of any portion of domestic water systems until properly disinfected, flushed and certified.

3.07 Cleaning:

- A. All equipment, piping, etc. shall be thoroughly cleaned so as to remove rust, scale, plaster or any internal obstructions before any covering is installed or any piping or equipment is painted. No scarring or disfiguring of equipment, piping, etc. will be acceptable before covering or painting is applied.
- B. All parts of the work which are to be painted or which are exposed in the finished work shall be thoroughly cleaned and made ready to receive paint finish.

- C. The exposed parts of equipment shall be cleaned, oil and grease removed, and the bright parts left clean and polished.
- D. Upon completion of the work, remove all rubbish, debris and surplus materials, resulting therefrom, from the premises together with all his instruments and equipment and shall leave the site in a neat, clean and acceptable condition as approved by the Architect.

3.08 Preliminary Operations:

- A. Should the District require that any portion of the system or equipment be operated prior to the final completion and acceptance of the work, the Contractor shall furnish such operation. All the expense thereof will be paid by the Owner, separate and distinct from any money paid on account of the Contract.
- B. Such preliminary operation or testing payment shall not be construed as final acceptance of any of the work of this Contract.

3.09 Excavation and Backfill:

- A. Comply with the requirements for trenching, backfilling and compaction as specified in Section 02221.

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DIVISION 15 - MECHANICAL

SECTION 15500 - FIRE PROTECTION SPRINKLER SYSTEMS

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Document 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. System design.
 - D. Underground service line from points shown into building.
 - E. Inspection test valves and drain lines.
 - F. Interior piping, sprinkler heads, fitting, alarm facilities for automatic fire sprinkler systems.
 - G. Inspection and tests.
 - H. Control wiring and conduits.
 - I. Operation instructions.
- 1.02 Requirements
- A. Codes and standards:
 - 1. Comply with all pertinent recommendations contained in:
 - a. Los Angeles Plumbing Code, latest edition.
 - b. NFPA 13, Standard for the Installation of Sprinkler Systems.
 - c. NFPA #101, Life Safety Code.

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1.03 Related Work in Other Sections

- A. Site Work: Division 2.
- B. Finishes: Division 9.
- C. Electrical: Division 16.

1.04 System Design

- A. Areas to be protected.
 - 1. Entire Maintenance Building, First and Mezzanine Second Floors: Hydraulically designed wet pipe system for ordinary hazard Gr. 1 occupancy except sprinklers for offices shall be designed for light hazard.

1.05 Submittals

- A. General: Comply with provisions of Section 15010. Mechanical General Provisions.
- B. Shop drawings: The Contractor shall submit shop drawings for approval prior to fabrication of any component of the system as follows:
 - 1. Shop drawings shall consist of one reproducible (sepia) and one blue line drawing prepared by an Engineer-Draftsman, and hydraulic calculations of sprinkler system. Provide piping layout which shall include fire riser and all mains, branch lines, cross mains, sprinklers, and controls.
 - 2. Before proceeding with any construction work, fire protection design drawing shall be approved by the Engineer and by the Fire Department of the City of Los Angeles.
 - 3. The Contractor shall first submit fire protection design drawings and calculations to the Engineer for his review and after all corrections are completed, Contractor shall submit to the Fire Department of the City of Los Angeles for their approval.
 - 4. Any revisions to the Contractor's working drawings during construction, or at any time after the above approval, must be identified on the drawings, approved by the agencies specified above and resubmitted to the Engineer for his review before proceeding with the work.

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5. After all construction work has been completed and approved by the agencies having jurisdiction, the Contractor shall furnish computations and prints to the Engineer for record purposes, showing the final installation in detail.

C. Submittal data:

1. The submittal data to be furnished shall include, but not be limited to, the following:
 - a. Valves.
 - b. Sprinklers.
 - c. Pipe, hangers, supports.
 - d. Fire Department connection.
2. Design criteria:
 - a. The design and installation of fire protection systems shall be complete with all necessary accessories for proper operation and shall be accomplished by the Contractor in accordance with requirements of the City of Los Angeles Fire Department.
 - b. The number of sprinklers required and their placement shall be the responsibility of the Contractor, and his shop drawings shall reflect this information in accordance with fire codes and governing authorities. Expense for adding or moving sprinklers to conform to local fire or building codes and building configuration shall be borne by the Contractor.
 - c. Materials and equipment: All materials and equipment used for the installation of the sprinkler system shall be new and listed by U.L. Fire Protection Equipment List or the FM Approval Guide and shall be the standard product and the latest design of the manufacturer. Where two or more units of the same class of equipment are required these units shall be products of the same manufacturer.
 - d. Where provisions of pertinent codes and standards conflict with this specification, the more stringent provisions shall govern.

1.06 Product Handling

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- A. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary and at no additional cost to the Owner.

ARTICLE 2 - PRODUCTS

2.01 Pipe and Fittings

- A. Above ground piping: Schedule 40 black steel pipe manufactured in accordance with ASTM A-120. Pipe 2-1/2" and smaller shall have cast iron screwed fittings. Pipe 3" and over shall have welded fittings. All flanged welded fittings shall be neck type. At the Contractor's option, victaulic couplings Style 75 may be used in lieu of welded or screwed joints if victaulic groove depth control tool is used for field grooving.
- B. Underground piping: Cast iron Class 250 with mechanical joints in accordance with ANSI A21.10 (AWWA C110-7) and ANSI A21.22 (AWWA C111-72). Provide thrust blocks at each change of direction and where indicated on the drawings.
- C. Drain piping: Schedule 40 galvanized steel pipe ASTM A-120 with 150 PSI galvanized malleable iron screwed fittings.

2.02 Valves

- A. Area control valves: OS&Y iron body, bronze mounted, flanged Crane #467. Provide tamper switch for valve supervision.
- B. Check valves: Cast iron body, wafer type, spring loaded clappers, Viking, Model B-1.
- C. Drain valves: Bronze, Globe type Crane #1 straightway valve, or Crane #2 angle valve, Class 125, screwed bonnet.

2.03 Sprinklers

- A. Rooms with no ceiling: Sprinklers shall be standard type for upright position with brass body and metallic fusible link.

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- B. Below Ceiling: Sprinklers shall be chrome plated, finish, flush type with chrome plated escutcheons.
- C. Sidewall: Horizontal, chrome plated satin finish with chrome plated escutcheons.
- D. Temperature rating of sprinklers shall be as required by NFPA #13 in accordance with the maximum ceiling temperature.
- E. Spare sprinklers: Provide a metal cabinet with spare sprinklers of each type as indicated in NFPA #13 to be located at the direction of the Architect. Provide two sprinkler wrenches.
- F. Sprinkler guards: Sprinklers subject to mechanical injury shall be protected with approved guards.

2.04 Alarm

- A. The alarm shall be provided by water flow switch connected to general fire alarm system.

2.05 Water Flow Indicator Switch

- A. Water flow indicator switch shall be paddle type, tamper proof, with two-single pole, double throw micro switches to operate on 115V, AC and shall have an adjustable time delay to prevent false alarm due to fluctuations in water pressure. Time delay shall be adjustable from 0-70 seconds and set for 20 seconds. Complete unit shall be UL listed and FM approved and shall be Potter-Roemer #6200 or approved equal manufactured by Grinnell, Viking or Reliable.

2.06 Tamper Switch

- A. Tamper switch shall detect unauthorized operation of shut-off valves. Unit shall have two single pole double throw microswitches to operate on 115V, AC and shall be Potter-Roemer #6220 or approved equal as manufactured by Grinnell or Viking.

2.07 Pressure Gauges

- A. Pressure gauges shall have 3-1/2" polished brass case with 1/4" bottom male connector and gauge cock and glass enclosed dial with pressure range from 0-300 PSI. Pressure gauge shall be Potter-Roemer #6240 and shall be UL listed and FM approved. Pressure gauges manufactured

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by Terrice or Marsh will be acceptable if they comply with these specifications.

2.08 Fire Department Connection

- A. 2-way with clappers, size 4" x 2-1/2" and shall be Potter-Roemer #5021 or approved equal. Provide plugs with chain at each outlet.
- B. Identifications Nameplate shall be lettered:
Sprinkler.

2.09 Pipe Hangers, Clamps and Supports

- A. Support sprinkler piping from building structure with hangers and supports in accordance with NFPA Standard No. 13. Attach hangers or rods to roof joists with steel I-beam clamps. Furnish and install intermediate support members spanning between joists. Attachment or support of hangers from metal decking is not permitted.

ARTICLE 3 - EXECUTION

3.01 Inspection

- A. Examine pipes for defects.
- B. Examine areas to receive piping for:
 - 1. Defects such as weak structural components that adversely affect execution and quality of work.
 - 2. Deviations beyond allowable tolerances for piping clearances.
- C. Start work only when conditions are corrected satisfactorily.

3.02 Field Measurements

- A. Locate hangers, supports and accessories to support pipelines valves, and additional concentrated loads.
- B. Locate hangers, supports, and accessories within maximum span lengths specified to support continuous pipeline runs unaffected by concentrated loadings.

3.03 Installation

- A. Piping layout:

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1. Inspect the architectural, structural, electrical, plumbing and HCAC drawings and specifications to familiarize with the class of building construction, types of floors, walls, etc.
2. Coordinate work specified under this section with that of the other trades.
3. All piping shall be made up and installed in a manner that permits expansion and contraction caused by changes in water temperature and pressure. This shall be accomplished by installation of supports that will permit the movement of the pipe without undue stress, and by any other precautions that might be deemed necessary.
4. Piping exposed in rooms shall be installed as nearly as possible parallel to or at right angles to the building walls. Run all pipe straight and true. Springing or forcing piping into place will not be permitted unless specifically called for.
5. Keep piping free from structure or installed items.
6. Piping in portions of the building with suspended ceiling shall be concealed.

3.04 Pipe Joints: Make Carefully and Neatly

A. Threaded: ANSI B2.1 NPT.

1. Cut thread full and clean with sharp dies.
2. Ream ends of pipe after threading and before assembly to remove burrs.
3. Leave not more than three pipe threads exposed at each connection.
4. Use teflon tape on male thread only making joints.

B. Welded: ANSI B31.1

C. Flanged:

1. Tighten flange bolts so that gasket is uniformly compressed and sealed.
2. Do not distort flanges.
3. Leave flange bolts with ends projecting 1/8 to 3/8

inch beyond the face of nut after tightening.

D. Grooved:

1. Cut grooves clean and sharp without burrs or chuck marks.
2. Ream ends of pipe after grooving and before assembly to remove burrs.

3.05 Cleaning

- A. Keep inside of all pipe, fittings and valves clean and free from dirt and debris.
- B. Thoroughly blow all lines before testing or placing service.

3.06 Connection to Main

- A. Furnish and install piping and make final connection to water main as indicated on the drawings.

3.07 Identification and Labeling

- A. Control valves: Identify with engraved two-color laminated plastic labels with 1/2" lettering. Labels shall be secured with bronze chains or drive screws. Sign shall read: "Shut-off Valve, Keep Valve Open".
- B. Drains and test valves: Identify with brass tag not less than 2-1/2" diameter with inscribed numbers 3/4" high which shall be chained to valve.
- C. Alarm bell: Identify with 7" x 9" sign constructed of 20 gauge steel fire red background, 3/4" border, lettering 1" high shall be white. Sign shall read: "Sprinkler Alarm When Bell Rings Call Fire Dept."

3.08 Sprinklers

- A. Position: Brass sprinklers shall be generally installed in an upright position, except in rooms with suspended ceilings, where flush type sprinklers and matching escutcheons shall be installed and piping shall be concealed above the suspended ceiling. Sidewalk sprinklers shall be installed in accordance with manufacturer's recommendations.

3.09 Control Valves

- A. Control valves shall be OS&Y gate valves. All valve stems shall be set vertically. All valves shall be checked during pressure test and stuffing boxes shall be tightened if necessary.

3.10 Test

- A. Disconnect all devices which may be damaged by the test pressure and plug or cap the lines for testing.
- B. Test each piping system for two hours at 200 PSIG.
- C. Prove each system absolutely tight at the test pressure.
- D. Repair any leaks found by observation or during testing.

3.11 Thread Test

- A. A test shall be made of the thread on the 2-1/2" valves using a coupling from the Los Angeles Fire Department hose. The test shall be made in the presence of the Engineer.

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DIVISION 15 - MECHANICAL

SECTION 15800 - HEATING, VENTILATING & CONDITIONING SYSTEMS

ARTICLE 1 - GENERAL

- 1.01 Scope: Work includes but is not necessarily limited to the following:
- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Document 0 and Division 1 apply to the work of this section.
 - B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - C. Air conditioning systems including air conditioning units, unit heaters, ductwork, air outlets and air inlets.
 - D. Air exhaust, transfer, and relief systems including fans, drives, ductwork, air outlets and air inlets, as indicated on drawings.
 - E. Testing and preliminary system operation.
 - F. Installation of automatic dampers, instruments and control devices as indicated on drawings.
 - G. Engine fume exhaust systems.
- 1.02 Related work specified elsewhere:
- A. Concrete: Division 3.
 - B. Moisture Protection: Division 7.
 - C. Finishes: Division 9.
 - D. Building Specialties: Division 10.
 - E. Electrical: Division 16.
- 1.03 Submittals:
- A. General:
 - 1. Refer to to Division 1, General Conditions for requirements governing submittals.
 - 2. No product will be accepted on job site without prior approval.
 - 3. Prepare shop drawings on transparencies at a

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scale suitable to clearly delineate the subject.
Sheet sizes: multiples of 8-1/2" x 11".

4. Drawing legend shall contain project title, drawing title, drawing number and number of drawings to set.
 5. Reference catalog cuts and brochures of products to proper paragraph in Specifications. Furnish numerical index by Specification paragraph number listing product name, catalog number and references to page number of submittal brochure.
 6. Give name of manufacturer, brand name and catalog number of each item. Submit complete submittals, at one time, with items arranged in numerical sequence within each section and article of specifications. Listing items "as specified" without both make and model or type designation is not acceptable, except pipe and fitting not specified by brand names may be listed "as specified" without manufacturer's name, provided proposed materials comply with specification requirements.
 7. Descriptive data: Send copies of complete description, information, and performance data covering materials and equipment which are specified but for which catalog plate numbers, brand names, or specific models have not been used.
 8. Miscellaneous: Prior to installation submit to Construction Supervisor on job site, two copies of the following:
 - a. Installation instructions for each piece of mechanical equipment furnished.
 - b. Dimension drawings for all mechanical equipment pads and curbs including bolt sizes and locations.
 - c. Do not install any materials or equipment until written approval has been obtained from Architect.
- B. Submittal data: To be furnished for this project shall include but not limited to the following:

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1. Air conditioning units, complete with fan and coil selection data, calculations, physical dimensions, horsepower, electrical requirements, motor, etc.
2. Air filters, complete with all data specified.
3. Gravity ventilators complete with selection data physical dimensions and accessories.
4. Exhaust fans, complete with selection data, vibration isolation, fan rotation, physical dimensions, capacity data, motor, fan balancing, etc.
5. Electric motors, furnished under this Division.
6. Sheet metal ductwork and hangers, complete with ductwork construction details of joints, connections, reinforcing hangers, etc. All construction details shall be properly indexed on each shop drawings, etc.
7. Air distribution equipment, including ceiling supply diffusers, registers, etc.
8. Automatic temperature controls, complete with all wiring diagrams, materials, control properties, etc.
9. Air balancing procedures and recording forms.
10. Supports, hangers, inserts.
11. Dampers, louvers, grills, registers diffusers.
12. Openings, special framing and access doors.
13. Isolation mounting.

1.04 Product Handling

- A. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary and at no additional cost to the District.

ARTICLE 2 - PRODUCTS (Refer to contract drawings for symbols
and model numbers).

2.01 Materials

- A. General: Throughout the Specifications, types of materials may be specified by manufacturer's name and catalog number in order to establish standards of quality and performance and not for the purpose of limiting competition unless specifically stated otherwise, the Bidder may assume the phrase "or approved equal", except that the burden is upon the Bidder to prove such equality. If the Bidder elects to prove such equality, he must request the Engineer's approval in writing to substitute such item for the specified item, stating the cost difference involved, with supporting data and samples, if required, to permit a fair evaluation of the proposed substitute with respect to quality, service ability, warranty and cost. Such supporting data shall include the basic specifications characteristics and other information concerning the proposed substitution demonstrating its equality to the specified item and the effect of the substitution on the schedule and cost, if any.

2.02 Air Conditioning Units (Symbols AC-1, AC-2 and AC-3)

- A. Type: Roof mounted packaged-type, single-zone, electric cooling, gas heating unit, meeting requirements of California Title 24, complete with all controls and zone dampers.
- B. Capacities: As shown on the drawings.
- C. DX cooling system:
1. The coils shall be non-ferrous construction with aluminum fins mechanically bonded to copper tubes. All coils shall be factory pressure leak tested.
 2. The system shall consist of two (minimum) totally independent refrigeration systems including compressor, condenser coil, condenser fan and evaporator coil with expansion valve. The condenser coils shall have sub-cooling rows. The compressors shall be mounted on vibration isolators and unit shall be complete with joints, connections, reinforcing hangers, etc. All construction details shall be properly indexed on each shop drawings, etc.

D. Gas heating system:

1. The unit shall have two independent gas control systems.
2. Two-pass tubular heat exchanger shall be constructed of aluminized steel. Stainless steel power burner shall have pre-purge, intermittent spark ignition, 100% safety shutoff controls, electronic flame sensing controls, series gas valves and fan controls to terminate blower operation at night. An automatic safety shutoff valve shall be furnished.

E. Control Systems:

1. The unit control panel shall be prewired in the unit casing-furnished with a 24-V control transformer, low-pressure switches, compressor, condenser, and evaporator fan motor contactors, as well as other protective devices.
2. An economizer control shall be factory-assembled and installed in the unit. The economizer control shall maintain a fixed supply-air temperature during the "free" cooling operation by providing for full modulation of the operable outside and return-air dampers. The package shall be complete with necessary dampers, linkage, and spring-return modulating damper motor. The economizer controls shall include an enthalpy control capable of controlling the dampers by measuring the heat content of the outside air.

F. Remote status control panel shall consist of the following:

1. "On-off" system switch.
2. Supply fan operation indicator.
3. Dirty filters indicator.
4. Heating and cooling system failure.
5. Remote thermometer indicators (see paragraph 2.14).

G. Controls: All controls shall be the sole responsibility of the mechanical equipment manufacturer, and shall be installed, factory wired, and tested.

H. Frame and casing: All external surfaces shall be of painted outdoor enamel heavy gauge galvanized steel. All galvanized side and top panels shall be insulated

with 1-1/2" thick fiberglass insulation. The top panels shall be sealed with a rubber tubing in the bottom of each standing seam. Side panel seams shall be sealed with polyurethane foam. All interior support members shall be heavy gauge steel. All access panels shall have locking door handles.

- I. Supply air blowers: Twin supply air blowers shall have permanently lubricated ball bearings, velocity pressure converters, adjustable belt drives and a cradle motor mount where belt tension can be easily adjusted. The entire assembly shall be floated on rubber mounts with minimum static deflection shall be 2".
- J. Outside air damper: Damper blades shall ride in nylon bearings. Damper actuator shall be full modulating with adjustable potentiometer for minimum position. Damper blades shall be equipped with gaskets for tight seal.
- K. Exhaust damper: Damper blades shall ride in nylon bearings. Blades shall be gasketed for tight seal and quiet operation.
- L. Filters: Provide Farr 30/30, 2" thick throwaway filters or approved equal by Cambridge or Continental.
- M. Provide filter gauge and thermometers as specified on paragraphs 2.13 and 2.14).
- N. Manufacturer's representative shall be present during start-up, testing and balancing and shall provide operational instructions to Engineer.
- O. Manufacturer: Payne or approved equal by Carrier or Trane.

2.03 Room Air Conditioner (Symbol RAC-1)

- A. Type: Window type, air cooled packaged heat pump. UL listed and shall comply with Title 24 of California Administrative Code.
- B. Capacities: Cooling and heating capacities not less than those indicated on the drawings. AHAM ratings.

- C. Cooling unit shall have the following basic control selections: Off, continuous fan operation, and solid-state fan speed control. Unit shall have a choice of two fresh air cycles, ventilation or exhaust.
- D. Controls shall be factory wired and completely enclosed within unit. Controls shall be located on front of the unit.
- E. Casing shall enclose all parts of unit and be constructed of zinc-coated steel, bonderized and Painted with baked-on enamel. Casing shall be insulated to prevent condensation and minimize noise level. Unit shall have a slide-out type chassis.
- F. Evaporator and condenser coil heat transfer surfaces shall be of non-ferrous construction with aluminum plate fins mechanically bonded to staggered aluminum tubing.
- G. Evaporator and condenser fans shall be direct-driven with a common motor. Evaporator fan shall be of mixed-flow centrifugal type. Condenser fan shall have condensate removal system.
- H. Manufacturer: Carrier, or approved equal by Trane, York, or Fedders.

2.04 Unit Heaters (Symbol UH-1)

- A. Type: Horizontal discharge, gas fired, blower type, indoor, AGA approved, automatic packaged unit.
- B. Capacities: As shown on the drawings.
- C. Components:
 - 1. Cabinet: Zinc grip steel cabinet with horizontal louvers. Baked-on enamel. Suspension couplings, two 1" IPS free turning female pipe thread.
 - 2. Blower: Centrifugal, belt driven, capacity start ball bearing vent motor.
 - 3. Heat exchanger: Aluminized steel.
 - 4. Burners: Aluminized steel, spark ignited recycling interrupted safety pilot system; with electronic flame supervision which shall shut off pilot between heat cycles, time delay pre-purge switch.

5. Controls: 120 volt supply line voltage, 24 volt controls, fan and limit control motor contractor, terminal block wiring, pressure differential switch, remote two stage thermostat and summer-winter switch.
 6. Provide thermostat guard, 30 degree downturn nozzle and OSHA type belt guard.
- D. Manufacturer: Reznor, Sterling, or approved equal.
- 2.05 Exhaust Fan, Power Roof Ventilator, Low Silhouette Type
(See schedule on drawings)
- A. Type: Belt-driven centrifugal, low silhouette with aluminum housing for roof mounting, completely weatherized, capable to withstand 20 pounds per square foot wind load.
 - B. Capacity: As shown on the drawings.
 - C. Fan: Backward inclined with centrifugal wheel statically and dynamically balanced at factory.
 - D. Motor: Install motor in weatherproof housing outside of air stream. Electrical characteristics shown on the drawings. See Section 15.010.
 - E. Drive: Belt drive with adjustable motor sheave. Belt, oil resistant.
 - F. Disconnect switch: Provide factory wired non-fused disconnect switch located under hood of unit.
 - G. Backdraft dampers: Installed in curb of the unit.
 - H. Bird screen: Protect entire air outlet of fan by 1/2" aluminum mesh securely installed.
 - I. Acceptable manufacturers: "Exitaire" or approved equal by "Cook" or "Pace".
 - J. Provide neoprene pad between exhaust fan base and roof curb.
- 2.06 Exhaust Fans:
- A. Utility Vent Sets:
 1. Fans shall be either forward curved or backward curved vent sets, as scheduled. Each fan shall

include a Class I blower, motor, V-belt drive, drive guard, weather shield if located outdoors, vibration isolators, and capacities as indicated on the drawings. All exhaust fans shall have rating certified by AMCA V-belt drive, and shall be sized for 150% of maximum connected motor horsepower. Ratio of sheaves shall not exceed 6:1.

2. Manufacturer: Pace, McQuay or Trane.

B. Ceiling Exhaust Fan:

1. Shall be Pace Type DD, or equal, of the size and capacity indicated on the drawings. The fan unit shall be complete with fan, housing, motor, roof jack with barometric damper, and prime coated grille.

2.07 Gravity Ventilators (Symbols GV-1)

A. Aluminum stationary type with square base.

1. Sizes: Throat sizes as indicated on plans.
2. Screens: 1/2" mesh birdscreens on heads.
3. Backdraft dampers. Installed in curb of the unit.
4. Acceptable manufacturers: Exitaire or approved equal by Cook, Breidert or Pace.

2.08 Tail Pipe Exhaust Systems

- A. General: Provide - complete underfloor exhaust system with equipment as manufactured by Car-Mon Products, Inc. or approved equal.
- B. Underground disappearing type system: Complete consisting of exhaust fan, PVS coated steel air duct, stainless steel sheet metal duct connections, and floor fixtures with flexible stainless steel tubing and car adapters as shown on the drawings. The floor fixture shall be Type 64 TR constructed in two pieces. A 12 gauge floor box with 1/4" boiler plate flange and door, and an adjustable sweep connection constructed of 16 gauge metal inserted into transite duct. These units to be capable of handling one stainless steel flexible tube 4" in diameter by 12 feet long, with stainless steel tail pipe adapters and guide rings. Stainless steel

tubes shall be .020 thick, Series 304. The floor receptacle shall have an automatic door closer so that when tubes are retracted, the door automatically closes. The door shall be replaceable.

C. Exhaust fans: (See schedule on drawings).

1. Type: Centrifugal; V-belt drive, welded steel casing, malleable iron paddle wheel, steel backside and back, ball bearing pillow blocks.
2. Capacity: As indicated on drawings.
3. Coating: Fan wheel and inside of casing shall be coated with a minimum 10 mils of vinyl, "Amercoat" No. 23; applied in accordance with manufacturer's recommendations; blower wheel shall be statically and dynamically balanced after coating has been applied.
4. Drive: Belt Drives shall be sized to allow 25% adjustment in operating speed.
5. Motor: Shall have horsepower and characteristics shown on drawings and shall comply with requirements set forth in Electric Motor Section in these Specifications.
6. Provide combination vibration isolators and seismic restraints as manufactured by Mason Industries, Vibrex or Korfund.

D. Provide eight (8) canes for top exhaust outlets on buses.

2.09 Grilles, Registers, and Diffusers:

- A. All supply diffusers and registers shall be provided with right angle volume extractors and opposed blade volume dampers in the air stream behind the outlet. All return air registers shall be provided with opposed blade volume dampers behind the inlet. Volume dampers are not required in transfer grilles.
- B. All diffusers, registers, and grilles shall be furnished with off-white baked enamel finish. After balancing and testing, the Contractor shall refinish all damaged spots and screw heads.

- C. All diffusers shall be installed in approximately the locations indicated on the drawings, but the Contractor shall verify the exact locations at the building, making any changes as may be required and as approved by the Architect.
- D. Ceiling diffusers shall be louver face, adjustable pattern type (downblow to horizontal) Krueger series SH with frame 23 (for lay-in tee-bar ceiling) and Series or approved equal by Anemostat or Tuttle and Bailey.
- E. Ceiling return registers and transfer grilles shall be louver face to match supply Krueger Series SH (for lay-in tee-bar ceiling) (for other types of ceiling) or approved equal by Anemostat or Tuttle and Bailey.
- F. Ceiling exhaust registers shall be louver face type with horizontal stationary deflecting vanes spaced on 3/4" centers set at 35° angle to restraint vision, Krueger series 5585-H or approved equal by Anemostat or Tuttle & Bailey.
- G. Sidewall return and exhaust registers and transfer grilles shall be same as ceiling and exhaust register.
- H. Sidewall supply registers shall have double deflection grilles set on 3/4" centers with individually adjustable in both horizontal and vertical planes, Krueger Series 880-H or approved equal by Anemostat or Tuttle & Bailey.
- I. All diffusers, registers and grilles exposed to shower areas, battery room and pit areas shall be of stainless steel construction.

2.10 Condensate Drain Line:

- A. Drain Lines shall have deep sealed trap fabricated with plugged tees to permit unit pan drainage.
- B. Pipe shall be copper tubing Type "M".

2.12 Ductwork:

A. Materials

- 1. Galvanized (zinc-coated) steel sheets ASTM 526 64T for all duct work except otherwise noted.

2. Stainless steel sheets ASTM A167-63, 304 No. 4 finish for engine tail pipe exhaust system (above-ground except in pit areas), battery room and shower rooms exhaust ducts.
 3. Steel angles and shapes ASTM A7-65.
 4. PVS coated steel duct and fittings for underground ductwork.
- B. Duct System, Sheet Metal: Metal gage, and reinforcements shall conform to Los Angeles City Code, SMACNA LVDCS, NFPA 90A and other local and state codes whichever is more stringent. Ductwork shall be air tight and shall not vibrate or pulsate when system is in operation. Round ducts may be spiral duct. All rectangular ducts regardless of size, shall be cross-broken or beaded.
1. Curved elbows: Curved elbows shall have a center line radius not less than 1-1/2 times width or diameter of the duct.
 2. Joints: Joints for ducts shall be sealed airtight, with "United" or "Duro-Dyne" and no duct sealer dust mark from air leaks shall show at duct joints, or connections to grilles, registers and diffusers.
 3. Laps: Laps at joints shall be made in the direction of air flow. Button punch or bolt connection in standing seams shall be spaced at fixed centers not greater than 6 inches. Horizontal locks or seams, known as "Button Punch Snap Lock" may be used in lieu of Pittsburg Lock.
 4. Fittings: Rectangular elbows, vaned elbows, take-offs, branch connections, transitions splitters. duct volume dampers, flexible connections, and access door shall conform to recommendations of SMACNA LVDCS unless shown otherwise. Round fittings shall be by "United Sheet Metal" or approved equal.
 5. Flexible duct take-offs shall be combination butterfly damper and extractor as manufactured by Thermaflex or approved equal.
 6. Backdraft dampers: Backdraft dampers shall be galvanized steel or aluminum multiblade type. Blades shall have felt strips riveted or crimped

in place. Blades shall be rigidly attached to a pivot rod. The rod shall extend into oil-impregnated bronze bushings, or anti-friction bearings, located in the frames.

7. Fire dampers: Fire dampers shall be California Fire Marshall approved and Los Angeles City Code NFPA 90A and UL 555. Provide 12" x 12" minimum access doors at all fire damper locations. Design is based on "Ruskin" IBD2.
8. Manual Dampers: Install in all branches of ductwork and where required for distribution control. Dampers shall be opposed blade type for rectangular ducts or butterfly type for round ducts lever operated, complete with locking device which permits the dampers to be adjusted and locked in position. A permanent black arrow shall be painted on duct to indicate proper position of the damper. Manual dampers shall be so linked that only one locking device is required.

C. Duct System, PVS coated steel duct:

1. Material: Shall be PVS coated galvanized steel with PVS plastic thickness of 4 mils outside and 4 mils inside "SPIRA-Kig" PVS 4x4 or approved equal.
2. Gauge Schedule.

<u>Diameter</u>	<u>Duct</u>	<u>Fittings</u>
4"-8"	26	26
9"-14"	24	24
16"-18"	24	22

3. Compliance: U.L. #181, Issue 1600, Class I Air Duct.
4. Connections: PVS couplings shall be used for connecting duct sections, providing a permanent corrosion-proff joint. Sheet metal screws on 6" centers should be inserted circumferentially in all over-lapping slip joints to make a rigid and solid connection. These should be placed closed enough to the joint to be covered with subsequent hardcast taping.
5. Sealing: All duct end joints - where slip joints connect duct to duct or duct to fittings - should

be wrapped with Hardcast tape and adhesive to prevent air or fume leakage and to keep dirt, sand and water out of an underground system. Hardcast tape, type DT-5300 (3" x 300'), a mineral impregnated cloth, is wetted with FTA-20 Hardcast adhesive and epoxy activator type, in one gallon plastic jugs. Usage is approximately one roll of tape to one gallon of adhesive. Other joints connecting the gores and miters of fittings and the seams of rectangular outlet boxes should be brush taped with hardcast.

6. Scratched Surfaces: Apply PVS coating compound to scarred or scratched surface of duct.

E. Extractors:

1. Furnish and install a volume control deflector in duct collar outlet back of each supply outlet. Deflector to consist of a series of turning blades to provide for distribution of air over duct or grille face. Felt or rubber gaskets shall be installed between the deflector frame and the duct collar to ensure a tight fit and freedom from vibration. Deflectors shall have blades with locking device designed that the blade will remain in position after setting. Deflector shall be of the size required for installation in duct collar and shall be Deflectrol as manufactured by Barber-Colman or approved equal.

F. Access Doors in Ducts:

1. Provide an airtight access door where fire dampers are enclosed inside of ductwork, of such size as to permit inspection and adjustment and also to permit renewal of fire damper link or fan bearing through access opening. The minimum size shall be at least 14" x 14" wherever possible.
2. Door shall be double wall type with felt or foam rubber gasket seal, and shall have butt hinges and sash locks on 2 sides, at a maximum spacing of 9". Use sash locks on both sides where hinged door swings may be obstructed.
3. Door in insulated ducts shall contain full thickness of insulation between the door panels.

- G. Flexible duct: Comply with UL 181, class 1, (including connectors), "Thermafex" M-KC or approved equal. Use for connections between rigid duct and outlets. Duct shall not be more than 12 feet long and without intermediate joints. Minimum working pressures shall be 2 inches water column. Flexible duct insulation shall be blanket or felt type one-inch nominal thickness and with a C-factor of 0.23 BTU/HR/SF/OF with a vapor barrier. Seal joints with pressure sensitive vapor seal adhesive tape or duct sealer and secure with sheet metal screws.
- H. Louvers connected to ductwork shall be "Carnes" L-33 extruded aluminum with 1/2" birdscreen with natural mil finish or approved equal by "Ruskin" or "Air Balance, Inc." Provide No. 10 gauge galvanized 1/2" mesh birdscreen at the interior face of the louver.
- I. Flexible Duct Connections Non-combustible waterproof, airtight, glass fabric, double coated with neoprene, weight 30 ounce per square yard, UL approved as manufactured by "ventfabrics" Ventglas or approved equal.
- J. Square/Round Quadrants
1. Type: Thumbscrew set with "open", "shut" indication.
 2. Material: Heavy gauge dial, die cast handle with socket head set screws; handle locked with wing nut; steel parts cadmium-plated.
 3. Acceptable Manufacturer: Young Regulator, Ventlock or Trimlock.
- K. Dial Regulators:
1. Type: Wrench-set with "open", "shut" indication.
 2. Material: Die cast core, heavy gauge dial with 3/32" steel handle and 3/4" hexagon nut; steel parts cadmium-plated.
 3. Acceptable Manufacturer: Young Regulator, Ventlock or Trimlock.
- L. Turning Vanes:
1. Type: Non-adjustable double walled air turns designed to reduce pressure loss in square duct elbows.

2. Material: Galvanized steel, roll-formed from single sheet, surfaces and edges smooth. Blades assembled over formed tenons on side pieces, for cutting to size and assembly in field.
3. Acceptable Manufacturers: Tuttle & Bailey, Titus or Barber-Colman.

2.13 Air Filter Gauge - Magnehelic:

- A. Type: Diaphragm actuated type.
- B. Range: 0-1" water minor division 0.2". Accuracy + or -2 percent full scale.
- C. Construction: 4-1/2" diameter body, 3-7/8" diameter white dial, black figures and graduations, pointer with zero adjustment. Furnish two static pressure tips, settings for 1/4" metal tubing and mounting bracket.
- D. Acceptable Manufacturer: Dwyer or approved equal.

2.14 Thermometers: Shall be of the remote bulb dial type equal in quality to "Trerice" L80040 (flush mounted). Thermometers shall be installed in accordance with the following schedule:

Location
Range (Degrees F.)

Supply Air	0-100
Return Air	0-100
Mixed Air Plenum	0-100

2.15 Instrument Test Holes:

- A. Test holes shall be Ventfabrics Model #699-2 or approved equal. Test holes shall be installed as required. A minimum of one test hole shall be provided at the following locations:

Mixed Air Plenum
Supply Duct
Return Air Duct

ARTICLE 3 - EXECUTION

- 3.01 General: Furnish and install all piping, ductwork, equipment trim, etc., including all work necessary to make

complete and properly operating systems, whether or not all details are mentioned in these specifications or indicated on the drawings.

- A. The installation of the air supply and distribution system shall conform to Local and State Code, NFPA 90A and SMACNA LVDCS mounting and supporting of ducts, equipment, accessories, and appurtenances shall be provided, including but not limited to structural supports, hangers, stands, clamps and brackets, access doors, and dampers. Installation of equipment shall conform to equipment manufacturer's recommendation, unless otherwise indicated. Equipment shall be installed, leveled, and located so that working clearance is available for all necessary servicing such as shaft removal, replacing or adjusting drives and motors, lubrication, and access to automatic controls. Electric isolation shall be provided between dissimilar metals for the purpose of minimizing galvanic corrosion. Provide supply air, return air and exhaust air distribution systems, as shown on the drawings, specified herein, or required for a complete and proper installation and not specifically called for under other Section of these specifications.
- B. Electrical work: Electric motor driven equipment specified herein shall be provided complete with motors and controls. Electrical equipment and wiring shall be in accordance with Division 16. Manual or automatic control and protective devices required for the operation herein specified and any control wiring required for controls and devices but not shown on the electrical plan shall be provided.

3.02 Installation of Ductwork and Air Moving Devices:

- A. Ductwork Installation: Elbows, vaned elbows, take-offs, branch connections, transitions, splitters, duct volume dampers, flexible connectors, and access doors shall conform to SMACNA and shall be installed so that ductwork shall operate without chatter, vibration, and be air tight so that no dust marks from air leaks will show at connections or outlets.
- B. Field changes to ductwork: Changes such as those required to suit the size of factory fabricated equipment actually furnished shall be designed to minimize losses in pressure and performance due to sudden expansion.

sion and contraction. Transitions shall be used in field changes as well as modifications to connecting ducts.

- C. **Splitters and Dampers:** Dampers shall have accessible operating mechanism, and where operators occur in finished portions of the building, operators shall be chromium plated with all exposed edges rounded. Splitter dampers shall be operated by quadrant operators or 3/16-inch rod brought through the side of the duct with locking setscrew and bushing. Two rods are required on splitters over 8 inches. Manual volume-control dampers shall be operated by locking-type quadrant operators. Dampers and splitters shall be two gages heavier than duct in which installed. Unless otherwise indicated, multileaf dampers shall be opposed-blade type with maximum blade width of 12". Access doors or panels shall be provided for all concealed damper operators and locking setscrews. Unless otherwise indicated, the locking-type quadrant operators for dampers, when installed on ducts to be thermally insulated, shall be provided with stand-off mounting brackets, bases or adapters to provide clearance between the duct surface and the operator not less than the thickness of the insulation. Stand-off mounting items shall be integral with the operator or standard accessory of the damper manufacturer. Volume dampers shall be provided where indicated on the drawings and as required by air balancing Contractor.
- D. **Deflectors:** Deflectors shall be provided in all square elbows duct-mounted supply outlets, take-off or extension collars to supply outlets, and tap-in branch-takeoff connections. Deflectors shall be factory fabricated and factory-or-field-assembled curved turning vanes or louver blades for uniform air distribution and change of direction with minimum turbulence and pressure loss. Square elbows shall be provided with curved vanes.
- E. **Access Doors:** Access doors shall be provided at all coils, thermostats, temperature controllers, and other apparatus requiring service and inspection in the duct system.
- F. **Connections:** Branch take-off connections to grille galvanized sheet steel, with one inch clearance except at grilles, registers, and diffusers.

- G. Duct sleeves and prepared openings: The Contractor shall be responsible for the proper size and location of sleeves and prepared openings.
1. Duct sleeves: Fabricate from 20 gauge galvanized sheet steel, with one inch clearance except at grilles, registers, and diffusers.
 2. Prepared openings: Provide one inch clearance except at grille, registers, and diffusers.
 3. Closure collar: Provide galvanized sheet metal not less than 4 inches wide, on each side of walls or floors where sleeves or prepared openings are provided except where grilles, registers, or diffusers are installed. Fabricate collars (for square and rectangular ducts) with a maximum side of 15 inches or less than 20 gauge galvanized steel. Collars shall be installed with nails on maximum 6 inch centers.
 4. Packing: Pack space between the sleeve or opening and the duct or duct insulation with mineral fiber.
- H. Duct supports: Install in accordance with Local Code. Straps may be used for round ducts. Where supports are required between structural framing member suitable intermediate metal framing shall be provided. Where C-clamps are used, install retainer clips provide seismic restraints on each duct by strapping duct tight to beams, where duct runs parallel to beams, install seismic restraining as shown in SMACNA, Plate No. 5.
- I. Flexible duct: Support every 3 feet. Stretch to smooth out internal corrugations, use long radius elbows where possible. Cut ducts to lengths required rather than create bends to take up excess lengths.
- J. Access panels: Provide for all valves, controls, dampers, duct access doors (when concealed) and any item requiring inspection and maintenance. Provide 12" x 12" minimum size access panels as specified in Section 15010, "Mechanical General Provision".
- K. Air filters: Provide access space for serving filters. Install filters with suitable sealing to prevent by passing of air.
- L. Inspection plates and test holes: Inspection plates and test holes when required in ductwork or casings

for air balance measurements shall conform to SMACNA. Factory fabricate test holes, air-tight, noncorrosive with screw cap and gasket. Extend cap through insulation.

- M. Flexible Collars: Provide in connections between fans and ducts or casings and where required. Make of neoprene coated glass fabric weighing approximately 30 ounces per square yard. Secure by zinc coated iron clinch-type draw bands for round ducts. For rectangular ducts, secure using normal duct construction standards.
- N. Cleaning of Duct System: Cleaning of rubbish, plaster, dirt and any other debris after completing installation of ductwork. After installation of equipment and connections are made on fan, and before any grilles, outlets or registers are installed, entire system shall be blown out with dampers and outlets wide open.
- O. Diffusers, Registers and Grilles: Support independently of suspended ceilings with minimum of 3 equally spaced straps or wires or rigidly screwed to sheet metal duct.
- P. Screens: Install 18 gauge galvanized 1/2" mesh screens over outside air intake openings and exhaust fan discharge. Reinforce openings over 30" wide with angle iron.
- Q. Dampers - Motor Operated: Install damper and frame level in both directions. Install without twist or torsion. Blades shall not touch adjacent material through full travel of blade.
- R. The tailpipe fume, battery room and snow room exhaust ducts shall be fabricated with 26 gauge stainless steel 304. All joints and seams shall have continuous external weld. All underground ducts shall be sealed airtight.
- S. Joints between dissimilar metals: Isolate joints between dissimilar metals in ductwork with asbestos gaskets and bolts having fiber ferrules and washers.
- T. Flashings: Flashings shall be provided to all roof penetrations and shall be made waterproofed. Flashing shall conform to Division 7.
- U. Test holes: Drill instrument test holes into ductwork for pilot tube test. Install hole covers attached to ductwork by sheet metal screws.

3.02 Equipment

- A. General: Equipment and components shall be completely installed in a manner to insure proper and sequential operation of the equipment and its controls. Installation of equipment not covered herein or in manufacturer's instructions shall be installed as directed by manufacturer's representative. Proper platforms and supports for mounting of equipment, accessories, appurtenances, piping and controls shall be provided, including, but not limited to supports, vibration isolators, stands, guides, anchors, clamps and brackets. Platforms or supports for equipment shall conform to equipment manufacturer's recommendation, unless otherwise shown on drawings. Anchor bolts and sleeves shall be set accurately using properly constructed templates. Equipment bases shall be leveled, using jacks or steel wedges, and neatly grouted-in using a nonshrinking type of grouting mortar. Equipment shall be located so that working space is available for all necessary servicing such as shaft removal disassembling compressor cylinders and pistons, replace or adjusting drives, coils, motors, or shaft seals, access to water heads and valves of sheet and tube equipment, tube cleaning or replacement, access to automatic controls, refrigerant charging lubrication, oil draining and working clearance under overhead lines. Dielectric isolation shall be provided between dissimilar metals for the purpose of minimizing galvanic corrosion.

3.03 Field Inspection and Tests:

- A. Ductwork test: Test all supply, return, and exhaust ducts, plenums, and casings. Make substantially airtight pressure indicated for the system before covering with insulation or concealing. Substantially, airtight shall be construed to mean that no air leakage is noticeable through the senses of feeling or hearing at all duct joints.
- B. Preliminary tests: The air supply and distribution system and its components shall be given an operational test for a period of not less than 4 hours.
- C. Balancing: After preliminary test, the air supply and distribution system shall be tested, adjusted, and balanced in accordance with this Section.

3.04 Testing and Balancing Air Distribution Systems:

- A. Procure services of an independent balance and testing agency, and which is a member of the Associated Air Balance Council, to balance, adjust and test equipment and air distribution systems.
- B. Perform testing and balancing in accordance with AABC National Standards for Field Measurement and Instrumentation, Form No. 81236, Volume One, Standards for Field Measurement and Instrumentation.
- C. Work under direct supervision of qualified Engineer. Instruments shall be accurately calibrated and maintained in good working order. Conduct tests in presence of Engineer when requested.
- D. Balance and testing shall not begin until systems have been completed and are in full working order. Contractor shall put all heating, ventilating, and air conditioning systems and equipment into full operation and continue operation of same during each working day of testing and balancing.
- E. Compile test data upon completion and submit 6 copies of complete test data to Contractor for forwarding to Engineer of evaluation and approval. Records of balancing for each zone shall also be compiled for submittal to Engineer for evaluation and approval.
- F. Air balancing: Perform following tests and balance system in accordance with following requirements:
 - 1. Install filters during all preliminary testing and operating. Replace filters at time of final acceptance.
 - 2. Test and adjust blower rpm to design requirements.
 - 3. Test and record motor full load amperes.
 - 4. Make Pilot tube transverse of main supply ducts and obtain design cfm at fans.
 - 5. Test and record system static pressures, suction and discharge.
 - 6. Test and adjust system for design recirculated air, cfm.

7. Test and adjust system for design cfm outside air.
8. Test and record entering air temperature (D.B. heating and cooling).
9. Test and record entering air temperature (W.B. cooling).
10. Test and record leaving air temperatures (D.B. heating and cooling).
11. Test and record leaving air temperatures (W.B. cooling).
12. Adjust all main supply and return air ducts to design cfm.
13. Test and adjust each diffuser, and register as to location and area.
14. Identify each grille, diffuser, and register as to location and area.
15. Size, type, and manufacturer of diffusers, grilles, registers, and all tested equipment to make required calculations.
16. Readings and tests of diffusers, grilles and registers shall include required fpm velocity and test resultant velocity, required cfm and test resultant cfm after adjustments.

3.05 Start-Up of Equipment:

- A. No start-up of heating, ventilation and air conditioning equipment is permitted without the direct supervision or participation of the manufacturer's representative. The manufacturer must be given a minimum of 3 normal working days notice to schedule their representative for start up work.

3.06 Preliminary Operations:

- A. Should the Owner require that any portion of the system or equipment be operated prior to the final completion and acceptance of the work, the Contractor shall furnish such operation. All the expense thereof will be paid by the District separate and distinct from any money paid on account of the Contract.

- B. For such preliminary operation or testing, payment shall not be construed as final acceptance of any of the work of this Contract.

3.07 Operating Instructions:

- A. The Contractor shall provide the services of a competent Operating Engineer to supervise the operation of all equipment specified herein and to instruct the District operators during a one day operating period. The operating instruction period shall be defined as straight time working hours and shall not include nights and weekends.
- B. The District shall be notified in writing at least five days before each operating instruction period begins. The District must accept the instructional starting time in writing to the Contractor. Upon arrival, the various instructors shall report to the District.

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DIVISION 15 - MECHANICAL

SECTION 15900 - CONTROLS AND INSTRUMENTATION

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees submittals, clean-up, as built and all other applicable requirements of Document 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Automatic controls, electric and electronic, for all items indicated on the drawings and described herein- after including sensors, switches, relays, thermostats, and control panels.
- D. Electric motors for air dampers, etc.
- E. All control wiring and conduit for temperature control system.
- F. Control panels.
- G. Complete calibration and adjustment of control system and instructions for maintenance and operation of control equipment.
- H. Composite control diagram showing interlocking equipment and control.

1.02 Related work specified elsewhere:

- A. Finishes: Division 9.
- B. Electrical: Division 16.

1.03 Submittals

A. General:

- 1. Refer to Division 1, General Conditions for requirements governing submittals.

B. Submittal data to be furnished shall include, but not limited to the following:

1. Room thermostats.
2. Motorized dampers.

ARTICLE 2 - PRODUCTS

2.01 General

- A. Automatic temperature control system shall be as manufactured by Barber-Colman Controls or Honeywell, Inc., or approved equal, complete with necessary thermostats, valves, damper motors, switches, relays, control panels and wiring.
- B. The temperature control system shall be completely automatic and shall accomplish control sequence and results as hereinafter specified. Control devices shall be so located that they will be readily accessible for adjustment and servicing. Any temperature sensing devices which do not function properly because of incorrect location shall be relocated at no cost to the Owner.
- C. Provide substantial backing for any devices mounted on plaster walls.

2.02 Products

- A. Thermostats: (Not provided by air conditioning unit manufacturer).
 1. Thermostats shall be modulating or two position as required to accomplish the sequence of operation.
- B. Damper motors shall be equipped with oil immersed gear trains and ample capacity to handle the required loads under normal operating conditions. Where indicated, spring-return type motors shall be supplied.
- C. Air flow dampers:
 1. Dampers to be louver type with galvanized steel frame and equipped with brass or nylon bearings and 1/2" zinc plated shafts.
 2. All dampers over 48" high or 48" wide, or over 25 square feet area, shall be built in two or more sections with interconnection on every other blade.

3. Damper blades shall be 16 gauge galvanized steel with neoprene edges and minimum width of 8".
- D. Provide such additional material, equipment, and appurtenances as required to make satisfactory operating systems.
- E. The functional sequence of all controls shall be the responsibility of the Contractor.
- F. Coordinate the mechanical and electrical drawings to provide a complete interconnected wiring diagram.

ARTICLE 3 - EXECUTION

3.01 General

- A. Install thermostats indicated on drawings.
- B. Provide conduit and wiring for complete temperature control system in accordance with Division 16. Work shall be completed under this Section of the specifications.

3.02 Testing

- A. Calibrate and adjust the system under operating conditions.
- B. At the Engineer's request the system shall be tested in the presence of the Engineer.

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DIVISION 16 - ELECTRICAL

SECTION 16010 - ELECTRICAL

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0 and Division 1 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
- C. Work includes, but is not limited to, the following:
- D. Addition of a new circuit breakers in existing main distribution switchboard DS and extending of 480V, 3 phase, service to the new building.
- E. Emergency power and lighting system.
- F. Distribution systems for power and lighting.
- G. Grounding system for switchboards, transformers, equipment.
- H. System of lighting, outlets and devices.
- I. Conduit and wiring for HVAC controls where not furnished under the mechanical section.
- J. Telephone and signal raceway systems, as indicated, including conduit, outlets, pull wires, sleeves, backboards.
- K. Conduit and wiring system for heating, ventilating, air conditioning and plumbing, including items of industrial control. Connection to package units furnished under Division "Mechanical".

- J. Conduit, wiring and connections to electrical equipment furnished under other sections and equipment furnished by Owner. Outlets, junction boxes, switches and devices to make a complete installation. Installation of controls furnished under other sections.
- K. Complete television and monitor system.
- L. Paging system.
- M. Fire alarm system.
- N. Clock system.
- O. Other specialized systems as may be specified herein.
- P. Excavation and backfill for work under this section.
- Q. Shop drawings, wiring diagrams, equipment data.
- R. Testing, cleaning, adjusting of completed work.
- S. Record drawings.
- T. Permits, inspections, fees.
- U. Temporary power and lighting as required for work under this section.
- V. Metal supports, channels, plywood backing, vibration isolation, seismic bracing, as required for work under this section.
- W. Exterior parking lighting.

1.02 Related Work in Other Sections:

- A. Furnishing and setting of motors (Mechanical Trades).
- B. Painting, except shop finishing and field touch up (Section "Painting").
- C. Public telephone cable and instruments (Utility Company or Owner).
- D. Furnishing of package air conditioning controls (Section "Heating, Ventilating and Air Conditioning").

E. Temporary service (General Conditions).

F. Formed concrete (Section "Concrete").

1.03 Legal Requirements and Standards:

A. Codes and Regulations: Comply with applicable sections of national, state and local codes, laws, ordinances, rules and regulations of authorities having jurisdiction, including:

1. National Electric Code (NEC).
2. Occupational Safety and Health Administration (OSHA).
3. State and local fire regulations and requirements.
4. National Fire Protection Association (NFPA).
5. Underwriters' Laboratories, Inc. (UL).
6. City and State Electrical Codes. Applicable portion or local Building Codes.

B. Standards: Comply with latest editions of applicable regulations and standards of:

1. Insulated Power Cable Engineers Association (IPCEA).
2. Institute of Electrical and Electronics Engineers (IEEE).
3. National Electrical Manufacturers Association (NEMA).
4. American National Standards Institute (ANSI).
5. National Bureau of Standards (NBS).
6. Certified Ballast Manufacturers (CBM).

C. Minimum Requirements:

1. Comply with the requirements of authorities and listed standards as minimum acceptable work.

2. The drawings and specifications take precedence when they call for materials or construction of better quality or larger size than required by codes, laws, rules and regulations.
- D. Permits: Obtain and pay for all fees, permits and inspections, unless otherwise specified. Deliver all certificates of inspection to the Architect and include copies with maintenance manual. Code compliance inspections will be performed by the Electrical Engineer of SCRTD. Notify the SCRTD requesting all code required inspections.
- E. Guarding:
1. Provide protection for moving parts and hazardous conditions.
 2. Provide industrial accident and warning signs per ANSI and OSHA.
 3. Erect and maintain suitable barriers, protective devices, lights and warning signs for the protection of the public and employees from the work under this section.
 4. Conform with applicable safety regulations, including those required by the Engineer and Owner.

1.04 Services:

- A. Ground transformers, switchboards as specified and per code requirements. Provide ground at public telephone terminals.
- B. Verify exact location of existing feeder conduits scheduled to be reused for the new building. Reconnect as required.

1.05 Substitution of Materials:

- A. The applicable paragraphs of General Requirements, Division 1, shall apply herein.
- B. Basis for Design:
 1. The manufacturer's name and product listed on the drawings or in these specifications are used as a basis for design to establish space requirements, a standard of quality and performance.

2. The phrase "or equal by" followed by manufacturer' name means that this manufacturer's product shall match the performance, construction, fit, features, etc., against those selected for design, and implies that his standard catalogue product could require certain modifications to meet specified requirements.

C. Substitutions:

1. Provide bid based on specified material and equipment, except the contractor may submit proposed substitutions prior to ten days before bid opening. Such proposed substitutions must receive written approval from the Engineer prior to bidding.
2. In proposing a substitution, the Contractor assumes full responsibility for any associated modifications in building openings, circuiting, control wiring, and space considerations, and bear all costs.
3. Engineer reserves right to reject any proposed substitution.

- D. Liability of Substitutions: Performance of substitutions shall be equal or superior to the item used for basis for design and shall meet all requirements of above "or equal by" clause. Should the substituted item fail to perform in accordance with specifications, replace with the originally specified item without extra compensation.

1.06 Submittals of Materials and Equipment:

- A General: Make submittals in accordance with the General Requirements, in order as listed. Obtain material list approval prior to submission of manufacturer's data and shop drawings.

1. Material and Equipment List.
2. Manufacturer's Data and Shop Drawings.

B. Submittals:

1. Piecemeal submittals will not be acceptable.
2. Submit in brochure form with all listings referenced to applicable paragraph in the specifications.

- C. Review: Submittals will be reviewed for general design only, and not for method of assembly, erection, construction or detailed compliance with Contract Documents.
- D. Condition of Acceptance of Submittals:
 - 1. No deviation permitted from Contract Documents unless specifically so noted by Contractor and accepted by Engineer.
 - 2. Assume Responsibility For:
 - a. Error or omissions in submittals regardless of review status of such submittals.
 - b. Coordination with work of other trades.
 - c. Space coordination and maintenance of code required aisle space.
 - d. Erection and installation techniques, including structural adequacy and suitable bracing.
 - e. Maintenance of installation safety.
 - f. Satisfactory performance of all work.
- E. Material List:
 - 1. Submit a complete list of materials and equipment proposed for the job, including manufacturer's name, referenced to applicable sections and paragraphs of the specifications.
 - 2. List only names of proposed manufacturer. Catalog numbers and performance data are not required and will not be reviewed prior to complete submission.
 - 3. Submit all materials and equipment, even if same as specified or shown on the drawings.
- F. Manufacturer's Data: Submit with associated shop drawings after review of material list.
- G. Shop Drawings:
 - 1. Identify with project name and number and with item designation as indicated on drawings and reference to applicable paragraphs of the specification.

2. Submit legible reproducible transparency and two prints minimum for the Engineer's record. Make necessary prints of reviewed transparency for distribution. If reproducible is not available, submit a minimum of six copies of catalog cuts.
3. Prior to submission, check all shop drawings for conformance with the requirements of the drawings and specifications, and against available space. Obtain public utility company approval of service metering and indicate on shop drawing. Have motor control centers reviewed by respective mechanical trades for motor size and control coordination. Have submittals signed by all reviewing parties. Make required corrections before forwarding to the Architect for review.
4. Include dimensional data, weights, ratings, construction details, component descriptive data and sufficient information to illustrate compliance with the specifications. List labeling and approving agencies and standards of design employed in manufacture.
5. Submit shop drawings and technical data on all equipment and auxiliary systems, including:
 - a. Switchboards, motor control centers, panelboards.
 - b. Signal system components, wiring diagrams, conduit and outlet diagrams, system function description.
 - c. Gutters and wireways, concrete pull boxes or manholes, specially fabricated pull boxes.
 - d. Catalog cuts of lighting fixtures.

1.07 Record Drawings:

- A. Record of Job Progress: Provide and maintain in good order a complete set of blue line electrical contract drawings available at the site for inspection. Keep an accurate dimensional record of as-built locations and all job changes, including dated authorizations. Refer to Section 01720 for additional information.
- B. Record of Installation: At the conclusion of the work, receive from the Engineer a set of reproducible electrical

electrical drawings and incorporate all as-built data in a clearly legible and reproducible manner utilizing contract drawing symbols and notations.

C. Include in Record Drawings the Following:

1. Corrected panel schedules indicating installed condition.
2. Revisions, including sketches, change orders, written directives, regardless of source of the revision.
3. Physical routing of feeders and conduits two inch trade size and larger.
4. Location of underground conduit and stubouts dimensioned from building structure.
5. Location of site pull boxes, and manholes by elevation and dimensioned from buildings and permanent structures.

D. Acceptance: As a condition for acceptance of the work, deliver signed and dated reproducible drawings and one set of prints to the Engineer and obtain receipt.

1.08 Spares, Spare Parts, Special Tools:

A. General:

1. Provide to Owner as specified in other paragraphs of the specification and as follows.
2. Obtain receipts and include copy with Operating and Maintenance Instruction Manual(s).
3. Provide lists of each category describing type, rating and use and include lists with Operating and Maintenance Instruction Manual(s).

B. Fuses:

1. Three spares of each current rating for each type including communication and control system fuses.
2. Where quantity exceeds thirty, provide wall mounted cabinet with hinged lockable door and shelving adequate for storage and display. Locate as directed.

- C. Pilot Light Lamps: Ten percent by type, but not less than two each.
- D. Overload Heaters: Two set of three for each rating.
- E. Breaker Lockout Devices: One for each six panelboard circuit breakers or as noted, whichever is greater.
- F. Receptacle Plugs: One for each receptacle excluding NEMA 5-15R and 5-20R and L5-15R types.
- G. Special Tools: Provide, as standard accessories, tools not readily available in commercial market required for assembly, adjustment and/or maintenance of equipment provided under this section.

1.09 Operating and Maintenance Data:

- A. General: As a condition for acceptance of the work, provide to Architect three copies of Operating Instruction Manual, complete and at one time, in looseleaf three ring binders with permanent covers, identified, indexed and cross-referenced to the specifications. Include the following:
 - 1. Complete set of "as-built" shop drawings.
 - 2. Catalog data.
 - 3. Wiring and block diagrams.
 - 4. Brief system operation description for signal systems.
 - 5. Motor starter overload schedule.
 - 6. Operating and maintenance data.
 - 7. Parts lists and source for parts and service.
 - 8. Guarantee and warranties.
 - 9. Receipts for all items delivered to Owner.
 - 10. Test reports.
 - 11. Inspection certificates.
 - 12. Suppliers and manufacturers conformance certificates.

13. Material list as installed.
 14. Manufacturer's directions.
 15. Instruction reports.
- B. Verbal Instructions: Instruct the Owner's designated operating personnel in the operation and maintenance of all systems. Submit written report with operating instructions indicating date and time of instruction and personnel involved, and signed by personnel receiving instruction.
- C. Inspections: In addition to required service calls, make a minimum of two inspections accompanied by operating personnel, within the guarantee period, at no expense to the Owner, to insure all systems to be in satisfactory operating condition. Submit written report signed by operating personnel witnessing inspection to the Owner indicating inspection results with a copy to the Engineer.

1.10 Completion:

- A. Before Final Review: The work hereunder will not be reviewed for final acceptance until Operating and Maintenance Data, Manufacturer's Literature, Identification and Nameplates specified herein have been approved and properly posted in the building and final cleaning has been completed.
- B. Before operating any equipment for demonstration or test, comply with manufacturer's preparation instructions.
- C. Demonstration of Operations: When the installation is complete and specified adjustments have been made, operate the systems for a period of one week, during which time demonstrate to the Engineer that systems are completed and operating in conformance with these specifications.

1.11 Guarantee:

- A. General:
1. Comply with guarantee requirements of Division 1.
 2. Guarantee all material, equipment and work for a period of one year from written acceptance of the work, against defects of any kind, covering all parts.

3. Guarantee fluorescent and high intensity discharge fixture lighting ballasts for period of two years after ballast manufacture, but not less than eighteen months after written acceptance of the work for material and labor. Submit guarantee along with "Operating and Maintenance Instruction Manual(s)" and include name and telephone number of designated representatives who will perform required maintenance.
- B. Parts Warranty: Obtain guarantees and/or warranties for factory assembled equipment and include with "Operating and Maintenance Instruction Manual(s)".
 - C. Replacement: In the event of failure of any work, equipment, or device during the life of the guarantee, at no cost to Owner, repair or replace the defective work and remove, replace or restore any parts of the structure or building which may be damaged as the direct result of the defective work or in the course of making the replacement of defective work or materials.
- 1.12 Preliminary Operation: The Owner reserves the right to operate portions of the electrical system on a preliminary basis without voiding the guarantee or relieving the Contractor of his responsibilities.

ARTICLE 2 - PRODUCTS

2.01 General:

- A. Provide material and equipment of new and recent manufacture, UL labeled and/or listed for the specified use.
- B. Where UL labeling is not available, provide certification by a nationally recognized testing laboratory.
- C. For each category of material and equipment, use products of the same manufacture and type.

2.02 Raceways and Wireways:

- A. Rigid Conduit Including Couplings, Locknuts, and Nipples: Steel, hot-dipped galvanized inside and out, after threading, galvanized, threaded malleable iron or steel fittings, notched locknuts with gripping teeth.
- B. Intermediate Metal Conduit Including Couplings, Locknuts, and Nipples: Steel, hot-dipped galvanized outside,

interior galvanized, lacquered or enameled, galvanized threads, galvanized threaded malleable iron or steel fittings, notched locknuts with gripping teeth.

- C. Electric Metallic Tubing Including Locknuts, Fittings, Couplings and Connectors: Galvanized steel, lacquered or enameled interior, raintight, gland ring compression type fittings, insulated throat connectors and couplings. Submit sample fittings for approval. Indenture fittings are not acceptable.
 - D. Flexible Conduit: Manufactured from single steel strip, galvanized on all four sides prior to fabrication, galvanized steel twist-in connectors, UL listed for ground continuity.
 - E. Liquidtight Flexible Conduit: Flexible galvanized steel core, with extruded polyvinyl chloride cover. Liquidtight insulated throat fittings shall seal and ground conduit. Provide separate bond wire where integral conductor is not available.
 - F. Gutters and Wireways: Galvanized sheet steel, hinged covers, elbows and fittings without sharp edges or projections.
 - G. Nonmetallic Conduit: High impact 90° C polyvinyl chloride, Schedule 40 extruded to iron pipe sizes with manufactured spacers, couplings, bends and offsets. Plastic to plastic connections by means of solvent welding per manufacturer's directions. Plastic to metal connection with UL listed adapters.
- 2.03 Fittings, Outlets and Junction Boxes: Provide bright and new stock, stored where continuously protected from the weather and conforming to the following:
- A. Outlet Boxes and Covers: Pressed steel, knockout type, with full access screw-on covers or plaster rings, hot dipped, galvanized, with cadmium plated machine screws.
 - B. Cast Outlet Boxes: Cast ferrous metal construction, galvanized, complete with threaded hubs for rigid conduit, number and location as required, and plugs in unused hubs; gasketed cast covers; cast device plates suitable for indicated device; in nazardous area, approved for the class of hazard. Provide for Class "1", Division "1", Group "B" hazard classification unless otherwise indicated.

- C. Small Junction and Pull Boxes: As specified for outlet boxes.
- D. Large Junction or Pull Boxes: Galvanized code gauge sheet steel construction, with full access screwed on covers and cadmium plated or galvanized machine screws; minimum size per the governing electrical code or as noted on the drawings, whichever is greater; barriers for required separation; special configurations, where determined from field measurements to surmount structural conditions; factory painted with gray enamel. For flush mounting, covers shall extend 3/4" beyond edges of boxes. Where used for cable support, brace box to support cable weight. For junction boxes larger than 36 inches in any dimension, provide 3/4" diameter steel pipe cable supports with flanged ends bolted to box frame, and with continuous fiber insulating sleeve spaced on 36 inch centers maximum.
- E. Junction Boxes on Exterior or Where Exposed to Moisture (e.g., Tunnels, Pits, Mechanical Rooms): Edges welded and ground smooth, leaving interior fillets; galvanized after fabrication; gasketed covers; stainless steel screws, countersunk; factory painted with gray enamel. Gaskets to be factory made of an approved type.
- F. Floor Mounted Junction or Pull Boxes: Heavy wall cast iron with flanged lip; galvanized; gasketed, screwed-on, watertight coverplate; drilled and tapped conduit openings as required; minimum size 6 inches square by 4 inches deep.
- G. Floor Boxes: Watertight cast iron units; galvanized; adjustable before and after installation; 4" diameter by 3-1/2" deep; gasket between adjusting ring and box, drilled and tapped conduit entrances as required; plugs in unused openings; ganged barriered units where indicated; 4 inch round heavy brass cover with 1 and 2-1/8" plugs (or cover compatible with device); brass carpet flange in carpeted areas. For junction box use, provide conduit elbow with adjustable flush brass coupling to allow for conduit extension above floor. Use shallow boxes where required by slab thickness. Galvanized steel boxes may be used in suspended slabs. For duplex outlet flush with floor, provide cover with individual hinged caps.

2.04 Concrete Pull Boxes:

- A. Precast Concrete Pull Boxes Outside Building, Branch Circuiting: Where not otherwise noted or detailed, provide bottomless units with reinforced bolt down

concrete cover; outside dimensions 13 by 19 by 12 inches deep minimum; in traffic areas, provide bolt down traffic covers. Provide 12 inch depth of crushed rock or pea gravel below boxes for drainage.

B. Pull Boxes, Distribution:

1. Provide precast concrete pull boxes where indicated, 48 inches square by 48 inches deep minimum dimensions, complete with pull irons on four sides, conduit entry provisions on four sides, dry sump, cable racks, galvanized steel frame and two piece, bolt down, cast iron or steel cover (where not covered by electrical equipment). Traffic type in traffic areas.
2. Caulk between sections and coat exterior with waterproof compound.
3. Set pull boxes on 6 inch deep gravel or sand bed, flush with paving in paved areas with paving sloping away from pull boxes. In unpaved areas locate boxes so that runoff water will not drain to pull box, set cover 2 inches above finished grade and provide 6 inch thick by 12 inch wide concrete apron around box, sloping away from cover.
4. Alternate: Poured in place pull boxes of equivalent characteristics may be provided. Submit structural details and calculations for review.
5. Identification: Cast system designation in covers in 2 inch size letters as directed Secondary power ELECTRICAL. Communications systems - SIGNAL.

C. Hand Holes (Grounding): 10" round (I. D.) cast traffic box with cast iron or galvanized steel cover.

2.05 Conductors - 600 Volt:

A. General:

1. Manufactured within eight (8) months of installation, of soft drawn copper of not less than 98 percent conductivity, conforming to ASTM Specification and NEC; 600 volt insulation unless specifically noted otherwise, of the type specified; standard American Wire Gauge (AWG) sizes; stranded for No. 8 AWG and larger; insulation not less than temperature requirements.

2. Provide new conductors delivered to the site in original, unbroken packages, plainly marked or tagged with Underwriters' labels; size, type, insulation and voltage rating of the wire; name of manufacturing company and the tradename of the wire; date of manufacture.

B. Insulation:

1. All sizes - THW, XHHW.
2. No. 6 AWG and Smaller: THW, THWN, XHHW. For Dry Locations: THW, THWN, XHHW, THHN.
3. Connections to recessed fixtures from closest outlet in wet locations - AVL.
4. Through ballast housings, and for connections to recessed fixtures in dry locations - AVA, ABV, RHH, THHN, XHHW.
5. In exposed conduit on exterior, on roof or in conduit concealed under roofing material - AVL, MI (wet locations).

Exceptions: Short conduit extensions (six feet or less) to roof mounted equipment may be same as remainder of circuit.

6. For communication and signal systems and for control of mechanical equipment - THWN throughout unless otherwise specified.
7. For pendants and cords - Underwriters' Type SJ or SJO with ground wire, or as indicated.

- 2.06 Ground Electrodes: Provide, where indicated, driven ground rods of cone pointed electrolytic copper bonded to carbon steel core, sectional type where over 10 feet in length, die stamped near top with name or trademark of the manufacturer and length of rod in feet; diameter sufficient to permit driving without damage, but shall be not less than 5/8 inch; approved copper alloy clamps brazed to upper end of rod. Bolt ground wires to rods.

2.07 Switchboard, Motor Control Centers:

A. General:

1. Complete factory assembled, metal enclosed assembly with lifting means, consisting of the required

number of 90 inch high (unless available headroom requires 78 inch height), self-supported, vertical sections, including pull and/or transition sections, bolted together to form a floorstanding assembly, front and rear aligned. Feeder termination suitable for wire connections, as indicated. Ratings indicated on the drawings.

2. Switchboards: NEMA Class I, drip proof, front accessible, switchboard construction with flush group mounted devices connected and removed and maintained from the front, suitable for mounting with back against the wall.
3. Code device handle heights considering installation on a 4 inch high concrete base pad.
4. Rodent proof ventilation as required to maintain allowable temperature rise at rated capacity.
5. Interfacing of external cable conductors and control wiring with all related equipment supplied herein, under other sections of the work.
6. All devices, controls, auxiliaries, and instrumentation, as indicated on the drawings and as required for the specified function, assembled, interwired and protected, prior to shipment, at the manufacturer's plant.
7. Switching and protective devices with visible means of ON-OFF identification and interrupting rating not less than the switchboard rating.
8. Shop drawings, operating and maintenance data, identification and testing as described in Part 1.
9. Anti-turn (two bolt), solderless, copper or copper core CU-AL saddle type incoming and outgoing feeder terminals per Paragraph "Installation of Conductors".
10. Submittals to include voltage/current rating, short circuit rating of board and devices, overall dimensions, available conduit space, circuit schedule, circuit numbers, device rating and description, conductor ratings, one line diagram with circuits numbered, nameplate schedule, equipment weight, motor center and control panel internal and inter-connecting wiring diagrams, certification of conformance.

11. Switchboard and device settings and ratings to be based on short circuit and coordination reports where specified to be part of this work.
12. Verify top or bottom entry and instruct equipment supplier.

B. Construction:

1. Code gauge sheet steel, phosphatized, primed and factory finished medium gray, with removable, screwed on, pan type, side, top and rear access plates, capable of being moved into installation position without deformation or damage and bolted directly to the floor without use of floor sills.
2. Full height vertical wiring compartments with hinged pan type access doors, or screwed on pans with captive screws, top and bottom wiring compartments, cadmium plated hardware and captive screws.

C. Bussing:

1. Flat copper bussing, silver plated at joints, sized for 1,000 amperes per square inch of cross section, mounted on high impact, nontracking insulators braced for available fault current. Label boards for specified short circuit rating.
2. Compression type bolts at all bus joints using a combination of flat and spring type washers.
3. Unreduced, fully rated horizontal bus for length of board, arranged for future expansion, and rated not less than the main device. Incoming bus rated not less than the main device or sum of main devices.
4. Full height vertical bus, rating equal to sum of devices and spare devices served, but not less than two-thirds of the horizontal bus rating for two sections or one-half for three or more sections.
5. A-B-C bus arrangement throughout, left to right, top to bottom, and front to rear.
6. Bus assembly to maintain UL clearances without reliance on any insulating material.

7. Full length copper equipment ground bus 1/4" by 2" cross section secured and bonded to each section of board, with terminals for feeder ground connections.
8. Fully rated neutral bus insulated from ground for all grounded neutral boards with a removable neutral bus link.
9. Horizontal bus located not less than 8" from front panels and bottom of boards.

D. Features:

1. 480 volt switchboards containing relays to have control power source for relay supply, consisting of a current limiting circuit breaker connected to main bus, and 480 to 120 volt, 0.5 KVA minimum rating, control transformer with secondary fusing.
2. Spare devices for all switchboards and motor control centers as indicated on the drawings, but not less than one for each board containing eight or more feeder devices and rated not less than the smallest feeder or branch device in the board.
3. Fully equipped spaces including bus extensions, drilling and tapping of busses, suitable dead plates, but less device connecting straps, as indicated, but not less than one per switchboard and not less than one for each six devices or fraction thereof, rated not less than the smallest feeder or branch device in the board.
4. Devices and wiring connected ahead of mains or energized from external sources to be isolated, barriered and identified.
5. Oiltight, transformer push-to-test type indicating pilot lamps with lamps replaceable from exterior.

E. Wiring:

1. No. 14 AWG minimum, NEC switchboard type, terminated with spade lugs on screw stud type terminal blocks, on bakelite frame.
2. Color coding reserving white for neutral and green for equipment ground. Colored tape identification is equivalent to colored insulation. Conductors fanned, laced and identified with numbered strips.

3. Isolate wiring from external sources and identify.
- F. Circuit Devices: Types as designated on the drawings and meeting the requirements of applicable paragraphs of the specifications, short circuit rating not less than switchboard rating. Provide for padlocking in OFF position.
- G. Equip circuit breaker added to existing main switchboard with ground fault relays as described under "Circuit Protective Devices".
- H. Distribution Switchboards:
1. Floorstanding switchboards for more than six devices.
 2. Floorstanding or wall mounted units of panelboard construction for six or less devices (including specified spares and/or spaces).
- I. Motor Control Centers Additional Requirements:
1. NEMA Class II, Type B wiring, dust proof and drip proof, industrial use, NEMA Type 12 construction, 20" deep.
 2. 480 volt, 3 phase, 60 Hz, rated for 22,000 amperes RMS symmetrical but not less than available.
 3. Items of industrial control and control wiring to meet the functional control requirements specified in Mechanical and Electrical Sections and shown on wiring diagrams on Mechanical and Electrical Drawings.
 4. Vertical wireways with a minimum of 35 square inches of cross-sectional area adjacent to each vertical unit, with separate door containing steel cable support with plastic ties.
 5. Vertical bus completely isolated and insulated, designed to prevent fault generated gases from passing between phases.
 6. Shutter mechanisms to cover stab openings on removal of circuit devices.
 7. Wiring compartments isolated from starter and feeder units, and from vertical and horizontal bus.

8. Combination circuit protective device and controller in modular compartment with individual, defeatable, door interlock to prevent opening door with power on. Door mounted control switch with nameplate to automatically disconnect control circuits when compartment door is open. Defeatable interlock to prevent removing or inserting device in ON position.
9. ON and OFF indication on circuit protective devices with door open or closed, and padlock provision on handle.
10. Power terminals sized for associated motor current rating. Two piece control terminals, separable without requiring conductor disconnection.
11. Starters with 120 volts coils of rating and type indicated on drawings, meeting requirements specified under Paragraph "Magnetic Motor Starters", of drawout construction, utilizing design which increases contact-pressure under short circuit conditions.
12. For circuit breaker type motor control centers, use motor circuit protectors (magnetic breakers) with size No. 1 starters. For larger starter sizes, use breakers as specified under Paragraph "Circuit Protective Devices". Use integral current limiters where required for available fault current. Verify motor sizes with trade supplying motors, and size protectors accordingly, prior to submitting shop drawings.
13. Oiltight devices, push-to-test, low voltage pilot lights with integral transformers. Heavy duty industrial class relays with minimum of one normally open and one normally closed, 10 ampere tungsten lamp rated contact. Time delay relays where indicated.
14. Controls, as indicated on wiring diagrams, grouped in each center and barriered from other devices. Group separately, relays controlling external loads or relays energized from external source and barrier from remainder of center, or enclose in separate housings and run wiring to these units in conduit. Provide engraved nameplates identifying relays as externally powered. Mount switch devices through face of board and identify.

15. Wiring terminating in terminal blocks for remote starter control from building automation center.
16. Posted schedules of starter overload data based on motor horsepower on motor center behind clear plastic.
17. Spare pilot lamps per Paragraph "Spares".
18. Submit starter diagrams indicating specification conformance.

2.08 Panelboards:

A. General Features:

1. Code gauge galvanized or galvanized sheet steel cabinets, with corners lapped and welded or riveted, dead front, dead rear, front accessible.
2. In equipment or storage rooms, trim and cabinet to be factory phosphatized, primed and finished medium gray inside and out to match switchboards. In painted walls where exposed to public view (e.g., corridors, offices), field paint trim to match wall.
3. Full height unreduced copper bus, rigidly supported. Solderless, saddle type, copper core CU-AL lugs for connection per Paragraph "Installation of Conductors". Bus feeder sequence as for switchboards. Solid neutral bar for grounded systems. Lugs sized for feeders. Subbreakers, split bus, main lugs, main breaker, double lugs, voltage and current ratings, all as indicated on the drawings.
4. Minimum bus rating of 225 amperes, except where 100 amperes is specifically indicated, but not less than feeder protective device rating.
5. Main breakers, where required, mounted vertically ahead of panel bus. Replacing of branch devices with main breaker is not acceptable.
6. Copper equipment ground bus for termination of feeder and/or branch circuit grounding conductors.
7. Oversize gutters for feed through, where indicated or required, sized not less than five times the

total cross-sectional area of the through feed cable in addition to required branch circuit gutter. Provide suitable pull box or gutter adjacent to panels for connections, in lieu of double lugs or feed through, where required by code or field conditions.

8. Incorporate associated contactors, relays, etc., in separate control sections of the panel, behind separate door, but with common frame, or in separate enclosure. Where push button or contactor bypass is required, mount on dead plate behind panel door so that no live parts are exposed.
 9. Flush mounted in areas exposed to public view. Surface mounted in electrical, communication, mechanical and storage rooms.
 10. Hinged lockable door covering all devices. Flush catch and cylinder lock with point catch at top, bottom and center. Vault handle on doors over 4 ft. high. All panels and cabinets keyed alike. Provide two keys per panel and cabinet. Keys to match existing panelboards where adding to existing facility.
 11. Raintight enclosures in damp locations.
 12. Certify conformance with the specifications.
- B. Lighting and Appliance Panelboards Additional Features:
1. Minimum size 20 inches wide by 5-3/4 inches deep, unless specifically indicated otherwise.
 2. Metal sided index cardholders with typewritten circuit schedules reflecting as-built circuiting, behind clear plastic cover on inside of door.
 3. Automatic circuit breakers, molded case, trip free, quick-make, quick-break, thermal magnetic type, bolted to the bus, with handles clearly indicating size and tripped position, of size and arrangement as shown on schedules. Common internal trip with single handle for multipole breakers. Permanent plastic or metal circuit numbers on adjacent trim (including spaces), screwed or riveted to trim. Adhesively applied labels are not acceptable. Where indicated, or where used for switching, use UL listed SWD switching duty breakers.

4. Minimum panel and breaker interrupting rating of 10,000 (22,000 where noted) amperes below 150 volts to ground and 14,000 (25,000 where noted) amperes above 150 volts to ground, RMS symmetrical.
5. Breaker handle padlocking devices for 120 volt circuits serving electric discharge lamps, built integral with panel.
6. Breaker lockout device per Paragraph "Spares".

C. Power Panelboards Additional Features:

1. All requirements of lighting panelboards, including doors.
2. Convertible type construction.
3. RMS symmetrical rating equal to interrupting capacity of smallest device but not less than 22,000A (240V) and 25,000A (480V).
4. Breaker ratings per paragraph "Circuit Breakers, Molded Case".
5. Device handle padlocking provision.
6. Minimum bus rating of 225 amperes.
7. Minimum side wiring gutter width for branch wiring of 5 inches where largest device is 225 amperes and 8 inches for larger devices.
8. Where number of devices requires use of more than one section, provide totally enclosed sections, each with full capacity bus, and double lugs for full capacity feeder connection between sections.
9. Equipped spaces as shown, but not less than one per board.

D. Switching Panels:

1. Where toggle switches and/or other devices are indicated to be grouped in a panel, provide panel-board construction, flush mounted. Mount devices on a dead plate.

2. Barrier devices of different voltages and normal and emergency power.
3. Provide nameplates or engraved designation for each device, indicating function.

2.09 Terminal Cabinets:

- A. Construct as described for lighting panels and key alike with panels.
- B. 12" wide by 18" high by 4-1/2" deep, minimum dimensions.
- C. Vertical barrier between line and low voltage sections, and where required.
- D. Fireproofed plywood backing 3/4" thick, for attachment of terminal strips. For fire alarm system, omit plywood and provide metal channels.
- E. Requirements of signal system supplier as specified under appropriate sections of the specification.

2.10 Controllers, Control Devices:

- A. Magnetic Motor Starters (Unless Otherwise Indicated):
 1. Full voltage, across-the-line, nonreversing, horsepower rated, size No. 1 minimum with three ambient compensated thermal bimetallic type overload relays and undervoltage release. Overloads sized for actual motor nameplate data per manufacturer's recommendation. Coil 120 volt rated and fused.
 2. Arc extinguishing characteristics and silver to silver renewable contacts. Auxiliary contacts as required by wiring diagrams but not less than two normally open, field convertible.
 3. Wiring points brought out to numbered terminals. Interlock requirements, remote control, status indication, per control sequence and/or wiring diagrams on mechanical and electrical drawings.
 4. For 480 volt starters where control circuit is energized from motor circuit conductors, provide individual control transformer with 480 volt primary

and 120 volt secondary and with (2) primary and (1) secondary fuses, adequate for controls energized from transformer, but not less than:

<u>Minimum Starter Size</u>	<u>Transformer Size</u>
1	Standard Transformer + 50 VA
2	Standard Transformer + 50 VA
3	Standard Transformer + 100 VA
4	Standard Transformer + 100 VA

5. Mount oiltight devices on starter face including manual reset button, red RUNNING push-to-test, transformer type pilot light, hand-off-automatic switch for automatically controlled motors, and additional devices where indicated or scheduled.
 6. Separately mounted combination starters to have magnetic motor starter and switch or circuit breaker (as indicated) in common enclosure behind door with bypassable door interlock, features as specified for components.
 7. Magnetic starters for remote control of 120 volt motors to be in separate enclosures and mounted adjacent to panelboard from which they are supplied.
 8. Enclosures to be NEMA Type 12 dust tight for separately mounted units. In motor control centers, conform with requirements for motor control centers.
- B. Manual Motor Starters: Voltage as required, horsepower rated, padlockable, toggle operated, with pole and overload heater for each ungrounded leg, ON, OFF and TRIPPED indication, integral RUNNING pilot light, flush mounted where practical. Where located in motor control centers or panels, group in control section on dead plate assembly, barriered from other voltages. Where used for motor disconnect switch, omit overloads and pilot light. Interlock or status contact where shown.

C. Contactors and Relays:

1. For Remote Control of Lighting Circuits (Unless Otherwise Indicated): UL listed, mechanically held, electrically operated, momentarily energized, single solenoid, relays and/or contactors of indicated ratings, operating independently of gravity or switch position, positive locking in both positions, manual operation without tools, manual operating lever for ratings 60 amperes and above. For branch circuits control, use 25 ampere rated relays with required number of poles. Install on sound absorbing shock mounts in switchboards, panels, or where individually mounted. Designation "LC".
2. For Magnetically Held Contactors: Resistive load and horsepower rated motor starters less overload elements applied per manufacturer's recommendations. Designation "EC".
3. For Control of Resistive Heating Devices: Heavy duty heater control contactors, resistive load rated for 100,000 operations. Designation "HC".
4. For Air Conditioning Systems or Motor Control: 600 volt, AC, 10 ampere, heavy duty, industrial type relays, magnetically held contacts as indicated with minimum of one normally open and one normally closed contact, field convertible, "T" rated for tungsten lamps, continuous duty coils, visible contacts or indicator. Designation "R".
5. For Line Switching of 120 Volt Motors Automatically Controlled: Magnetic motor starters with integral hand-off-automatic switch and pilot light.
6. Where required by number of poles indicated, use multiple relays in parallel.
7. NEMA Type 12 enclosure for individually mounted units.

D. Time Switches:

1. General: Type, voltage, and with number of poles indicated; heavy duty, self-starting, high torque, synchronous motors, 20 amperes, tungsten rated contacts at 277 volts. Manual bypass switch for

each pole, accessible without opening door or externally mounted, which does not disturb automatic settings. Spring driven reserve to operate clock for ten hours minimum on power failure and automatically rewind on power restoration. Terminal strip for No. 10 AWG wire minimum, dead front with door open.

2. For HVAC and Plumbing Control, and Where Indicated; Seven Day Calendar Type: 6-1/2 inch minimum dial. Accuracy of plus or minus 15 minutes, integral hand-off-automatic control, accessible, without opening cover, or externally mounted, for each circuit, ON-OFF trippers with minimum one hour on period and two hours between consecutive OFF and ON operation.
 3. For Control of Exterior Lighting and Signs (Where Not Photocell Controlled) and Where Noted: Twenty-four hour, astronomic dial. One to six day skip operation. Sunset ON, adjustable OFF, in one-half hour increments. Set for city of use.
 4. For Control of Interior Circuits and Exterior Lights on Photocell: Seven day calendar type unless otherwise, noted.
 5. For Control of Mechanically Held Contactors: Double throw contacts.
 6. For Control of Mechanically Held Contactors in Parallel With Other Control Devices: Double throw, momentary contacts, rated for 120 amps inrush at 120 volts.
 7. Engraved micarta nameplate to indicate clock designation and load controlled.
- E. Photocell Control: Solid state silicon junction photocell ALR #SST-PV with three year guarantee and six year warranty. Surge protected; fail-safe design; rated 1,000 VA HID and 1,000 VA tungsten; mount to IEEE-NEMA locking receptacle. Use with double throw electrically held relays for operation of mechanically held relays and contactors.
- F. Ionization Detector (Elevator Interface):
1. Approved by code enforcing authority for indicated use.

2. Products of combustion type, dual chamber, solid-state voltage regulator, LED visual alarm.
3. Self-contained, 120 volt, unit to provide signal to elevator control panel.
4. Auxiliary contacts, remote alarm, where indicated.

2.11 Circuit Protective Devices: Type as indicated on the drawings conforming with the following:

A. Circuit Breakers, Molded Case:

1. Trip free, quick-make, quick-break, thermal magnetic handles clearly indicating rating and ON, OFF, or TRIPPED position, type and rating indicated and specified. Multipole breakers to be common trip with single molded handle. For nonautomatic units, omit trip.
2. Individually mounted breakers in NEMA Type 12 enclosures generally, and NEMA Type 3R for weather-proof units and NEMA Type 4 stainless steel in corrosive locations. NEMA Type 1 where flush mounting is indicated.
3. Padlocking provisions for breakers individually mounted and in switchboards, motor control center, and power panelboards.
4. For switchboards, power panelboards, motor control centers, or for individual mounting, UL labeled interrupting rating not less than the rating specified for the equipment, or the following, whichever is greater:

<u>Breaker Rating</u>	<u>Frame</u>	<u>RMS Symmetrical</u>
15A to 60A	100A	22,000A @ 240V 25,000A @ 480V
70A to 225A	225A	25,000A @ 240V 22,000A @ 480V
250A to 350A	400A	42,000A @ 240V 30,000A @ 480V
400A to 800A	800A	42,000A @ 240V 30,000A @ 480V

B. Disconnect Switches:

1. Heavy duty (HD) horsepower rated, quick-make, quick break, safety type, externally operated, rating and number of poles required, capable of switching 10 times switch rating. Fused for branch circuit protection, and in elevator machine rooms, with UL rejection type clips. Nonfused for motor disconnect where indicated.
2. Include bypassable interlock, padlock provisions, positive ON and OFF indication, molded case breaker mechanism or visible blades, single switch mechanism to preclude mechanical single phasing, solid neutral bar for four wire feeders, copper core CU-AL terminals spring loaded clips with noncurrent carrying springs.
3. Use manual motor starting switches for manual control and/or disconnecting of 120 volt fractional horsepower motors up to 5 HP at 230V and 10 HP at 480V.
4. For flush mounted disconnects, provide nonautomatic circuit breakers with flanged trim.
5. Enclosures to be NEMA Type 12 in interior, NEMA Type 3R on exterior and in wet locations, NEMA Type 4 stainless steel in corrosive location.

C. Fuses, Low Voltage: Provide NEC dimensions rejection type fuses as follows:

1. 600 Ampere and Smaller: Class RK1, low peak dual element with separate overload and short circuit elements.
2. Coordinate fuses with each other and with circuit breakers which they are protecting.
3. Provide label inside each switch cover indicating specific type of fuse required for replacement.
4. Provide spare fuses per Paragraph "Spares".

2.12 Transformers, Dry Type:

A. General:

1. UL listed, dry type, ratings as indicated, built per IEEE, ANSI, and NEMA Standards, utilizing Group III insulation, rated at 220°C. Normal life expectancy and winding temperature rise not exceeding 150°C in a maximum ambient of 40°C, and an average ambient of 30°C, with continuous rated nameplate load connected to the secondary side, at rated voltage.
2. Minimum impedance of 4.25% for ratings over 100 KVA, indicated on nameplate.
3. Delta primary and wye secondary connections for three phase units.
4. Vibration dampeners between core and case. Exterior lifting holes.
5. Two 2-1/2 percent taps each, above and below normal for ratings above 5 KVA.
6. Terminals below, bottom and side conductor entrance Temperature rise in terminal compartment suitable for 60°C or higher insulated conductors. Case temperature rise 35°C maximum at rated load.
7. Rodent proof bottom enclosures. Ventilating openings arranged to prevent contact with live parts. Weather shield on all ventilated units, for drip protection.
8. Epoxy encapsulated units, sealed against moisture, dust, and fumes, for 30 KVA and smaller units.
9. Braced per latest ANSI "Short Circuit Characteristics" specifications.
10. BIL Ratings: 600 volt class and below - 10 KV.
11. Provide anti-turn solderless, copper core, CU-AL saddle type incoming and outgoing feeder terminals per Paragraph "Installation of Conductors".

B. Tests: Factory tests based on NEMA and ANSI reference temperatures. Submit certified test reports for duplicate units of each rating with shop drawings.

1. Applied voltage test to other winding and ground 600 volt class - 4 KV primary and secondary.
2. Induced voltage at twice rated voltage.
3. Ratio and polarity.
4. Sound level not to exceed 46 db.
5. Efficiency, impedances, losses.
6. Temperature rise.
7. Short circuit (latest ANSI Short Circuit Test Code).

C. Control Transformers:

1. Machine tool designed for high inrush.
2. Temperature rise below 55°C at continuous rated full load.
3. Terminal board construction.
4. Secondary board construction.
5. Rating not less than indicated or specified but adequate for inrush currents of connected control devices.

2.13 Wiring Devices:

A. General:

1. Specification grade.
2. Device Colors:

General Use - Ivory (As Available)
and Emergency

Isolated Ground - Orange

3. Screw type terminals on all devices, suitable for up to No. 10 solid copper conductors.
4. Where not specified herein, provide configuration as indicated on drawings.
5. Explosion proof devices to meet classification of location. Class 1, Division 1, Group B, where not otherwise indicated.

B. Toggle Switches:

1. Flush tumbler, AC type, insulated base, completely enclosed.
2. 20 ampere, tungsten load rated, at 277 volts.
3. 1 pole, 2 pole, 3-way, 4-way or key operated as indicated on drawings. Symbols: S, S₂, S₃, S₄, S_k.
4. Thermal overload switch, rated 1 HP at 120 volts, equipped with bimetallic or melting alloy type overloads sized for motor controlled, number of poles as required. Symbol: S_m.
5. Momentary type, three position, single pole, double throw, two circuit, spring return to center OFF position. Symbol: S_r.
6. Pilot lights, where indicated, flush neon type with lucite jewel suitable for use in switch plate opening ganged on plate with associated switch, 120 or 277 volt as required, red jewel on emergency systems, green jewel on normal systems, lighted in the ON position unless otherwise noted. Symbol: S_p.

C. Receptacles:

1. General: Number of poles and ampere rating as shown on drawings and of NEMA standard configurations. Ground pole connected to circuit grounding conductor.
2. Duplex Convenience Receptacles: 20 amperes, 125 volt; grounding third pole; side wired for 2 wire circuit use. Where 2 circuits are indicated, provide individual circuit for each half. NEMA 5-20R.

3. Ground Fault Interrupting (GFI) Receptacles: NEMA 5-20R with integral ground fault protection and weatherproof lift cover. Mount in cast box on exterior.
4. Clock Receptacles for Surface Clocks: Flush type with recessed grounding receptacle and clock support hanger with removable stainless steel plate, NEMA 5-15R. For recessed clocks, install back box furnished by clock supplier.
5. Single 120 Volt Convenience Receptacles in Floor Boxes: Grounding type, with adapters as required, for mounting in floor box. NEMA 5-20R.
6. Duplex Receptacles in Floor Boxes: Standard device behind special plate described under floor boxes. NEMA 5-20R.
7. Duplex Receptacles on Floor Boxes: Standard device in horizontal cast aluminum, satin finish fitting nipped to floor box. Double duplex receptacles back-to-back where indicated. NEMA 5-20R.
8. Weatherproof Duplex Outlets (Unless Otherwise Noted): Two single grounding receptacles mounted in tandem cast box with cast plate and chain retained screw covers. For wall mounting, recess box in wall and provide adapter plate for cast cover. Furnish weatherproof plug with threaded cap for each outlet. For freestanding outlet, stub mount and provide plugged hubs in top and sides for extension. NEMA 5-20R.
9. Isolated Ground Duplex Receptacles (IG): Configuration as indicated; but with grounding pole isolated from outlet body.

D. Motor Control:

1. Push Buttons, Selector Switches: Oiltight for starter and contactor control, 10 ampere tungsten lamp rated, miniature type.
2. Pilot Lights: Oiltight, push-to-test, miniature, transformer type.

E. Wall Plates:

1. Device plates of one make and design for all outlets, smooth, satin finish, type 302, stainless steel, 0.040" thick, beveled edges, to fit device.

2. For Surface Mounted, Pressed Steel Outlets in Utility Areas: Galvanized pressed steel plates, 0.040" thick, to conform with box and device.
3. For Exterior Locations: Cast plates on cast boxes.
4. Provide split plate one hole covers for telephone and intercom desk instrument outlets with 5/8" I. D. vinyl grommet and mounting yoke.

F. Telephone and Signal Systems:

1. Public Telephone Outlet on Floor Box: Horizontal cast aluminum, satin finish fitting with 1" bushed opening, to match receptacle floor outlet, nipped to floor box with 1" nipple.
2. Signal System Outlet on Floor Box: Same as telephone outlet.

2.14 Lighting Fixtures, Lamps Accessories:

A. General:

1. Provide complete lighting system, wired, assembled and operable, including lighting equipment and accessories as shown on the drawings, described in the fixture schedules, specified herein and covered by allowance. Accessories include canopies, suspension of proper lengths, hickey, castings, sockets, holders, reflectors, ballasts, diffusing material, louvers, plaster and mounting frames, lamps, recessing boxes, supporting brackets and channels to span structural members.
2. Catalog numbers are given for manufacturers' identification. Conform to written descriptive requirements governing material and fabrication, either in the general or specific sections. Where catalog numbers are indicated as modified, no modification will be required if the standard unit fully conforms to all descriptive requirements in the specifications and conforms with specified construction. Fixtures to be UL labeled for location and operating conditions indicated.
3. Fixtures of the same type to be of one manufacturer and of identical finish and appearance. Where not identified on drawings, provide same type as indicated in similar locations.

4. For recessed fixtures, provide frame and trim compatible with ceiling type and construction.
5. Provide adequate lamp shielding, proper ventilation and heat dissipation.
6. Secure diffusers to trim by devices not requiring tool for removal, or for relamping.
7. Locate fixture outlets and recessed fixtures by reference to architectural drawings, Architectural reflected ceiling plans and measurement of building construction Do not scale electrical drawings.
8. Provide shop drawings for custom and modified standard fixtures, and catalog cuts illustrating conformance with specifications, for standard fixtures. Drawing to indicate materials, assembly, and finish. Coordinate fixture type with ceiling supplier and submit fixture compatible with ceiling system.

Include dimensions of the assembled fixture, weight ballast characteristics, description of lens or diffuser material and finish, frame, housing, reflector, special accessories, recommended lamps and list of agencies which have labeled the fixture. Indicate the number and type of wires for which fixture with attached junction box has been approved. Indicate conformance with temperature rating requirements of specifications.

Provide (for types in quantity of 30 or more) photometric report from an independent testing laboratory equal to the standard report furnished by E.T.L., including candlepower distribution curves and tables, luminaire brightness readings, tabulation of coefficients of utilization and percent efficiency, and a description of the unit and test conditions.

9. Before ordering the specified light fixtures (for quantities of 30 or more), make available to the Engineer, on request, samples for his final approval. These samples may be on display at local distributor or manufacturer's showroom. The Owner reserves the right to change the fixture selection at no additional cost to himself except for actual fixture cost difference.

B. Construction - General:

1. Sheet Metal: Free of tool marks and dents. Finished to eliminate exposed sharp edges. Intersections and joints formed true, sufficiently rigid to prevent distortion after assembly.
2. Castings: Free of blemishes, scale and rust, and finished smooth.
3. Aluminum Surfaces, Nonreflecting: Anodized clear or with color as indicated. Castings may be irradiated, sandblasted or anodized.
4. Aluminum Reflectors: Treat with alzak process to provide permanent reflective surface of 85% minimum. Extruded reflectors to be unscored, bright dipped and clear anodized.

C. Fluorescent Fixture Ballasts:

1. 60 Hertz, energy saving, usable with normal or energy saving lamps, voltage as indicated, E.T.L. approved, 95% power factor in recessed troffer.
2. UL Class P, with non-PCB type capacitors and core, coil and capacitor protection.
3. An "A" sound rating for rapid start 48 and 36 inch lamps.
4. Two lamp rapid start ballast with 48" lamps in recessed fixture to produce 95% light output +5%, -3%, with energy saving lamps and 78 watts input +5%.
5. Trigger start for 24 inch lamps.
6. Special types as indicated.
7. Ballasts fastened directly to metal fixture housing with three captive bolts or screws, or acceptable equivalent method.

D. Fluorescent Fixture Temperature Rating:

1. Design Recessed Fixtures to Limit Ballast Case Temperature Installed in Fixtures to 90°C Under Following Conditions:

- a. Line Voltage: 277 volts plus 5 percent.
 - b. Room Ambient: 25°C plus 5 percent.
 - c. Plenum Ambient: 55°C plus 5 percent.
 - d. Ceiling Material: Not to exceed R factor of 20.
2. Provide premium low operating temperature ballasts where required to achieve specified fixture temperature rating.
 3. Certify conformance on submittals.
 4. Conform with Guarantee Requirements per Paragraph "Guarantee".

E. Fluorescent Fixture Construction:

1. Sockets: Securely fastened to brackets or socket straps with machine screws in a manner to eliminate excessive flexing under normal lamp pressure, replaceable without removing fixture from the installation. In fixtures with end plates, backed by fixture housing to prevent twisting. Where sockets cannot be backed up by housing, secure with two screws or bolts.
2. Housings and Bodies: Fabricated of die-formed, cold-rolled steel not less than 20 U. S. gauge welded into a one-piece assembly using lap seam construction. Breaks, bends, edges, holes and knockouts accomplished by die-forming and machine operation. Alternately, fabricated of extruded aluminum sections or die-formed from aluminum sheet of not less than No. 16 B and S gauge aluminum, with sections positively interlocked to provide a rigid unit. A complete die-formed housing of 22 U.S. gauge steel will be acceptable providing the unit is ribbed, embossed or paneled so as to be equivalent in strength to the above specified.

Provide wiring and ballast compartment accessible from below when the fixture is in the installed position, with wiring secured to the body of the fixture with the cover removed.

In suspended ceilings, in addition to seismic suspension, provide four clips attached to fixtures to positively tie fixture to T-bar or ceiling channel suspension. In plaster and dry wall ceilings, provide plaster frame and U channel supports.

In fixed ceilings, provide access to fixture outlet box through fixture.

3. Finish: Finish visible fixture trim in color designated on drawings, or baked matte white enamel where not otherwise noted.

Rustproof Metal Parts in the Following Sequence
Degrease washing; hot water rinsing; zinc phosphatizing rust-inhibitor; cold water rinsing; chromic neutralizer. Provide enamel finish, baked-on at a minimum temperature of 300°F. Enamel reflective surface to have 87 percent reflectivity, minimum.

4. Diffusers: Provide diffusers of type specified with characteristics as follows:
 - a. Lens: Flat lens designed to direct light down and present low surface brightness within normal viewing angles; high molecular weight virgin acrylic plastic having maximum melt flow rate of 2.2 grams/10 minutes per ASTM D1238 Condition 1 and minimum flow temperature of 315°F per ASTM D569; smooth on one side, uniform pattern of cones or hexagonal prisms on the other; 1/8" average thickness up to two foot width, 3/16" for three and four foot width; average determined by adding overall thickness to minimum unpenetrated thickness and dividing sum by two.
5. Door: Provide minimum trim, separable ninged door constructed of not less than 16 B and S gauge aluminum, with mitered corners, secured in place by inconspicuous spring loaded, visible, finger operated catches, removable without tools, but hinged to preclude accidental dislodgement in the open position. Incorporate light trap between door and fixture. Retain lens firmly in door with clips or clamping frame, but allowing for lens replacement without special tools.
6. Fixture Wiring: Wire with 600 volt, 105°C rated thermoplastic or asbestos insulation, No. 14 AWG minimum size. Interconnect between sockets and ballasts and provide twelve inch minimum length pigtailed. Provide two wire pigtail for single circuit connection four wire for two circuit connection. Where fixture is served from two sources,

barrier wiring from emergency source and provide inside notation indicating separate source. Connect to fixture outlet, with six foot length of flex and conductor insulated for rated fixture operating temperature.

F. Incandescent Fixtures:

1. Medium base sockets below 300 watts and mogul base for 300 watts and larger, unless otherwise noted.
2. For recessed fixtures, provide mounting frame with an attached prewired junction box, rated for through wiring with 60°C conductors, designed for installation without installing trim, diffusers or lens. Verify suitability of attached junction boxes for number of conductors indicated on drawings, and provide additional boxes where attached junction box capacity is exceeded. Provide UL damp location label for exterior or wet locations.

Provide I.C. rating in insulated ceilings. Use concrete pour type in concrete construction.

3. Fasten fixture sockets and reflectors securely to body to prevent rotation or rocking during relamping.
4. Fasten or hinge trims and lenses to the fixture body so that no part of the fixture must be held during the relamping procedure. Securely retain lenses in lens door so that dropping of door cannot dislodge lens.
5. Glass lenses or diffusers to be free from spherical chromatic imperfections and have thermal characteristics of "Pyrex".
6. Color filters to withstand fixture operating temperature without cracking or fading.
7. Guarantee black alzak finished reflectors against fading for a minimum of two years including material and replacement cost.
8. Where cool beam lamps are indicated, provide fixture UL approved for that use.

G. High Intensity Discharge Fixtures:

1. Provide porcelain, screw type mogul sockets UL listed at 600 volts, 1500 watts, securely fastened

to fixture body to prevent twisting or rocking of socket when lamping or relamping. For pendant units, provide balanced construction for use on swivel hanger.

2. For interior use, where not otherwise specified, provide constant wattage, "B" sound rated, fluorescent style encased and potted ballasts, meeting requirement for fluorescent fixture ballasts, and including automatic resetting thermal protector.
 3. For exterior use, provide constant wattage, weather-proof, minus 20°F rated, high power factor ballasts complete with automotive type fuses in plastic fuse holders, wired into primary circuit. Where specified provide integral luminaire construction, utilizing core and coil units, to provide same performance.
 4. High Pressure Sodium Vapor Additional Requirements:
 - a. Ballast to operate with lamp in open or short circuit condition for six months without significant loss of ballast life.
 - b. 2% maximum wattage variation from lamp watts at rated voltage.
 - c. 2% maximum wattage variation at $\pm 10\%$ voltage variance.
 - d. Power factor 85% minimum $\pm 10\%$ voltage variation through life.
 - e. Ballast, including starting aid, to protect itself against normal lamp failure modes.
 5. Conform with ballast guarantee requirements per Paragraph "Guarantee".
 6. Provide ballast compatible with specified lamps and so certify.
- H. Parking lot and floodlighting standards. In addition to specific fixture specifications, provide:
1. Complete installation including poles, anchor bolts luminaires, lamps, ballasts, wiring as detailed and/or specified, mounted on reinforced concrete bases.

2. UL wet location label on fixtures on exterior or in wet locations.
3. Exterior pendant or pole mounted fixtures to withstand minimum lateral load of thirty pounds per square foot of exposed surface. Certify conformance on shop drawings.
4. Poles for exterior fixtures to be round tapered steel (unless otherwise noted), 11 gauge minimum, height as indicated, with welded steel baseplate, four galvanized anchor bolts, eight nuts and washers and hand hole with cover. Poles to be galvanized and field painted to match fixture. Painting to conform with PAINTING section of specifications.
5. Stainless steel or nonferrous hardware throughout on exterior fixtures.
6. Grounding lugs on pole mounted fixtures.
7. Shock resistant glass diffusers on exterior.
8. For poles exceeding 25 feet in height, provide structural calculations to enforcing authority and obtain approval.

I. Lamps:

1. Unless specified otherwise herein, furnish and install a lamp for each fixture of type and wattage indicated on drawings. Refer to Paragraph "Spares".
2. Fluorescent Lamps: Energy saving type, compatible with specified ballast, 48 inch (or 36 inch where noted) rapid start, 24 inch trigger start, T12 Bi-Pin, warm white unless otherwise noted.
3. Incandescent Lamps: Inside frosted or as recommended by fixture manufacturer. For fixtures mounted higher than 14 feet above floor, and where otherwise noted, provide 130 volt rating.
4. Mercury: Deluxe white, ANSI Type DX, unless otherwise noted, safety type. Breaking of outer glass to disconnect supply to arc tube.
5. Metal Halide: Phosphor coated, unless otherwise noted, universal burning type, used with compatible ballasts in enclosed fixtures.

6. High Pressure Sodium: Diffuse coated, unless otherwise noted, universal burning type, used with compatible ballasts.
 - J. Lighting Fixture Description: Refer to schedule on drawings and to General Requirements in other paragraphs herein.
 - K. Pit Lighting System - General: The pit lighting system shall be constructed as shown on the plans and in accordance with the provisions in these special provisions.
 1. The fixture shall be an Underwriters' Laboratories listed for "Hazardous Location Class 1, Division 2, Groups A.B.C.D., Suitable for Wet or Damp Locations".
- 2.15 Emergency Engine - Generator Set:
- A. General: furnish and install one complete emergency engine generator set as herein specified. Engine generator set shall be completely factory assembled with weatherproof enclosure and integral day tank on 4" concrete pad as indicated on drawings.
 - B. Engine shall have the following characteristics and/or associated items of equipment:
 1. Diesel, two cycle, 8 cylinder; water cooled radiator type; size adequate for generator load test specified, at the altitude where the unit is to be installed. Minimum horsepower 285 bhp, Detroit Diesel Allison Model 7085-7005, or equal.
 2. Operating speed, 1800 rpm, piston speed at 1800 rpm, 1500 (fpm) maximum, cubic inches displacement 568 cu. in. maximum.
 3. Starting system not less than 24 volt DC; starting motor shall be Sprag drive.
 4. Simplex No. SFT25A day tank assembly shall be provided with necessary threaded pipe fittings, pressure relief valve, inlet check valve and filter, fuel level gauge, fuel shutoff valve, drain valve, low and high level contacts which shall cause the engine alarm horn to operate. Day tank shall be mounted on engine but in an accessible location. The pump (208 volt, 1 phase, 1/3 hp), provided under plumbing section, and located in the main supply tank shall be automatically started and stopped by running contacts in the engine control panel.

5. Lubricating oil filter of the full flow type shall have replaceable elements.
6. Breather pipe suitable for adding oil while the engine is running.
7. Heavy duty dry type air cleaner.
8. Pusher type fan complete with shroud and protective guard. The fan shall be of adequate capacity to overcome back pressure of air duct and louvers, which shall be designed to have no greater than 0.3 inches of water static pressure loss.
9. Radiator of ample capacity to permit full load operation with air at an average of 110° F. (room ambient) entering the radiator. The radiator shall be provided with adapter for connecting duct. Radiator shall have a readily accessible drain system. Nalcool additive to be supplied.
10. Exhaust muffler of two chamber residential construction type, with a minimum of 12" flexible connection between muffler and engine. A rain cap shall be furnished and installed to prevent moisture entering the exhaust system. Provide a drain at the lowest point of the muffler installation. The location, size and routing exhaust system shall be as required for the engine furnished and as directed. (Exhaust lines and muffler installed in rooms shall be lagged, insulated, part of Mechanical Section.)
11. Exhaust manifolds, where not enclosed in engine housing or water cooled, shall have safety guard installed.
12. Centrifugal water pump with thermostat and bypass.
13. Provide shutoff valves at the engine block on all water jacket heaters, at both inlet and outlet sides.
14. 115 volt immersion heater with thermostat or a "Kir Hotstart" preheater. All water heaters shall be readily accessible. The electric heater supply shall be provided through a 3 wire locking type, grounding receptacle and matching plug. Heaters to maintain the water temperature of the engine at 100°F with an ambient temperature of 40°F. The immersion heater shall be energized by a normal power source.

15. Engine Protective Devices: Provide protective devices to cause engine shutdown in case of low oil pressure, high water temperature or overspeed. The low oil pressure and high water temperature protective devices shall have two terminals, both insulated, in weather proofed case and mounted on the engine. Provide a manual reset mechanically driven overspeed device activated at approximately 110% of unit operating rpm. The shutdown system shall feature intake air shutoff as positive protection means of stopping engine. Provide individual signal lights mounted in engine control panel with manual reset and indicating low oil pressure, high water temperature, overspeed, and overcrank. Provide low fuel alarm and shut down contacts. Equip unit with a horn operated by battery voltage and indicating any failure. Equip engine control panel with water temperature gauge and oil pressure gauge addition to signal lights and horn, and select switch.
16. Governor: Equip with an isochronous electric speed sensing governor, Woodward Model 2301, including speed sensing modules of the solid-state type to maintain a steady state condition of zero droop when operating as one plant. Upon full load application the governor and engine shall reestablish engine operating conditions within 3 seconds with zero droop regulation setting of the governors and for removal of full load to no load. The maximum transient frequency drop shall not exceed 5% of rated frequency as indicated on the Esterline Angus recording meter Model AW operating at 12" per minute chart speed. The throttle shall permit speed adjustment within 1/4 cycle.
17. Starting battery of batteries shall be lead acid type in hard rubber case, designed for diesel cranking, ample capacity to start the engine in 10 consecutive attempts within the temperature range specified. The batteries shall be at least 205 ampere hour (20 hour rating). Provide a corrosion resistant earthquake type steel rack for the batteries, mounted on the engine generator set, yet permitting ready access for servicing batteries and engine.
18. Battery hydrometer.

19. Replaceable element type secondary fuel oil filter and replaceable type primary fuel oil filters.
 20. All air box drain tubes shall be piped into a common removable receiver mounted on the engine.
- C. Generator shall be single ball bearing type, directly connected to engine with semi-flexible coupling. The exciter shall be directly connected to the end of the generator shaft. Generator and exciter shall conform to USASI, IEEE and NEMA standards for Class B insulation 70°C rise. Nameplate ratings shall correspond to the manufacturer's published data of not more than six months prior to bidding.
1. Continuous duty rating shall not be less than 165 KW, 206 KVA, at 0.8 PF; 480/277 volts, 3 phase, 4. wire, cycles, 248 full load amps.
 2. Overload rating 190 KW for two (2) hours in any 24 hour period.
 3. External voltage regulator shall maintain regulation with + 1/2% above and 1/2% below normal voltage. The instantaneous voltage drop when full load at 80% power factor is applied, shall not exceed 13% with recovery to stable operation within two seconds. Locate in control panel.
- D. Control panel unit mounted from engine generator base shall contain the following:
1. Water temperature gauge.
 2. Oil pressure gauge.
 3. Battery charging rate ammeter (if battery charging alternator is supplied).
 4. 24 volt panel light with switch.
 5. Voltmeter with 0-600 volt, General Electric Series 250, 4-1/2" Big Look, selector switch to connect any one phase to phase across meter.
 6. Frequency meter of a type which will read true frequency relative to speed, General Electric Series 250, 4-1/2" Big Look.

7. Ammeters with 0-600 ampere, General Electric Series 250, 4-1/2" Big Look, selector switch for all three phases.
8. Running time meter, General Electric Series 240, 3-1/2" Big Look.
9. Emergency start button which will bypass all automatic controls.
10. Voltage regulator and control with locking bushing.
11. Battery charger and immersion heater shall be fed from the control panel power. Integral to unit.
12. Control switch with "Automatic", "Off", "Manual", and "Test" position. A relay or switch contacts shall be provided to actuate a signal light inside and outside the generator room door in the event that the control switch is left in other than the "Automatic" position. A red laminated engraved plastic nameplate shall be mounted at the outside light reading, "RED LIGHT INDICATES EMERGENCY GENERATOR NOT IN AUTOMATIC POSITION" in white letters not less than 1/4" high. The circuitry shall be such that the generator will be able to transfer to emergency at any time of a normal power failure during an exercise period or on a manual position, providing the generator is up to voltage and frequency.
13. Necessary relays and time delay to permit automatic cranking of the engine for an adjustable period of 15 to 45 seconds, at which time the controls shall be disabled by an overcrank position. A mechanically driven speed switch shall disconnect the starter motor when engine speed exceeds 600 rpm's.
14. Controls to automatically run engine at no load and governed speed for an adjustable period of 0 to 10 minutes after load is transferred from emergency back to normal source. This period to be called "cool-off".
15. Separate indicator lights and common audible alarm with necessary control for:

- a. Failure to start (overcrank).
- b. Overspeed trip.
- c. High water temperature.
- d. Low oil pressure.
- e. Nonautomatic.

The common audible alarm shall consist of a 24 volt DC horn on the panel.

- 16. Time delays and timers shall be either motor driven or solid-state types Thermal or oil dashpot types will not be accepted.
 - 17. All control components and overspeed reset shall be marked with engraved laminated plastic nameplates.
 - 18. Main circuit breaker 350 amp trip 600 amp frame molded case.
 - 19. Locking type frequency adjustment.
- E. Battery charger shall be solid-state type or provide taper charging. The charger shall maintain rated output voltage within plus 1% from no load to full load with input variations of plus 10%. The charger shall have two ranges within a manual selector switch for selecting either float or equalize range with individual float/equalize adjustments. The charger shall contain a DC voltmeter, DC ammeter, and AC and DC fuses, AC failure alarm relay, and low DC voltage alarm relay which shall cause the engine alarm horn to operate. Battery charger shall be energized by an emergency power source.
- F. Installation:
- 1. The engine generator to be mounted on spring isolators having telescopic top and bottom housing with vertical stabilizers to resist lateral and vertical forces made of shatterproof ductaliron per ASTM A536 grade 65-45-12. Acceptable product is type RJ from California Dynamic Corporation, or equal.

2. The engine generator shall be mounted on a 4" high concrete pad poured on top and doweled to the concrete slab. The concrete pad shall be provided by under Concrete Section. Pad shall extend 12" outside set base; bevel pad edges 1". Bolt the chassis to anchors fastened in the concrete slab according to manufacturer's anchors fastened in the concrete slab according to manufacturer's anchor bolt layout. Installation shall have a crankcase drain pipe that is at least 8" from the floor, equipped with a readily accessible shutoff valve. All units shall have a removable full length drip pan under the engine.

G. Engine Generator Tests:

1. Before delivery to the site, the test shall be given a preliminary operation and load test. This test will be witnessed by the Electrical Engineer when performed within the County of Los Angeles. When the test is performed beyond the limits of the County of Los Angeles, the test shall be performed by an approved independent testing laboratory.
2. The tests shall include load tests with load of a minimum 100% of capacity of specified generator full load and shall assure performance of all specified function to the satisfaction of the Electrical Engineer. Upon completion of the preliminary tests, the unit, complete with equipment, shall be delivered and installed at site by the Contractor at least 30 days before completion of contract. The Contractor shall furnish, in quintuplicate to the Electrical Engineer, complete records of preliminary Wiring diagrams for the complete installation shall be framed and mounted on the wall. All shop load tests must be run at 0.8 lagging power factor.
3. Upon completion of the installation work, including the electrical connection, and including grounding of equipment and neutral, the Contractor shall provide all necessary facilities, instruments and equipment, including approved electrical loads required for the load tests, and arrange for final test runs. Field tests to be run at unity power factor.
 - a. Load test at 0, 1/4, 1/2, 3/4, and full load until readings are constant for 10 minutes.

- b. 10% generator overload test for two (2) hours shall be made consecutively with the above test.
 - c. Generator shall be able to start and pick up full load at normal voltage and frequency within eight seconds.
 - d. Generator set shall be able to pick up full load in one step.
4. Readings required during the two tests shall be taken on recently calibrated laboratory instruments as well as those on the equipment and shall include:
- a. Frequency.
 - b. Voltage.
 - c. Current.
 - d. Wattage.
 - e. Power factor.
 - f. Ambient temperature.
 - g. Water temperature.
 - h. Exhaust air temperature.
 - i. Generator frame temperature at hottest spot.
 - j. Oil pressure and temperature.
 - k. Frequency and voltage tests shall include a record response time for recovery from load changes.
 - l. All adjustments and replacement of unsatisfactory equipment shall be made by the Contractor at his own expense.
5. Before acceptance of set, the Contractor shall instruct the Owner's maintenance force in the operation and maintenance of this equipment
Complete written instructions, manuals, operating

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schedules, parts lists blueprints wiring diagrams, maintenance and repair manuals, engine and generator specifications including actual performance curves, shall be submitted in quintuplicate to the Electrical Engineer before final approval. The foregoing tests and associated work shall be provided without additional cost to the Owner.

- H. Engineering Services and Maintenance: For a period of 12 months after acceptance of installation, the Contractor, at no expense to the Owner, shall, on call, provide mechanical and electrical adjustments to the equipment and replacement of any defective materials During these 12 months, ordinary maintenance will be performed by the Owner.
- I. The engine generator set shall be the product of a company with a record of successful and authorized factory and generator distributor manufacturer of such units during, at least, the preceding 10 years, and the supplier shall certify, subject to verification by the Owner, that he maintains adequate service and parts facilities within a radius of 50 miles from the site. The set shall be as manufactured by Lawless Detroit Diesel.
- J. Painting: All external nonworking surfaces or metal parts of the generator set shall be painted after thorough cleaning and priming with at least two coats of suitable machinery paint.
- K. Assembly Drawings and Wiring Diagrams: Before fabrication and/or assembly of the unit, seven (7) prints of shop drawings and complete wiring diagrams shall be submitted to the Engineer for approval. The entire installation shall be made in accordance with the recommendations of the manufacturer and within the regulations of the State Industrial Accident Commission and the Fire Prevention Bureau of the Fire Department having jurisdiction. Service and parts shall be locally available 24 hours a day to the engine and all electrical components by the authorized engine and generator manufacturer.
- L. Operation Manuals: Four required showing complete operation and parts breakdown of unit and shall be supplied to the user at job site acceptance of equipment. This shall include operator's manual for the engine, generator, and all major components, as well as a complete set of schematic diagrams and wiring diagrams.

- M. Codes: The installation shall comply with the requirements of OSHA, any applicable state and local codes. This shall not be construed, however, as relieving the Contractor from complying with the specifications that may be in excess of the regulations and not contrary to same.
- N. Provide a mechanically-held automatic transfer switch for wall mounting and in NEMA 2 enclosure as follows:
1. Size and voltage indicated on the drawings, listed per applicable UL standards as a recognized component for emergency systems, rated for all classes of loads including 100% tungsten lamp loads.
 2. Electrically operated, mechanically-held devices utilizing momentarily energized, single solenoid mechanism, positively locking without aid of gravity, gears, motor operators, hooks or latches, incorporating arc barriers for main contacts, with separate arcing contacts in ratings 400 ampere. Main and arcing contacts replaceable from front of switch without disconnecting power conductors.
 3. Transfer in either direction within one-sixth of a second.
 4. Withstand rating as indicated on the drawings, but not less than 10,000 amperes RMS symmetrical.
 5. Manual operating handle to stop contacts at any point in cycle.
 6. Drip proof enclosure with hinged lockable door, wall mounted.
 7. Services of factory engineer and replacement parts to be locally available, within radius of fifty miles.
- O. Transfer Switch Operations and Accessories: Logic panel with solid-state sensing and timing functions including:
1. Time delay on momentary dips in normal source (0.5 - 6.0 seconds), set at 1.0 seconds.
 2. Time delay on transfer to emergency for controlled loading of generator (0 - 1 minutes), set at 0 minutes.

3. Time delay on retransfer to normal (1/2 - 30 minutes) set at 10 minutes. Override if emergency source fails and normal is available.
4. Time delay on engine shutdown after retransfer to normal (0 - 5 minutes), set at 5 minutes.
5. Close differential voltage sensing of all normal source phases (pick-up 85-100% of nominal and drop out 75-98% of pick-up), set at 85% drop out and 90% pick-up.
6. Independent voltage (85-100% pick-up) and frequency (90-100% pick-up) sensing of the emergency source to prevent premature transfer, set at 90% voltage and 95% frequency.
7. Test switch (momentary type).
8. 10 amp engine starting contacts (1-N.C. and 1-N.O.).
9. Pilot lights to indicate switch position (white on normal and yellow on emergency).
10. Auxiliary contacts (1 - closed on normal and 2 - closed on emergency), AC rated 10 amps, 480 volts.
11. Time delay and sensing functions to be readily field adjustable over indicated ranges and operate without drift over -4°F to 158°F . Logic panel to be complete with enclosure and interwiring.
12. In phase monitor to control transfer/retransfer operation between live sources so that closure on the alternate source will occur only when two sources are within 60 electrical degrees, maximum. Monitor to function over frequency difference range of 2 hertz, minimum with a maximum total transfer operating time of one-sixth of a second. In event of failure of the load carrying source, monitor to be automatically bypassed. Monitor shall not require interwiring with generator controls nor active control thereof.

P. Transfer Switch Requirements and Test:

1. Temperature Rise: Measurements to be made after overload and endurance tests.

2. Withstand: UL listed to withstand the magnitude or fault current available at the switch terminal when coordinated with respective protective devices as shown on the plans at X/R ratio of 6.6 or less.
 3. Dielectric: Tested after the withstand test at 1960 volts AC RMS minimum.
 4. Voltage Surge: Control panel voltage surge withstand test per IEEE Standard 472-1974 and voltage impulse withstand test per ICS-1-109.
 5. Certify, upon request, that the complete unit meets or exceeds the seismic requirements of the California Administrative Code.
- Q. Submittals: Include independent test lab performance curves to illustrate generator set capability; verification of emission conformance; certified test data, wiring diagrams dimensional data.
- R. Manuals, Identification, Tests: Refer to Section 16010.
- 2.16 Approved Manufacturers:
- A. Raceways and Wireways:
1. Rigid Steel Conduit and Fittings, Hot-Dipped Galvanized: Allied Tube and Conduit, Republic, Torrance Tubing, Triangle, Wheatland.
 2. Intermediate Metal Conduit: Allied Tube and Conduit Torrance Tubing.
 3. Insulated Bushings: O. Z. Gedney Types A, B and BLG equal by EFCOR, T&B.
 4. Electric Metallic Tubing, Galvanized: Allied Tube and Conduit, Republic, Torrance Tubing, Triangle, Wheatland.
 5. EMT Fittings Raintight: Appleton TW Series, Crouse-Hinds MW Series Steel City TC710 Series, Thomas and Betts 5120 Series, Tomic 20 Series.
 6. Flex - Galvanized: Anaconda Metal Hose, O. Z. Gedney, Triangle.

7. Liquidtight Flex: Type U. A. with built-in bond wire, American Flex Conduit, Anaconda, O. Z. Gedney.
 8. Gutters and Wireways: Circle AW, Hoffman Engineering Company, Square D.
 9. Nonmetallic Conduit, Polyvinyl Chloride: Carlon Schedule 40, 90 degrees C rated.
 10. Hubs: Myers.
 11. Conduit Seals: Crouse-Hinds Type EYS.
 12. Expansion Joints: O. Z. Gedney Type "DX" or as detailed or specified.
 13. Wall Entrance Seals: O. Z. Gedney Type "FSK".
 14. Caulking Compound:
 - a. General: Tremco - "Acoustic Sealant", Manville, "Duxseal", Interchemical - "Prestite 579.64," Chase Foam.
 - b. Fire Rated Wall or Partitions: Chase Foam.
 15. Conduit Wrapping: Polyvinyl tape - 20 mil 1/2 lap Manville, Minnesota Mining "Scotch". 40 mil PVC coating - Occidental Coating Company.
- B. Outlet Boxes:
1. Pressed steel, 4" square by 1-1/2" deep minimum, Bowers, Raco, Steel City.
 2. Cast Boxes and Condulet: Appleton, Crouse-Hinds, Pyle.
 3. Floor Boxes: Hubbell "Dual Level," equal by Lew.
- C. Floor Junction and Pull Boxes:
1. Cast iron, Thomas and Betts, O. Z. Gedney.
 2. Precast Concrete Pull Boxes: Associated Concrete Products, Brooks Products.
 3. Hand Hole: Brooks Products No. 3-RT.

D. Conductors - 600 Volt:

1. Steel Spring Connectors (No. 8 and Smaller):
 Scotchlok Types R and Y.
2. Solderless Connectors (No. 6 and Larger) Bolted
 Saddle Type: Burndy - "Versitaps", Thomas and
 Betts "Locktite", Trumbull - solderless, O. Z.
 Gedney solderless.
3. Compression Connectors: T&B Stakon or equal (motor
 connections).
4. Tape: Scotch #23 rubber tape and #88 vinyl tape.
5. Sealant: Scotchkote.
6. Pulling Compound: Powdered Soapstone, Ideal Yellow
 77, Wirelube, Minerallac #100.
7. Conductors: Annixter, Anaconda, General Cable,
 General Electric, Okonite, Phelps Dodge.
8. Cable Supports: O. Z. Gedney split wedge, Kellems
 cable clamps.

E. Vibration Isolators:

<u>Type</u>	<u>Description</u>	<u>Manufacturer: Mason Inc., Equal by Amber/Booth</u>
PN	Neoprene Pad	W (Plus Bearing Plate)
MN	Neoprene Mount	ND
HN	Neoprene Hanger	HD
MS	Spring Mount	SLFH
HS	Suspension Hanger	30 or PC30

F. Switchboards, Panelboards, Terminal Cabinets: General
 Electric, Square "D", Westinghouse.

G. Motor Control Centers: Allen Bradley, General Electric,
 Square "D", Westinghouse, equal to G.E. 7700 line.

H. Motor Starters: Allen Bradley, General Electric, Square
 "D", Westinghouse.

I. Contactors and Relays:

1. Mechanically Held: 25 amperes ASCO Bulletin 1255-
 166; 30 amperes and larger - ASCO Bulletin 920.

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2. Magnetically Held Contactors: Same as for motor starters.
 3. Magnetically Held Relays: Industrial grade with normally open and normally closed contacts. Manufacturers same as for motor starters. Equal to Square "D" Class 8501, Type H, GE CR2810.
 4. Time Delay Relays: Manufacturers same as for motor starters. Equal to G.E. CR2820B Series.
 5. Transfer Switches: ASCO Bulletin 940.
- J. Time Switches: All with spring wound reserve.
1. 7 Day: Tork TW-LE Series, equal by Paragon.
 2. 24 Hour with Astro Dial: Tork TZ-LE Series, equal by Paragon.
- K. Photoelectric Cells: ALR #SST-PY, voltage as required.
- L. Ionization Detectors (Elevator Interface): Equal to BRK Electronics SS751D Series with 1004W base.
- M. Circuit Breakers: Molded case.
1. For Lighting Panelboards: Same as panel manufacturer.
 2. For Switchboards, Motor Control Centers, Power Panels, (Less than 400A): General Electric, ITE, Square "D".
 3. For Switchboards, Motor Control Centers, Power Panels, (400A and Above): General Electric, ITE, and Square "D".
- N. Disconnect Switches (Heavy Duty, Quick-Make, Quick-Break):
1. 800 Ampere and Smaller: General Electric, ITE, Square D. Rejection type for fused units.
 2. Motor Switches: Equal to Square D Class 2510. For 120 volt, 230 volt up to 5 HP, 460 volt up to 10 HP.
- O. Fuses:
1. 601 Ampere and Larger: Current limiting time delay (CLTD) Class L, Buss KRP-C.
 2. 600 Ampere and Smaller: Low peak, dual element Class RK1, Buss LPN-RK (250V) LPS-RK (600V).

P. Transformers Dry Type: General Electric, ITE, Square D.

Q. Wiring Devices:

1. Switches:

a. Maintained: Hubbell 1221-I Series, equal by Arrow Hart, Leviton, Sierra.

b. Momentary - Hubbell 1557-I, equal by Arrow Hart.

c. Door Operated Switch - Arrow Hart 4029/4030, Edwards 502/503.

2. Pilot Lights (Ganged with Switch): Neon type, Arrow Hart #1720, voltage and color as specified.

3. Duplex Outlets: Hubbell 5352-I, equal by Arrow Hart, Bryant, General Electric, Leviton, Sierra.

4. Special Receptacles: Hubbell. NEMA configurations as shown on drawings. Equal by Arrow Hart.

5. Weatherproof Receptacles: Crouse-Hinds DS222 in FS box with WP832 plug.

6. Ground Fault Interrupting Receptacles: Hubbell GF 5362I, WP26 plate indoors, WPF-26 plate outdoors.

7. Clock Receptacle with Stainless Steel Plate: Arrow Hart 452, General Electric 4224-5, Hubbell 5235.

8. Plates: Smooth satin finish Type 302 stainless steel. Hubbell, Leviton, Sierra.

9. Telephone Plates: Sierra S755N with 5/8" I. D. hole.

R. Lighting Fixtures:

1. Conform with all requirements described under "Lighting Fixtures, Lamps and Accessories" in addition to scheduled descriptions. Submit itemized conformance list with bid.

2. Lighting Fixture Schedule: Verify ceiling construction on Architectural Drawings. Supply fixture types compatible with ceiling.

- S. Ballasts (Per Specification): Advance, General Electric, Universal Energy saving type. Equal to GE Maximiser II.
- T. Lamps: General Electric, Norelco, Sylvania. Fluorescent to be energy saving type equal to GE Wattmiser.

ARTICLE 3 - EXECUTION

3.01 Drawings and Site:

A. Site Conditions:

1. Examine all the drawings and the specifications, survey the existing conditions, and include all necessary allowances in bid proposal.
2. Resolve all conflicts with code requirements, site conditions and the work of other trades.
3. Verify the locations of all existing utilities prior to construction and protect them from damage.
4. Pay all costs incurred due to damage of existing utilities or other facilities.

B. Locations:

1. Drawings are essentially diagrammatic, and although the size and locations of equipment are generally shown to scale, make use of data in all Contract Documents, and informational documents, and verify this information against field conditions.
2. Drawings indicate the required size and points of termination of conduits, and the number and size of wires and suggest proper routing of conduit. Install conduit with all necessary offsets, junction boxes, and fittings to conform to the structure, avoid obstructions, preserve headroom, maintain required accessibility, and satisfy the requirements of the governing codes and the standards of good practice.
3. Architectural and structural drawings and specifications take precedence over the electrical drawings in the representation of the general construction work. Civil drawings take precedence in the representation of the site work. Refer to the drawings, specifications, and reviewed shop drawings for all work, in order to coordinate electrical work with other work of the project.

4. When changes in indicated locations or arrangements are necessary due to conditions in building construction, rearrangement of furnishings or equipment, or conflict in location, make such changes at no cost to Owner, provided that the change is ordered before conduit is installed and that length of conduit run is not revised by more than ten percent (10%) of indicated run, for conduits 1" nominal or smaller, and five percent (5%) for larger conduits.
5. Bring discrepancies between different drawings, between drawings and actual field conditions, or between drawings and specifications, promptly to the attention of the Engineer for decision, and stop pertinent work subject to resolution of the conflict.
6. Equipment in mechanical and electrical and signal rooms or spaces has been laid out in accordance with the requirements of typical equipment of the class indicated. Modify wiring and location and pay all costs, to meet the requirements of the particular manufacturer's equipment, which is installed where it is different from that shown on the drawings. Do not use equipment which exceeds space or which infringes on required aisle or access space.
7. Coordinate the location of the lighting fixtures and framing with the ceiling construction so that the over-all pattern is acceptable to the Architect. Architectural reflected ceiling drawings, plans and details govern. Locate lighting fixtures in mechanical and equipment rooms to avoid ductwork, piping and equipment. Coordinate location with trade supplying equipment prior to lighting fixture installation.
8. Locate sleeves, floor and wall outlets, and devices serving equipment, built-in fixtures and appliances, in accordance with dimensions on the respective equipment drawings of the equipment supplier.
9. Provide clarifying details where required by inspecting authority and obtain Engineer's and Inspector's approval prior to installation.

C. Responsibility:

1. Provide complete functioning systems and include all labor, material and associated tools and transportation required for the system to operate safely and satisfactorily. Provide empty conduit systems where specified, complete, clear, and with pull wires, ready to accept conductors and allow for equipment installation.

2. Provide all work indicated on the drawings whether or not specifically mentioned in the specifications.
3. Coordinate the installation of electrical items with the schedules for work of other trades to prevent delays in total work. Assume responsibility for any cooperative work which must be altered due to lack of proper supervision or failure to make proper provision in time. Perform alterations to Architect's satisfaction, and pay all costs.
4. Resolve code conflicts prior to installation. Remove and replace all work conflicting with codes or, in the Engineer's opinion, not meeting specified requirements and pay all costs.

D. Quality Assurance:

1. Provide an experienced superintendent in charge of erection of the work, together with all necessary journeymen, helpers and laborers required to properly unload, erect, connect, adjust, operate and test the work involved to provide a neat, workman-like installation. Latest industry standards are considered minimum.
2. For the actual fabrication, installations, and testing of the work of this section, use only thoroughly trained and experienced personnel who are completely familiar with the requirements for this work and with the specified items. Where specified, provide factory personnel for testing and adjusting.
3. For signal system, communication and specialized systems, perform all work in accordance with instructions provided by, and under the supervision of, factory authorized agents. Evidence shall be provided that the factory agent has five projects equal in scope to specified systems, operating satisfactorily.

Submit a letter, with bid proposal, from principals of the equipment manufacturing company specifying the location of factory authorized parts and service organizations now in service intended to serve the subject project, the length of time which they have been in operation (which shall not be less than three years) and the guarantee available for their continued operation.

4. For major equipment such as transformers, switchboards, panelboards, motor control centers, circuit

breakers, control devices, etc., submit letters from principals of the equipment manufacturing company, with bid proposal, specifying the location of factory authorized parts and service organizations intended to serve the subject project.

3.02 Seismic Requirements:

- A. Scope: Brace electrical systems and equipment to withstand lateral and vertical forces that result from earthquake or wind.
- B. Equipment: Anchor all equipment, switchboards, panelboards, and transformers by securely bolting them in place to the building structure. Provide bolts, anchors and bracing to withstand acceleration of 0.5 g.
- C. For suspended conduits, 2" nominal and larger, provide diagonal bracing to structure at hangers at changes in direction and on 30' \pm centers.
- D. Lighting Fixtures: Provide 2 ten gauge steel support wires on diagonal corners or 4 twelve gauge at 4 corners of recessed fluorescent fixtures, tied to building structure. Allow 1/4" slack in wire. Provide approved seismic fixture suspension for pendant fixtures.

3.03 Excavation, Backfilling:

- A. General:
 - 1. Provide excavation, backfilling, and pumping required for work under this section, in accordance with requirements of Earthwork Section, Division 2, of the specifications. Remove surplus materials as directed.
 - 2. Where trenches are required through existing paving resurface after installation to match existing in accordance with appropriate sections of Division 2, by accredited journeymen of respective trade.
- B. Conduit Trenches: Provide minimum cover over buried conduit as follows: 42" over primary conduit outside building; 36" over primary conduit within building; 36" over 2" and larger secondary and signal conduits outside building; 30" for 1-1/2" and smaller outside building; 24" for 1-1/2" and larger secondary and signal conduit within building footprint. Cut trenches to bottom of conduit, allowing for concrete encasement where specified,

fixtures furnished by others. Support lighting fixtures in excess of 60 pounds to structure independently of outlet box.

16. Do not use back-to-back outlets or through boxes. See paragraph "Noise and Vibration".
17. Provide boxes for all devices. For devices not specified or scheduled, use boxes as approved.
18. For communication and signal systems, refer to Paragraph "Auxiliary Systems and Equipment".
19. Provide designations per Paragraph "Identification".

B. Support:

1. Install boxes with box hangers, expansion shields in masonry, and machine screws on metal work. Do not nail to structure. Use plated or galvanized screws throughout.
2. Secure pull and junction boxes to the structure independently of the conduits by means of bolts, rod hangers or brackets.

C. Devices:

1. Unless specifically directed otherwise, install switches with single gang vertical plate on latch side of door. Verify door swing before installation.
2. Unless noted otherwise, install duplex receptacles, single receptacles, telephone and communications outlets vertically. For vertically mounted receptacles, locate ground slot to top. Where horizontal mounting is required, locate ground slot to right when facing outlet.
3. Connect green ground wire to receptacle grounding screw and box.
4. Plumb and align all devices and install plaster rings flush with wall surface so that plates fit tight against wall and device surface without strain.
5. On exterior, and interior locations subject to moisture, use weatherproof devices.

D. Mounting Heights:

1. Install outlets to clear built-in features and equipment. Check architectural details and building equipment drawings before installation of outlets.
2. Install outlets for specific equipment or appliances per equipment suppliers' instructions.
3. Mounting height for wall mounted outlet is from center-line of outlet to finished floor, and is indicated on the drawing by "+".
4. Where not otherwise noted or detailed, use mounting heights herein indicated.
5. Switches and Push Buttons: + 48 inches.
6. Receptacle in Office Areas: + 12 inches.
7. Receptacles in Equipment Rooms, Vehicle Maintenance or Garage: + 42 inches.
8. At communication and/or telephone terminal backboards provide multioutlet raceway (Plugmold) below backboard at + 8 inches.
9. Desk Mounted Telephone and Intercom Outlet:
+ 12 inches.
10. Back Box for Wall Mounted Telephones: + 60 inches.
11. Signal System Device Requiring Manual Operation:
+ 48 inches.
12. Manual Fire Alarm Reporting Station: + 48 inches.
13. Thermostats: + 48 inches.
14. Signal System Audible Device: Locate outlet so that device clears finished ceiling by 1 inch, where not otherwise indicated.
15. Clock Outlet: + 84 inches. Above door, center between top of door frame and ceiling.
16. Bracket Light Outlet: + 96 inches, unless otherwise indicated.

3.10 Installation of Conductors:

- A. General: Store conductors where continuously protected from sunlight, heat and weather. Install as Follows:
1. Install all conductors (line voltage, low voltage, signal and control) in conduit. Complete conduit system and clean and dry conduit before pulling in conductors. Install conductors after general construction work in area has progressed sufficiently to avoid conductor damage.
 2. Circuit as indicated on plans and single line diagrams.
 3. Provide conductors in parallel of identical lengths.
 4. Use fish tapes with ball type heads for pulling conductors. Pull conductors in without kinking wires or scoring conduit.
 5. Use only lubricant, which does not damage conductors as a pulling aid.
 6. Fan and tie branch circuit and control conductors in panelboards, switchboards and terminal cabinets. Identify spare conductors (line, control and signal) and ground both ends to enclosure case.
 7. Run neutral conductors continuous to panel. Do not combine. Run feeders continuous to panel or equipment without splices. Do not splice or tap in equipment enclosures or condulets. Make necessary splices or taps only in junction boxes, pull boxes or in oversize wiring gutters designed for the purpose at panelboards.
 8. Use No. 12 AWG minimum for lighting and power and No. 14 AWG minimum for signal and communications and control, except where special conductors are specified.
 9. Allow 18 inch minimum free length of conductor where terminating in outlet or pull box. Provide longer lengths where indicated.
 10. Do not loop through receptacle terminals; connect by means of conductor taps joined to branch circuit conductors.

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11. Where branch circuit conductors extend from ground fault interrupting breakers, enclose conductors in plastic tubing within panelboard.
12. See Paragraph "Identification and Warning Signs".

B. Color Coding:

1. For lighting and outlet branch circuits, use factory colored conductors. For motor circuits and feeders, use pressure sensitive colored tapes at all panelboards, safety switches, motor starters, motor and equipment outlets. Where more than one multi-conductor circuit is run in a conduit, tape each multiconductor circuit together with its neutral at each junction point and outlet.
2. Color Codes for Line Conductors:

<u>Conductor</u>	<u>Color</u> <u>120/208V</u>	<u>Color</u> <u>277/480V</u>
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray (Where Permitted)
Traveler	Brown	As Approved
Equipment Ground	Green	Green
Instrument Ground	Green with Yellow Stripes	

3. Color code conductors used in communication and signal systems and of control wiring in-line and low voltage control panels, motor control centers and supervisory panels. Use white for grounded conductor and green for equipment ground, exclusively.

C. Connectors and Terminations, Line Voltage:

1. For joints, splices, taps and connections for 600 volt conductors, use solderless connectors.
2. For branch circuit conductors No. 8 AWG and smaller use steel spring with semi-rigid insulating shell, setscrew type, taped:
3. Terminate all solid conductors, No. 10 AWG and smaller by a fast holding application of the conductor directly to the binding screws of the equipment to be connected.

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4. For conductors No. 6 AWG and larger, use copper or copper core CU-AL bolted saddle connectors and lugs, sized for conductors. For conductors No. 4 AWG and larger, use lugs with two bolts through tongue, minimum. connectors and lugs which are crimp type or which apply setscrews directly to the conductors are not acceptable. For breaker connection in convertible switchboards where saddle lug termination is not available, dip conductor ends in solder prior to termination. Do not clip conductor strands.
5. Coordinate equipment terminations with equipment supplier to insure that terminals provided conform with requirements specified herein.
6. For connections at motors, use lugs on motor and branch circuit conductors, bolted and taped. For conductors No. 8 AWG and smaller, crimp lugs to conductors.
7. Splice grounding conductors by means of exothermic welding and terminate by means of approved grounding connectors. Do not solder.
8. Tape all noninsulated connections with lap wound layers of vinyl plastic tape (Scotch #88) or lap wound layers of rubber tape covered by lap wound layers of friction tape, to provide insulation equivalent to 150 percent of the conductor's insulation, but in no case less than three layers. Split bakelite casings with stainless steel spring clips designed for specific connectors may be used alternately.
9. Position all splices in pull boxes and junction boxes, so they are accessible from the removable cover side or the box.
10. Provide waterproof connections in wet locations. Pencil and roughen conductors and apply rubber tape equal to insulation thickness. Cover with two half-lapped layers of 8.5 mil, all weather, vinyl plastic tape, suitable for below freezing application, and coat with sealant. Form conductors into drip loops so that water does not collect on connections. Blow out conduit to remove moisture and seal conduit ends with waterproof compound.

D. Connector and Terminations, Signal Systems and Control:

1. Run conductors from equipment to terminal cabinets and devices. Do not splice.
2. In terminal cabinet and junction boxes terminate on solder terminals, screw type terminals, telephone type punch terminals or wire wrapped terminals.
3. At equipment or devices terminate on screw type terminals throughout.
4. For fire alarm systems and control use screw type terminals throughout.
5. For flexible connection use stranded conductors and crimp type lugs.
6. For shielded conductors, make shield continuous and isolate shields from ground and other shields.

3.11 Equipment Installation:

A. Clearances: Maintain required aisles, work space and clearances in front of equipment and behind accessible section of freestanding equipment as required by code and follows:

1. For equipment less than 600 volts to ground, maintain 3 feet clear minimum in front, 3-1/2 feet between accessible side and grounded surface, and 4 feet between rows.
2. For equipment over 600 volts to ground, maintain 5 feet clear minimum in front, 6 feet between accessible side and grounded surface, and 9 feet between rows.
3. For dry ventilated transformers, maintain minimum clearance between transformer ventilation openings and adjacent structure: 12 inches below 300 KVA; 24 inches for 300 KVA and larger.

B. Mounting Heights:

1. Install panelboards on a common wall with tops even. Mount panels at 78 inches to top unless approved otherwise.

2. Mount individual switches, starters, or controls at 72 inches from finished floor to top. Where required to be lower by equipment arrangement or configuration maintain 18 inches to bottom from finished floor.
 - C. Fastening: Fasten floorstanding equipment with four 5/8 inch bolts minimum Grout channel sills, where provided into concrete pad Fasten surface mounted equipment to structural wall members Provide support channel spanning structural members where equipment does not span members.
 - D. Panelboards: Install three 3/4" conduits minimum from each flush mounted panelboard into accessible ceiling space above and below panel and cap.
- 3.12 Lighting Fixture Installation:
- A. Connections: Use Underwriters' Laboratories approved solderless connectors as specified elsewhere herein, for splicing.
 - B. Blocking: Provide supplementary blocking and support under this section, as required to support fixture from structural members adequate for fixture weight.
 - C. Pendant Fixtures: Suspend fixtures with one piece steel stems with white enamel or lacquer finish and matching canopies using ball aligner swivels allowing 45 degree swing. Hangers to be approved for seismic conditions by enforcing agency.
 - D. Pendant Mounted Fluorescent Fixtures, Continuous Rows: Provide rigid coupling between fixtures, fastened to each fixture with a minimum of two bolts. Hang fixtures with two supports per eight foot or four foot fixture Limit continuous rows to forty foot length separated by 1-1/2 inch minimum with separate circuit connections to separated rows. Do not nipple between separated rows. Provide an approved swivel at the junction of stem and fixture Where indicated, provide channel bracing for rows of fixtures.
 - E. Surface Mounted Fixtures: Secure to structural members or to metal supports which span structural members with 1/4 inch minimum machine screws. Strip fixtures may be secured to T-bars with scissor clips designed for the purpose and 1/4 inch machine screws.

- F. Fixture Outlets: In accessible tile ceilings, locate outlet within four feet of fixture, rigidly fastened to structural member or suspended from structure with rod or channel. In nonaccessible ceilings, provide access to outlet through fixture housing or by lowering fixture from ceiling.
- G. Connections: Provide fixture outlet for each fixture, continuous row, or cluster of fixtures, which can be connected by six foot flexible connections. Do not use fixtures as pull or junction boxes. Do not flex between separated, suspended fixtures. Surface mounted fixtures, separated by not more than six inches in utility areas, may be nipped to gether. Connect from recessed fixtures to fixture outlet with six foot length of flexible conduit and conductors with insulation type described under Paragraph "Conductors".
- H. Machine Rooms: Prior to installation, coordinate light fixture location in machine rooms with equipment, piping, and ductwork to properly illuminate room and avoid interferences.
- I. Adjustable Fixtures: Aim adjustable fixtures as directed by Architect. For exterior units, adjust during evening hours to Architect's satisfaction.
- J. Location: Locate fixture outlets, recessed fixtures, and determine the length of custom, continuous row cove or "reverse cove" fixtures, by reference to Architectural Drawings and measurement of building construction. Do not scale electrical drawings.
- K. Lamping: For initial lamping of overhead fluorescent fixtures during construction, omit diffuser installation. Prior to final acceptance and when directed by the Owner in writing, clean the fixtures, remove construction lamps relamp with new lamps and install diffusers.

3.13 Auxiliary Systems and Equipment:

- A. Air Conditioning, Heating, Ventilating and Plumbing Control:
 - 1. Provide Under This Section:
 - a. Motor control centers, motor starters, disconnects, circuit protection, items of industrial control, individually mounted controls, as specified or required.

- b. Control wiring in conduit, to remote line voltage control devices, where indicated on the drawings, and where not included under the mechanical.
 - c. Connections to motors and controls as shown, but coordinated with motor supplier.
 - d. Verification of point of connection to motors with equipment suppliers prior to conduit installation. For roof mounted exhaust fans, rise within housing where possible.
 - e. Connection to package unit controls furnished as part of equipment.
 - f. Installation and connection of separately mounted electric line voltage thermostats and controls furnished with equipment, as indicated.
 - g. Connection to devices in piping or ductwork (such as aquastats, solenoids, float switches) installed under Division 15.
2. The Following is Specified to be Provided Under Other Divisions:
 - a. Furnishing and installation of motors.
 - b. Furnishing of thermostats, and controls which are part of equipment.
 - c. Furnishing and installation of air conditioning chiller starters as specified in Division 15.
 - d. Installation of devices in piping or ductwork.
 3. Refer to Divisions 15 and 17 of the specifications, and mechanical and electrical drawings to establish complete scope of work.
- B. Elevators - Provide:
1. Required feeders and circuit protective devices for supply and control circuits. Circuit protection and/or disconnect in elevator machine room for power supply. Verify circuit protective device ratings with elevator supplier and make required adjustments.

2. Circuits terminating in junction boxes for cab lighting and conduit for telephone as required. Coordinate location with elevator supplier.
3. Lighting, switches and receptacles in elevator pits, sheave spaces, machine rooms, as indicated and as required by code and elevator section of specifications.
4. Conduit and wire extension and connection to elevator controllers and control panels from disconnect switches, junction boxes and wireways.
5. Elevator control and signalling is provided under separate sections.

C. Interior Public Telephone System - Provide:

1. Empty telephone raceway system for the telephone utility's wiring as indicated on the drawings and as specified herein, including all distribution conduit, wireways, sleeves, grounds, pull wires, plywood backboards, outlets and plates indicated on the drawings. Minimum conduit to be 3/4 inch trade size.
2. Conduit bends with a minimum radius in feet equal to the diameter of conduit in inches, and not exceeding the equivalent of two 90 degree bends in a single run. Where over two 90 degree bends are required, install accessible pull box in run. Bush ends of all conduits. Do not use condulets.
3. Conduits at telephone terminal backboards terminated 6 inches above floor or within 6 inches of top of backboard.
4. Outlets and split type telephone plate for each outlet.
5. Plywood terminal backboards, 8 feet high by length indicated, for telephone and/or signal systems where indicated on electrical drawings, of 3/4 inch thick, APA exterior grade Douglas Fir A-C treated with fire retardant chemical to provide a flame spread rating of not more than 25 when tested according to ASTM E84. Install backboards over plaster or gypsum wallboard, not directly to studs. Use full sheets where practicable and attach to plaster walls with 1/4 inch flat head toggle bolts.

Attach to gypsum wallboard using fire retardant, nonexplosive contact cement, applied in strips spaced 16 inches on center horizontally or vertically across panels, and in a continuous band around perimeter of panels. Install panels with clear face exposed to view and with long dimension vertical.

- D. Communications and Signal Raceway Systems: Provide empty raceway systems, including sleeves, grounds, pull wires, cabinets and plywood backboards as indicated on the drawings for wiring systems provided under other sections or by the Owner.
- E. Electrically Operated Equipment:
1. Where electrically operated equipment indicated on the drawings is specified under other divisions of the specification, provide, unless otherwise indicated, all conduit, wiring and connections under this section, as required for proper operation, and in accordance with wiring diagrams furnished by equipment supplier.
 2. Install controls furnished by equipment supplier, and provide disconnect switches within sight of controller.
 3. Refer to equipment specification for coordination of work.
- F. Food Service Equipment and Appliances:
1. Appliances and equipment are installed under other sections of these Specifications, or by Owner. Provide connections and/or outlets as indicated on drawings.
 2. Determine exact location, mounting height and type of outlets and/or stub-ups required from shop drawings furnished by appliance supplier. Do not scale electrical drawings.
 3. In general, equipment requiring more than 1650 watts and motors 1/2 HP or larger will operate on 208 or 480 volts, 1 or 3 phase, and motors 1/3 HP or smaller will operate on 120 volts, 1 phase. Verify equipment ratings with supplier before circuiting.
 4. Provide and install heavy duty 3 wire cord and plug for toasters, suitable for rating of appliance.

5. Install disposer controls in accessible position near unit on mounting bracket and connect all controls.
6. Install all controls furnished by equipment supplier and provide all required disconnect switches.

G. Owner Furnished Equipment:

1. Owner Furnished Owner Installed (OFOI): Provide circuiting and terminations as indicated on drawings. Verify all provisions with Owner prior to installation. Owner will install and make final connections.
2. Owner Furnished, Contractor Installed (OFCI):
 - a. Items indicated as OFCI will be delivered to the site by the Engineer.
 - b. Confer with the Engineer to establish required delivery schedule for all Owner furnished items within 15 days after the award of the contract. At this time, submit quantity takeoffs itemizing the specified item, the quantity required and the desired delivery date.
 - c. Take delivery, unpack, check, assemble, distribute, install and connect in place, complete, the items indicated as OFCI electrical equipment, provided in accordance with equipment requirements as obtained from the Engineer.
 - d. Make a complete and careful check of all materials and furnish a receipt acknowledging acceptance of the delivery and condition of the materials delivered.
 - e. After such acceptance, assume full responsibility for the safekeeping and protection of same, until such time as the completed installation has been approved and accepted.
 - f. Furnish and install any auxiliary mounting or installation supports required in connection with lighting fixtures or equipment installed but not furnished under this section, such as inserts and bolts.

- g. Provide the branch circuiting terminating in outlets, junction boxes, or disconnect switches as indicated on the drawings. Verify exact location of connection point on the equipment with Owner prior to installing provisions.
- h. Insure that the appropriate structural, architectural, and utility rough-ins have been provided in accordance with equipment requirements as obtained from Engineer.
- i. Clean the equipment and with the Vendor's representative, test the equipment in the presence of the Engineer.
- j. Include as part of the basic proposal any appropriate allowances for general overhead and profit as a result of the provisions of this subsection.

3.14 Protection and Cleaning:

- A. Materials and Equipment: Cover all transformers, switchboards, panelboards, lighting fixtures, etc., stored or installed on the site, with polyethylene sheets or approved equivalent, to protect equipment from moisture, plaster, cement, paint, or other work of other trades. Cover outlet boxes with cardboard or plastic closures. Plug or cap conduit ends until final connection. Protect conduit stubs, stub-ups and risers from construction equipment.
- B. Storage: Provide proper and adequate storage facilities. Store conductors, raceways and fittings, in dry, protected locations.
- C. Damage: Replace all damaged or defective work, materials or equipment. Install sensitive or delicate equipment after major construction work is completed.
- D. Parts: Store and protect all portable and detachable parts or portions of the installation such as spare parts, fittings, fuses, keys, locks, adapters, locking clips and inserts until completion of the work. As a precondition for acceptance of the work, deliver to the Engineer and obtain itemized receipt. Include receipts with the Operating and Maintenance Instruction Manual(s) required under other paragraphs of the specifications.

- E. Site Cleaning: Periodically remove waste and rubbish and maintain order.
- F. Equipment Finish: Clean and polish finished metal surfaces. Clean and prepare prime coated gear for painting.
- G. Light Fixtures: Remove dust and handprints from light fixture surfaces. Clean diffusers before project acceptance.
- H. Electrical Equipment: Clean exterior and interior of all equipment. Vacuum interiors -- do not blow out. Apply permanent identification and remove temporary and unauthorized notations.
- I. Acceptance: Remove all debris, dirt, grease and oil from building surfaces, caused by work under this section. Clean out and vacuum electric rooms.

3.15 Painting:

- A. In Equipment and Utility Areas: Provide factory finished equipment including prime coat and medium dark gray finishing over rust-inhibitor.
- B. Outdoors and in Wet Locations: Provide additional factory coat of exterior lacquer for a two mils finish thickness. Indicate finish on shop drawings.
- C. In Public Areas: Provide shop prime coat for equipment installed flush in painted walls. Finish painting is under Section "Painting".
- D. Touchup: Use factory supplied paint for touchup of rusty or scratched surfaces. Replace marred or scratched plated finishes.
- E. Supports: All conduit hangers, racks and structural supports for electrical material and equipment required under other paragraphs to be galvanized or plated, to be field painted, if not plated, under this work in conformance with Section "Painting".

3.16 Identification and Warning Signs:

- A. Nameplates - General:
 - 1. Provide laminated, engraved plastic nameplates with one-half inch high letters for all switchboards, motor control centers and panelboards.

and make cuts as narrow as possible. For nonmetallic conduit without encasement, excavate 4" below conduit and backfill with sand. In rock, excavate 6" below conduit and backfill with gravel for encased conduit and sand for direct buried conduit. Separate signal and power conduit in a common trench by 12" of tamped earth or 6" of concrete.

- C. Within building footprint, run buried conduit, 1-1/4" nominal and smaller, 6" minimum below slab. Conduits with diameter less than 1/3 of slab thickness may be run in slab on grade where practical and acceptable to Architect.

3.04 Equipment Pads and Curbs:

- A. Install floor mounted switchboards, motor centers, and transformers on 4" high level concrete pads in basement, ground floor and roof levels; and in mechanical rooms on all levels, and where indicated extend concrete pad in front of equipment for maintenance where device handles exceed 6'-6" above room floor.
- B. Provide exact pad size, location and conduit entries based on equipment shop drawings to concrete section for construction.

3.05 Sleeves, Openings, Flashing, Cutting and Patching:

- A. Locations of Openings: Locate all chases, shafts, sleeves, openings, anchors and inserts required for the installation of the electrical work during framing of the structure and before concrete placement. Obtain approval from the Engineer, in writing, for penetration of structural member or blockouts through slabs for grouped conduits, prior to installation.
- B. Cutting and Patching: Provide additional cutting, core drilling and associated patching required, due to improperly located or omitted openings, by accredited journeymen of the respective trades without cost to Owner and per Engineer's requirements.

Do not sleeve, cut or drill structural members or footings without written approval of Engineer. Fill all blockouts and preformed openings provided for work under this section with concrete in a manner to maintain the fire rating integrity of the floor or wall.

- C. Location of Sleeves: Place conduits which pass through slabs on grade before concrete is poured. Where penetrating masonry or concrete interior slabs or walls,

solidly grout steel conduits one inch nominal or smaller, and plaster in where penetrating partition walls. For conduits 1-1/4" nominal and larger, provide sleeves of ample size to provide 1/4" to 1/2" annular joints.

D. Types of Sleeves:

1. Suspended Floor Slabs: Standard weight, 16 gauge minimum, black steel pipe, stub 1" above finished floor.
2. Walls and Partitions: 18 gauge galvanized sheet steel or steel pipe, ends flush with finished surface, and finished smooth.
3. Membranes: Stub sleeve 6" beyond membrane and provide flanges suitable for sealing of membrane. Obtain Engineer's approval of sleeve detail.
4. Caulking:
 - a. Through exterior walls, caulk conduit penetrations for full wall thickness for waterproofing. At fire rated floors and partitions, pack sleeves with fiberglass for full sleeve depth and caulk both ends.
 - b. Where sleeves or openings in fire rated floors and partitions contain conductors not enclosed in a raceway, fill with silicone foam the full depth of the sleeve or opening per manufacturer's instructions.
5. Cut all sleeves smooth, ream and install perpendicular to floor or wall.

E. Caulking Compound Characteristics:

1. General: Putty like; workable with hands down to 35°F; firm up to 300°F; remain pliable when exposed to air; adhere to metal, plastic, concrete, masonry and cable insulation; harmless to hands; seal without causing deterioration of material sealed.
2. Fire Rated Walls or Partitions: UL classified fire retardant silicone foam.

- F. Flashing: Wherever conduit extends through roof, provide galvanized iron flashing, consisting of 24 gauge roof jack extending 6" out on roof and up conduit at least 8", with flashing collar covering top of roof

jack. Caulk between jack and conduit. Coordinate installation of flashing with roofing installation. Provide pitch pockets as option and where indicated.

3.06 Noise and Vibration:

- A. General: System shall be free of noise and/or vibration transmission to building from transformers, rotating machinery or electric equipment through structure or conduit connections. Correct, at no cost to Owner, conditions resulting in noise transmission to facility from work under this section.
- B. Connections: Connect to motors, transformers and all isolated or vibrating equipment with 24" minimum length of liquidtight flexible conduit, slack connected. For transformers, conduit may be stubbed into bottom, not connected to frame, in lieu of flexible connection.
- C. Vibration Isolation: Provide between structure and vibrating or rotating equipment furnished and/or installed under this section:

<u>Equipment</u>	<u>Design Deflection</u>	<u>Isolator</u>
Transformers (Below 100 KVA)		
Slab, On Grade	0.06"	PN
Above Grade, Supported	0.3"	MN
Above Grade, Suspended	0.3"	HS
Transformers (Above 100 KVA)		
Slab, On Grade	0.06"	PN
Above Grade, Supported	0.3"	MN

- D. Switchgear, Switchboards, Distribution Boards, Motor Control Centers: Manufacturers to size, brace and arrange bus within gear and design enclosure to preclude hum and vibration. Provide sound baffles and shock mounts for relays and contactors.
- E. Wiring: In multiple runs of feeder conductors in conduit or wireway, twist associated phase and neutral conductors together to avoid abnormal field generation.
- F. Equipment Frames: For vibrating or rotating equipment to be isolated, provide mounting frames and/or brackets to carry the load of the equipment without causing mechanical distortion or stress to the equipment.

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G. Machinery Rooms:

1. In machinery and electrical rooms located above occupied spaces, do not penetrate floor slab without specific approval in writing. Where floor has membrane, avoid penetrations and run all conduit overhead.
2. In general, run conduits to motors and equipment overhead. For overhead drops exceeding 8 feet in length or floor risers over 2 feet high, provide unistrut or pipe brace to floor or structure. For slabs on grade 6 inches thick minimum, conduits 1 inch nominal or smaller may be run in slabs to floor mounted equipment. Verify stub-up location with equipment supplier.
3. Do not run conduit through vibration isolated (floating) concrete slabs.

- H. Outlets: Do not use back-to-back outlets or through boxes. Separate outlets on opposite sides of wall by 12 inches minimum unless otherwise detailed. For residential occupancies observe applicable local ordinances.

3.07 Grounding System:

- A. General: Provide new service and isolated system grounds with resistance to ground of three ohms or less and in accordance with applicable code requirements. Maintain equipment ground continuity through entire system including raceways, wireways, equipment enclosures, lighting fixtures and devices. Provide grounding as specified and as shown on drawings. Include ground conductor in all nonmetallic conduits. Use green insulated copper ground conductors sized per tables herein.
- B. Service Ground:
1. Provide 50 foot length of bare copper conductor extended full length and embedded along bottom of building concrete foundation, supported to provide two inch concrete encasement minimum. In steel frame buildings bond to a minimum of two steel columns. Bring loop out at center to accessible concrete hand hole located in main electrical room of the new building.

2. Bond from building cold water main, 2 inch or larger to service ground with insulated ground conductor in steel conduit at hand hole.
3. Extend engine generator neutral, transformer neutrals and equipment ground from main switchboard and transformers with insulated conductor in steel conduit to hand hole and bond to service ground.
4. Extend isolated system grounds to service ground at switchboard ground bus or at hand hole when located in same building as service.
5. Service Ground Conductor:

<u>Service Amperes</u>	<u>Embedded AWG</u>	<u>Cold Water & Service Ground AWG</u>	<u>Service Ground Conduit</u>
500A - 800A	2/0	2/0	1"

6. Where required to obtain specified resistance to ground, drive additional ground rods, number as required, and bond to service ground.
7. Engrave hand hole cover - GROUND ELECTRODE.

C. Isolated System Grounds: Ground transformers and generator from neutral bus or bushing to service ground, with insulated conductor in steel conduit as follows:

<u>KVA</u>	<u>208/120 Volts AWG Size-Conduit</u>		<u>480/277 Volts AWG Size-Conduit</u>	
	30 and Less	8	3/4	8
45	4	3/4	8	3/4
75	2	3/4	4	3/4
112-1/2	1/0	1	4	3/4
150, 225	2/0	1	2/0	1

Alternately, up to 150 KVA rating, ground conductor may be run back to service ground with transformer feeder.

D. Ground Continuity:

1. Provide green insulated ground conductor with TW or THW insulation in all nonmetallic conduits, each conduit run for feeders and where indicated for

branch circuits. For lighting circuits, connect ground wire to fixture ground lead where available or bond to fixture housing by mechanical means. Connect grounding conductors to ground busses in panels, switchgear, motor control centers and switchboards, and to terminals on devices, and bond to all equipment. Provide copper ground conductor, sized not less than following:

			30	70	110	225	450	700
Circuit Device			to	to	to	to	to	to
Setting Amperes:	15	20	60	100	200	400	600	800
Ground Conductor:								
AWG Size:	14	12	10	8	6	2	1	1/0

For parallel feeders or circuits, run ground in each conduit. Refer to schedule on drawings.

2. Provide ground bushings, fittings, jumpers as required at expansion and seismic fittings, isolated sections and wherever ground continuity is broken. Provide ground bushings on conduit stub-ups and bond to enclosure and ground bus.
 3. Bond plug strip, isolated metal parts of lighting fixtures, and ground terminal of receptacles to equipment ground.
 4. Provide separate green ground conductor in circuits serving isolated ground outlets, ground fault outlets, and all outlets in computer rooms and rooms with raised deck floors.
- E. Antennas and Masts: Provide 1 #8 (minimum) copper ground conductor in 3/4" conduit from antennas and masts to service ground, or 2" or larger cold water pipe.
- F. Communications Ground: Provide 1 #8 (minimum) copper ground conductor in 3/4" conduit from main telephone room and/or telephone terminal to service ground if available or to cold water pipe 2" or larger. Extend to other telephone terminals where indicated.
- G. Materials and Methods:
1. For ground loop, use soft drawn stranded copper conductors size as scheduled. Snake buried conductors to allow for settlement, and bury 12" minimum below concrete slabs on grade.

2. Install continuous conductors without splices. Where joints are required, use exothermic welding to join all conductor strands, providing completed joint equal to or larger than conductor. Obtain inspection before covering joints.
3. Provide conductor embedded in foundations, extended to precast concrete hand holes. Engrave cover "Grounding Electrode".

3.08 Installation of Raceways and Wireways:

A. General: Deliver raceways and wireways to the site in standard lengths, and store where continuously protected from moisture and weather. Install as Follows:

1. Conduit sizes on the drawings are minimum, sized for copper conductors, for normal (THW) insulation. Use 3/4 inch trade size minimum for underground runs. Increase sizes where required by physical conditions, or conductor insulations. Do not combine runs without written approval. Allow for grounding conductor as described under Paragraph "Grounding".
2. Conceal conduit above ceiling, below floors or in walls where possible.
3. Conduit may be exposed in shop and utility areas and where indicated. Install all conduit runs parallel with or perpendicular to structural members. Surmount obstructions by use of bends, offsets, and where necessary with junction and pull boxes. Use cast boxes and/or condulets for outlet and small junction boxes located within seven feet of floor, in exposed locations.
4. Cut conduits and raceways square and free of burrs. Ream conduit ends and clean conduits before pulling conductors. Secure rigid conduits to panels, pull boxes, wireways and enclosures with locknuts, inside and out, and provide high impact plastic or insulated throat steel bushings at terminations in pull boxes, wireways, signal cabinets, boxes and enclosures. Zinc insulated throat hubs with "O" ring gaskets may be used in lieu of double locknut and bushing. For feeder conductors No. 4 AWG and larger, provide steel insulating bushings with plastic liner. For EMT provide insulated throat connectors secured with locknut on interior of

box or enclosure. For flex conduit, provide insulated throat steel twist-in connectors secured with locknut on interior of box or enclosure, or steel twist-in connectors with plastic bushing, and locknut. At panelboards, switchboards and gear specified with ground bus, terminate conduits with ground bushing bonded to ground bus with code size conductor, No. 8 AWG minimum. Use approved couplings or unions. Running thread, threadless coupling, or split coupling connections are not permitted.

5. Cap open ends of conduits with approved manufactured conduit seals. Install as complete system, mechanically and electrically continuous between outlets, gear and equipment.
6. Where conduits or wireways cross expansion or seismic joints, provide approved expansion fittings, which allow deflection in all directions, except where alternate details have been provided.
7. For bends and offsets in conduit 1 inch and larger, use larger radius factory fittings or a hydraulic bender. Replace all flattened, deformed or kinked conduit.
8. Route raceways and wireways so as to prevent insulated conductors from being subjected to high ambient temperature conditions. Maintain the following Minimum Clearances:
 - Crossing uninsulated pipe or duct - 3 inches.
 - Crossing insulated pipes or ducts - 1 inch.
 - Parallel to uninsulated pipes or ducts - 3 feet.
 - Parallel to insulated pipes or ducts - 6 inches.
9. For underground steel conduit coat all joints and points where wrenches have been applied, with bitumastic paint.
10. Extend underground stub outs as shown on drawings, but 3 feet minimum beyond building foundations or concrete paving.
11. Provide No. 14 AWG black iron pull wire or polyethylene or nylon pull rope rated 250 pounds tensile strength in all empty conduits and stubs over 10' in length, extending at least 12" beyond conduit.

12. Where entering refrigerated spaces, provide approved compound filled sealing fitting, installed in accessible location, on warmer side of wall.
13. Provide compound filled sealing fitting for conduits terminating in or passing through hazardous areas per applicable sections of code.

In vehicle maintenance and garage areas, area within 18" of floor shall be considered hazardous. Run conduit overhead and keep conduit, devices and equipment out of hazardous area where possible. Unless otherwise indicated, area classification is Class I, Division I, Group "B".

14. Where conduit extending into building from site enters occupied level, slope conduits to drain away from building and seal to prevent entrance of moisture.
15. Terminate conduits in concrete light pole bases a vertical distance of 4" above top of foundation and inclined towards the light pole hand hole. Extend conduit stubs a minimum distance of 3' from outside of concrete foundation and cap. Before pouring of concrete bases, position all conduits at correct height and bond together. Hold anchor bolts and conduits in place by means of templates until concrete sets. Allow 72 hours for concrete set before erecting standards.
16. Stub conduit into bottom of dry type transformers where possible and bond to case.
17. Terminate branch circuit or communication conduits turning from floor into interior removable non-masonry partitions or freestanding appliances or equipment with flush floor couplings before extending conduit.
18. Route openable raceways and wireways so as to be readily accessible.
19. Gutter and wireway dimensions indicated on the drawings are minimum. Provide sufficient cross section to contain conductors including all splices in accordance with code allowed percent fill. Where covers occur on bottom, provide removable wire supports not more than 3' apart.

20. Refer to Paragraph "Identification" for additional requirements.

B. Conduit:

1. Use Rigid Steel Conduit in All Sizes or Intermediate Steel Conduit Up to 4 Inches: In slab on grade; on exterior; encased in exterior masonry or concrete walls; in wet locations; in refrigerated spaces; in exposed locations within seven feet of floor or walking surfaces.
2. Use rigid or intermediate steel conduit for trade sizes 2-1/2 inches and larger installed above grade throughout.
3. For underground installations use concrete encased rigid or intermediate steel below building and concrete encased rigid or intermediate steel or nonmetallic conduit outside building. Provide rigid or intermediate steel conduit elbows.
4. Where indicated in writing by the Engineer, underground steel conduit and couplings may, in lieu of concrete, be protected with plastic wrap or coating:
 - a. Factory wrap with 1/2 lap of 20 mil thick identified polyvinyl tape to provide uniform 40 mil coating. Field tape joints shall provide equivalent coating.
 - b. Factory coat with 40 mil thick PVC coating bonded to conduit. Coating on couplings shall extend beyond coupling ends for one conduit diameter up to 1-1/2".
5. Use rigid steel or electric metallic tubing in trade size 2" and smaller in dry concealed locations, in exposed locations above 7' from floor or walking surfaces, in electrical and telephone rooms at all heights.
6. Use flexible steel conduit, 1/2" minimum trade size, for connection to lighting fixtures from fixture outlet. Where structural conditions make use of rigid conduit or tubing impractical, obtain written permission from Engineer to use flexible conduit.
7. Use 24" Minimum Length of Liquidtight Flexible Steel Conduit, 1/2" Minimum Trade Size, Slack Connected

Connected For: Connection from outlet to motor and other moving or vibrating equipment; code length to lighting fixtures in damp or wet locations; to transformer housings; to kitchen equipment; all flexible connections in exposed areas.

Where conduit stubs into bottom of dry type transformer, without connecting to enclosure, bond conduit to enclosure and omit flex connection.

8. Provide bend radius for flexible conduit not less than 5 times the trade size.
9. For connection to exterior lighting standards, Schedule 40 PVC may be used without encasement outside of building area. Use rigid steel under building stubbed five feet beyond building, and in concrete pole base. Include ground wire and size conduit accordingly.
10. Where penetrating floors or fire separations, use UL listed fittings and/or devices to maintain separation integrity.
11. Where crossing existing pavement, place conduit under pavement by approved jacking method. Keep jack pit two feet clear of edge of pavement. Do not undermine paving with excessive water. If jacking cannot be accomplished, obtain Architect's permission in writing to cut and patch paving.

C. Support and Fastening:

1. Install rigid steel conduit with threaded couplings. Support conduits 1" and larger on 10' intervals, smaller than 1" on 7' intervals, all sizes within 3' of connection to box, cabinet or fitting. Support vertical runs 2" and larger a minimum of once, and on 15' centers maximum. Support vertical runs smaller than 2" on 8' centers maximum.
2. Support electric metallic tubing on maximum spacing of 10' and within 3' of connection to box, cabinet or fitting including couplings.
3. Support flexible metal conduit on 4' intervals, within 1' of outlet box or fitting (except at connections to recessed lighting fixtures) and within 2' of vibrating equipment.

4. Support gutter and wireways at 5 foot intervals and at changes of direction, in a manner to allow full access.
5. Attach to field poured concrete with preset inserts for conduits 3 inch and larger and with preset inserts or lead expansion screw anchors for smaller sizes. Shot driven studs are not permitted without written approval from the Engineer. Secure conduit with cast conduit clamps and cadmium plated machine or lag screws.
6. Attach to plaster, dry wall or hollow masonry walls with toggle bolts.
7. Attach to solid masonry walls with lead expansion anchors.
8. Do not fasten rigid conduit or tubing to equipment subject to vibration or mounted on shock mounts.
9. Secure conduits 1-1/4" and smaller to steel deck with cast conduit clamps and one inch minimum cadmium plated or galvanized sheet metal screws.
10. Where attaching to steel members, use beam clamp, welded threaded studs or machine screws.
11. Where not otherwise specified herein, support all sizes of suspended conduit from structure with factory made pipe hangers with split hinged malleable iron or springable steel pipe rings and solid round mild steel rods, 1/4" diameter for up to 1-1/4" conduit, 3/8" diameter up to 2" conduit and 1/2" diameter for larger conduit.
12. Provide trapeze type hangers where three or more conduits run parallel and clamp conduit to hanger.
13. Provide plated or galvanized hangers, rods, channels and metallic support and fastening material or provide two coats of rust resistant paint, in all damp or corrosive locations (e.g., vehicle maintenance garage, labs).

14. Do not use perforated metal strap or wood as support material.
15. Support conduit to structure above suspended ceilings three inch minimum above ceiling to allow removal of tile. Do not support from T-bars or T-bar hanger wires. Maintain a two inch clearance above recessed light fixtures.
16. Above fixed ceilings, tie conduit to furring or support channels with No. 16 gauge galvanized wire ties 4 feet on center, maximum.
17. Attach to precast or prestressed concrete as described under applicable sections of the specifications. Coordinate installation of precast unistrut or inserts where required, or obtain written approval from the Architect of alternate support methods.

3.09 Installation of Boxes and Devices:

- A. General: Use new, bright stock and store where continuously protected from weather.
1. Install all outlets and boxes in readily accessible locations.
 2. Provide additional pull or outlet boxes as required to meet code requirements or to facilitate pulling of wires. Locate in utility areas, above accessible ceilings, or in approved locations.
 3. Size boxes for devices contained and the number of wires passing through or terminating therein, not less than 4 inches square by 1-1/2 inch deep, or equivalent configuration. Pull and junction boxes to be of adequate size for splices and terminations contained therein.
 4. For door alarms and switches, use special boxes designed to fit in door frame.
 5. For receptacles 30A rating and greater, use 2-1/8" deep box with two gang ring and plate to match device.

6. Use 4-11/16" square box with round plaster ring, for surface mounted ceiling fixtures.
7. Where more than one switch is shown at one location, group behind common plate. Use gang boxes for three or more devices. Provide barrier between 277 volt switches controlling two or more circuits.
8. Use 4-11/16 inch square by 2-1/8 inch deep boxes, minimum size, for more than two flexible connections to lighting fixtures.
9. For wall mounted outlets serving desk telephone or intercom instruments, use 4-11/16 inch square by 2-1/8 inch deep box with one gang flush plaster ring. In hollow partition walls, use plaster ring secured to wall with epoxy glue and terminate conduit in a bushing just above edge of plaster ring.
10. Use cast metal, gasketed boxes for locations noted on drawings and as follows: Stub mounted outlets; outlets on exterior or within exterior walls facing the exterior; surface mounted outlets within 7 feet of the floor wet or corrosive locations. For flush mounted outlets provide adapter plates. Provide threaded plugs in unused hubs.
11. For concrete work, use concrete boxes which allow the placing of conduit without displacing the reinforcing bars. Use masonry boxes in block and masonry walls.
12. Use extension rings with blank covers for surface extension from flush box.
13. Barrier conductors from different sources in same box.
14. Recess boxes in finished areas, and wherever possible in utility, mechanical and electrical spaces. Provide extension rings and/or plaster rings to finish flush with finished surfaces. Install approved factory made knockout seals where knockouts are not intact, and close all openings.
15. Support light fixture outlets to building structure and equip with fixture stud and hanger bar or supporting device as required, including outlets for

Provide similar nameplates with three-eighths inch high letters for transformers, time switches, individually mounted breakers, switches and controls, and switchboard and motor center branch devices. Attach nameplates to gear with sheet metal screws. Adhesive mounted nameplates are not acceptable.

2. Include nameplate schedule on shop drawing submittals.

3. Indicate on Gear Nameplates:

Line 1	Equipment Designation
Line 2	Voltage, Phase, Number of Wires

Example	"PANELBOARD A" 120/208 VOLT, 3 PHASE, 4 WIRES
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4. Indicate equipment and/or equipment controlled and designation on component nameplates. Examples:

Example	Motor Starter "AIR HANDLING UNIT AH-1"
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5. Install panelboard nameplates behind panel door in public areas and on panel face in equipment rooms.

B. Nameplate Color Schedule:

1. 277 through 600 volts - green letters on white label.
2. 120 through 240 volts - black letters on white label.
3. Fire Alarm System: Black letters on red label.
4. Communication or Signal Systems: White letters on black label. Identify system.

C. Stencilled Designations and Labels:

1. Provide stencilled designations for the following with 1/2 inch high letters on background of contrasting color, colors as outlined under nameplates. Fabricate stencils of brass and deliver to Owner on completion of work.
 - a. Junction boxes and cabinets of signal and communication systems identifying system and voltage.

- b. 277 volt lighting outlet and junction boxes
- 277/480 VOLTS.
 - c. 480 volt outlet and junction boxes - 480 VOLTS.
 - d. Conduit runs on 25 foot centers and on both
sides of wall and floor penetrations, where
visible from floor as follows:
 - 1) Indicate circuit designation and number
on all feeders.
 - 2) Indicate system on all signal and communications
system conduit sized 1-1/2 inches and
larger.
2. At all fusible devices, either individually mounted
or part of gear, provide a label (as supplied by
fuse manufacturer) or nameplate inside each switch
cover, indicating specific type of fuse required for
replacement.
3. All junction box covers shall have panel and circuit
of each conductor marked on cover with waterproof
ink.
- D. Conduit and Conductors:
- 1. Tag feeders at panels, switchboards, pull boxes, and
other accessible enclosures, indicating circuit
number and conductor ampere rating.
 - 2. In exterior or wet locations and for medium voltage
conductors in all locations, provide 1-1/2 inch
diameter brass discs engraved or stamped with 3/8
inch high letters and tied with No. 16 gauge gal-
vanized wire.
 - 3. In interior dry locations, provide metal or
laminated plastic discs as above, attached with
nylon cord.
 - 4. Tag exposed ends of conduit stubs indicating system,
name of panel, switchboard, etc., of origin and
conduit size.
 - 5. Identify all branch circuit system conductors
with premarked, self-adhesive, wraparound cloth wire
markers, indicating circuit number and name of

panel, cabinet, etc., of origin, at panelboards, motor centers, switchboards, terminal cabinets, wireways, junction boxes and at outlet boxes containing more than one neutral wire.

6. Provide, above underground conduits stubbed for future use, engraved flush bronze marker anchored in 4 inch square by 12 inch deep concrete block, flush with grade, indicating system, conduit size and point of origin.
- E. Devices: Machine engrave on each device plate with 3/16 inch high block letters filled with black enamel as follows:
1. All device plates - panel and circuit number of devices.
 2. Lock switch and switch with pilot light - device controlled.
 3. Switch for fan, motor, unit heater - equipment controlled.
 4. Switch where lights or equipment are out of sight - equipment controlled.
 5. Switches in gangs of three or more - description of lights or equipment switched.
 6. Receptacles over 150 volts to ground and/or 30 amperes and higher rating - voltage and ampere rating.
 7. Where wording is not indicated, allow for ten letters per device and use wording as directed.
 8. For switch cabinets engrave each device or provide engraved nameplate.
- F. Warning Signs: Provide signs with 1 inch high black letters in all electrical and communication rooms and closets reading: ELECTRICAL (OR SIGNAL) ROOM - NO STORAGE PERMITTED.
- G. Panel Schedules: Provide typewritten panel schedules on inside of panel doors behind clear plastic. Indicate as-built number and type of outlets served and general location of outlets or fixtures and/or item of equipment served.

H. Diagrams: For signal and communication systems, provide block wiring and location diagram mounted behind clear plastic and posted at system control location or as directed. Submit diagram for approval with shop drawings.

3.17 Tests:

- A. General: Provide testing as specified under individual equipment and system specifications and as follows:
1. Upon completion of the work, and as a condition for acceptance, test all components and systems in the presence of the Engineer to demonstrate compliance with the specifications. Provide tests as specified and as required by the code or enforcing authorities.
 2. Provide supervisory personnel experienced with the particular systems involved, and where specified, arrange for the presence of factory representatives to direct indicated testing. Check all field connections prior to testing.
 3. Provide all required testing instruments and pay all costs for testing and for any resulting repair or replacement.
 4. Tighten all bolted connections and meggar all equipment and bus prior to testing.
 5. Tabulate all test data and prepare typewritten report covering all testing performed and include in Operating and Maintenance Instruction Manual(s).
- B. Test and Measurements: Include all required factory service engineering time to cover the outline testing. Submit a per diem cost to cover additional testing which may be requested.
- C. Ground Resistance: Test ground resistance at each ground loop for transformer grounding and at the secondary of each transformer, sized 75 KVA and larger. Perform test in accordance with the latest edition of James G. Biddle manual on "Earth Resistance Testing" and describe tests and results in test report. Where ground resistance is in excess of specified values, add ground electrodes as required to meet specifications. Perform tests before associated slabs are poured so that corrective measures are not precluded.

- D. Switchboards: Set, test and operate each operable device.
- E. Ground Fault Detectors: Verify proper neutral grounding and installation of ground fault detector. In zero sequence system, neutral and phase conductors to pass through sensor in same direction and equipment ground to be outside sensor. Demonstrate operation of each detector using factory authorized test equipment.
- F. Conductors: Test for continuity, short circuit and improper ground. Meggar all feeders with switchboards and/or panels connected, but with branch loads disconnected, and meggar circuits for 20 HP and larger motors. Insulation resistance to be not less than cable manufacturer's recommendation.
- G. Panelboards: Test with main disconnect open, branch circuits connected, wall switches closed, lighting fixtures and/or outlets permanently connected, without lamps for neutral ground, short circuit, continuity, improper ground, and multiple neutral grounds.
- H. Signal and Communication Systems: Factory engineer to test each system to demonstrate specified operation of all components. For code required systems, arrange for code authorities to witness tests.
- I. Ground Fault Interrupting Receptacle:
 - 1. Verify that receptacle is installed per manufacturer's instructions and terminal connections are secure and clean.
 - 2. With the aid of a GFI Tester, Such as Hubbell #GFT2-G, verify:
 - a. Hot - neutral - ground connections.
 - b. At two and three milliamps respectively, GFI shall not trip within 10 seconds.
 - c. At five milliamps, GFI shall trip within one second.
- J. Adjustments: After project loads are in full operation, and at a time acceptable to the Owner.
 - 1. Take voltage readings at each transformer. Where voltage on secondary of building transformers is

above or below required rating in excess of 2-1/2 percent at full load, make appropriate tap changes.

2. Take current readings on each phase at each panel. Adjust branch circuiting between phases where required to balance phase currents within 10 percent. Reflect revisions in panel schedules. Circuit revisions shall not compromise multiwire circuits sharing a common neutral.
3. Tabulate adjustment data by transformer and panel and submit with test data.

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DIVISION 16 - ELECTRICAL

SECTION 16100 - ELECTRONIC SYSTEMS

ARTICLE 1 - GENERAL

1.01 Scope: Work includes but is not necessarily limited to the following:

- A. Definitions, guarantees, submittals, clean-up, as-builts and all other applicable requirements of Documents 0, Division 1 and Section 16010 apply to the work of this section.
- B. Examine all other sections for work related to those sections which are required to be included as work under this section.
 - 1. Fire alarm system.
 - 2. Clock system.
 - 3. Paging system.
 - 4. Closed circuit television system complete.
 - 5. All work and material required in order to produce complete and operable systems under this section not provided under the work of any other section.
 - 6. Testing and equalization.
 - 7. Coordination of conduit work with electrical section, coordination of devices.
 - 8. Wiring diagrams and shop drawings.
 - 9. Record drawings.
 - 10. Permits, inspections, fees.
 - 11. Identification and instruction.

1.02 Related Work in Other Sections:

- A. Conduit, speaker back boxes, grilles (Section 16010).
- B. Telephone equipment.

- 1.03 Conditions: Examine other sections and Section 16010 and ascertain their effect upon and relationship to the work in this section. Provide the products, and execute the work for this section in accordance with the product and execution requirements, where applicable, as set forth in Section 16010 to provide interrelated electrical system.
- 1.04 Materials: Throughout the specification, types of material may be specified by manufacturer's name or catalog number in order to establish standards of quality and performance and not for the purpose of limiting competition. Unless specifically stated otherwise, the bidder may assume the phrase "or approved equal", except that the burden is upon the bidder to prove such equality. If the bidder elects to prove such equality, he must request, in writing, approval from the Architect and Engineer to substitute such items for the specified item. Provide supporting data and samples, if required, to permit a fair evaluation of the proposed substitute with respect to quality, serviceability, warranty and cost. Such supporting data shall include the basic specifications characteristics and other information concerning the proposed substitution demonstrating its equality to the specified item(s) and the effect of the substitution on the schedule and cost, if any.
- 1.05 General:
- A. Installation of all conduit, wire, sleeves, outlet boxes, insulating bushings, system cabinets, terminal boxes, junction boxes, inserts, anchors, system devices, etc., shall be in accordance with the appropriate requirements of the Southern California Rapid Transit Division.
 - B. Coordinate the work of all trades involved so that exact locations are obtained for all outlets, apparatus, appliances and wiring.
 - C. Provide 3/16" diameter polyethylene or polypropylene pull ropes, with 700 pound minimum breaking strength in all empty conduits provided for this section under Section 16010 Electrical.
 - D. Major equipment for each system specified herein shall be products of a single manufacturer, as far as practicable, of established reputation and experience, who shall have produced similar apparatus for a period of at least 5 years and who shall be able to refer to similar installations now rendering satisfactory service.

1.06 Fire Alarm System:

A. General:

1. Furnish and install a complete and operable Pyrotronics Fire Alarm System as herein described. It shall be installed as a single unit, supplied by the same manufacturer, properly interconnected, wires tagged, neatly laced and formed, and to operate in a manner satisfactory to the Engineer.
2. Furnish a letter from the representative of the manufacturer to the effect that the systems involved in this section are correctly and satisfactorily installed and guaranteed for a one year period from the date of final installation.
3. The manufacturer shall have a factory authorized service center within a 50 mile radius of the job site and provide 24 hour, seven day a week service.
4. The manufacturer shall present to the Owner, at the completion of the project, a one year maintenance contract, to provide a regularly schedule preventive maintenance program, and a Fire Alarm Inspection and Testing Agreement.

B. Operation of the Fire Alarm Control Panel shall be as follows:

1. Normal Condition: All system alarm and trouble LEDs shall be off. All function switches shall be in a normal position. Only the Normal Power LED shall be illuminated at this time.
2. Trouble Conditions:
 - a. An open in any portion of any alarm initiating loop shall report trouble to the control panel. An open in any portion of the smoke detector power wiring shall report trouble to the Control Panel. Any open in any portion of the bell circuit shall report trouble to the Control Panel.
 - b. In addition, a shorted bell loop also cause a trouble indication at the Control Panel. A grounded wire condition, whether a positive or negative state, shall indicate a trouble condition at the Control Panel.

- c. Primary power failure will be indicated at the Control Panel via battery standby. Standby batteries and charger unit are monitored for low, overcharged, disconnected, or polarity reversed batteries. Charger is monitored for trouble conditions. Any of these conditions shall be indicated their respective trouble at the Control Panel.

3. Alarm Conditions:

- a. Activation of the manual pull station shall sound the general alarm in all buildings.
- b. Activation of any smoke detector shall sound the general alarm in the building of alarm only.
- c. Activation of any thermo-detector shall sound the general alarm in the building of alarm only.
- d. The appropriate control module zone shall indicate alarm condition of the area of the alarm activation.
- e. The alarm signals shall sound until such time as the system components are reset.

C. Equipment:

- 1. Fire Alarm Control Panel shall consist of a mother board, a transformer, dual zone, with test switch, signal module, and a 4 round coder. It shall all be housed in a compact self-contained cabinet with a locked door and a viewing glass to view status of LEDs. One manual station shall be located in the supervisor/clerk's office to sound general alarm by authorized personnel.
- 2. Smoke detectors shall be listed UL to the current standard for photoelectric type smoke detectors (UL 168 and 167). Detectors shall be rate compensated typical 135°, fixed sensitivity, providing minimum response time to all types for fires. The detector light source shall be an LED, and operate on the multiple cell concept regulating photocell circuit matched to the smoke detection alarm circuitry from the same 2 wires. The detector shall lock-in an alarm and have a lock-in alarm/trouble indicator light.
- 3. Heat and rate-of-rise detectors - Thermometers, shall be rated at 136° F fixed temperature with an air chamber, vent, flexible metal diaphragm, to operate on the rate-of-rise principle.

4. Bells shall be vibrating, 6" red 24 VDC rated at not less than 90 db.
5. Horns shall be 24 VDC, red, polarized, rated at not less than 102 db. Fire alarm horns shall be fully supervised and be parallel connected. They shall be flush mounted in a 5911 box.
6. Zoning shall be as indicated on the plans.
7. Wiring: Wiring of the system shall be done to conform with the fire alarm manufacturer's wiring diagram, and in accordance with the instructions of the Owner and/or Engineer.
8. The installation shall be made under the supervision and responsibility of the equipment supplier with all final connections under the supervision of an accredited manufacturer's representative. Proper operation shall be the responsibility of the manufacturer's representative.
9. The manufacturer, or his representative, will instruct the Owner's personnel in the proper operation and basic maintenance of the fire alarm system.

1.07 Paging System:

- A. Provide equipment, conduit, wire, cables, outlet boxes, material and labor necessary to provide a complete operating system performing all of the functions described herein and satisfactory to the Owner and Engineer. Equipment and installation material required shall be furnished and installed whether or not enumerated herein or shown. The system shall be checked and guaranteed by a factory authorized sound engineering representative of the manufacturer.
- B. Provide the following equipment, or an approved equal:
 1. Paging system mixer/amplifier shall consist of a 100 watt Raymer Model No. 810-100A with four (4) inputs as follows: Two (2) microphones, one (1) music and 1 600 ohm telephone. The mixer/amplifier shall be complete with cover and shall have all necessary equipment and devices required to interface with the building AC system, speakers, microphones and local key telephone systems. Four outputs shall be provided: 4 and 8 ohm unbalanced; 25 volts and 70 volts balanced. The unit shall operate from a 115 VAC 60 Hz source.

2. The booster amplifier shall consist of a 100 watt Raymer Model No. 811-100 with one (1) high impedance input which shall be convertable to low impedance. A parallel input shall be provided to enable the booster amplifier to operate in parallel with the mixer amplifier. The booster amplifier shall operate from a 115 VAC 60 Hz source.
3. Inside flush mounted speaker assemblies shall consist of a Soundolier Speaker Model No. C10T70 with 70 volt line transformer with taps mounted in a Soundolier speaker enclosure Model No. 95-8 with a Soundolier baffle Model No. 51-8, and a Soundolier No. 81-8 mounting frame for a T bar ceiling or No. 75-8 mounting ring for stud supported ceilings.
4. Outside speakers shall be Atlas Model No. APR-30T with 70 volt line transformer (tapped as required). The outside speakers shall be switched on or off by a 24 hour timer without affecting the volume of the other speakers.
5. Inside speakers, shop area, shall be ceiling hung Atlas No. APC-30T with 70 volt line transformer (tapped as required).
6. Paging system microphones shall be Shure Model No. 522 with fingertip control bar to actuate mike and external relay and shall be equipped with 7 foot of four conductor (two shielded) cable terminated with a Switchcraft No. A5M Series plug.
7. Microphone wall receptacles shall be single gang stainless steel wall plate with Switchcraft No. B5F connector.
8. Speaker cable shall be one pair No. 18 stranded wire, Belden No. 8461.
9. Microphone cable in conduit shall be two shielded pairs No. 22 stranded wire, Belden No. 8723.

1.08 Master Clock System:

A. General:

1. Furnish and install a complete and operable Master Clock System as herein described. It shall be installed as a single unit, supplied by the same manufacturer, properly interconnected, wires tagged, neatly laced and formed and to operate in a manner satisfactory to the Engineer.

2. Furnish a letter from the representative of the manufacturer to the effect that the systems involved in this section are correctly and satisfactorily installed and guaranteed for a one year from the date of final installation.
3. The manufacturer shall have a factory authorized service center within a 50 mile radius of the job site, and provide a 24 hour, seven day a week service.
4. The manufacturer shall present to the Owner, at the completion of the project, a one year maintenance contract, to provide a regularly schedule preventive maintenance program, and a Fire Alarm Inspection and Testing Agreement.

B. Equipment:

1. The clock and program system shall be a SET/8100 Series as manufactured by the Standard Electric Time Corporation Model Number SET/8100 and constitute the design, type and quality of the equipment to be furnished. Any requests for substitution shall be submitted by the Contractor in writing so that they will be received by the Architect not later than 35 days after the award of the contract. Requests for substitution shall include product data sheets, system wiring diagrams, evidence of UL listing and other information that may be requested to determine if the request for substitution is equal in all respects to the specified equipment. The SET/8100 continuous run master clock shall be the SET/8100 series employing microprocessor and intergrated low-power solid state control plug-in printed circuit boards. All IC's shall be socketed for serviceability and trouble shooting. The sealed battery-powered crystal controlled reserve shall maintain the time base of the master clock during commercial power failures for a period of up to 100 hours. A constant trickle charge shall be provided by the master clock to maintain the battery at peak reserve power. Circuitry shall be provided within the master clock to correct the minute hand of all system secondaries within one hour of restoration of power. All system secondary clocks will be synchronized twice daily to the master clock time base. Daylight Savings and Leap Year corrections shall be fully automatic without need for manual initiation by means of a switch or time adjustments. Corrections for Daylight Savings

and Leap Year not fully automatic and requiring visitations to the job site for these annual adjustments are not acceptable.

2. The SET/8100 Master Time Programmer shall provide synchronization of all secondary clocks in the system. Two independent clock circuits are controlled from the master, thus providing expansion flexibility. The microprocessor shall incorporate a 365 day programmer which will automatically account for leap years and advances or retard of both master and secondary clocks for daylight savings time. Programming shall be accomplished by using the 16 push-button multifunction keyboard on the face of the Master Clock. A key switch shall protect unauthorized access of the program and shall be keyed the same as the cabinet. Program tapes, bars, ROMS or special equipment at additional costs for programming the master clock are not acceptable. The programability shall be completely consumer programability with easy to read pictorial instructions posted inside the door of the master clock. Each program circuit shall be capable of 250 program events, AM or PM, and the event duration shall be adjustable from 1 second to 11 seconds per circuit of program.

C. Controls: The following controls shall be provided on the front of the unit.

1. Individual manual momentary slide switches for each bell circuit.
2. An all-call feature for activation of all bell circuits simultaneously.
3. Manual wall clock correction and power switches for manual operation of secondary wall clocks.
4. LED indication for day of the week.
5. LED indication for AM or PM.
6. LED indication for Holiday status.
7. SCAN capability for the review of any circuit and its contents.
8. 16 pushbutton multifunction keyboard with key lock switch for access protection.

- D. Serviceability: Control circuitry shall be mounted on plug-in printed circuit board cards which may be easily removed for quick replacement and testing.
- E. Secondary Clocks:
1. Furnish and install secondary clocks as shown on the plans and as specified herein. Clock case color shall be metal with a textured aluminum finish. Dials shall be white with black Arabic numerals and markers. The hour and minute hands shall be black with the sweep second hand finished in red.
 2. The clock movement shall have a protective dust cover and come equipped with a ten inch extension cable with molded connecting plug. A matching receptacle having eight inch color coded leads shall be supplied with each clock.
 3. Service area clocks shall be Model Number J100051, 12" round, flush mount wall clock. Office area clocks shall be model Number J100050, 10" round flush mount wall clock. Back box shall be Model Number 105232 Universal back box, flush mount.
- F. Program Signals: The Electrical Contractor shall install the program clock as shown on the plans and wire into the signal distribution panel (bell control board) as indicated on the manufacturer's drawing. Provide audible signal chimes in office only, and buzzer in all other locations, where shown on the plans, as per schedule provided by the Owner.
- G. Wiring and Installation:
1. All wiring for signal shall be uniformly color coded throughout the transposition of colors will not be permitted. Leave at least 18" free end at all outlets for connections to the equipment and at least 36" free ends at all terminal cabinets.
 2. All wiring in terminal cabinets shall be neatly formed, laced and made up on terminal blocks. Wirenut type connections are not acceptable. Contractor shall follow the requirements of the equipment manufacturer in making up wiring terminal cabinets and shall secure information relative to forming lacing, grouping and tagging conductors before proceeding with the make-up of terminal cabinets. Color coding shall be as follows:

Clocks: 1#12 RED, 1#12 BLK, 1#12 WHT.

Chimes &

Buzzer: 1#12 YEL., (Common). 1#12 BLU. per bell to
bell control board and terminal cabinets.

3. Wiring shall consist of two (2) #12 wires common to all secondary clocks from the master clock and three (3) #12 wires (one GRN, GROUND) to the master clock from an unswitched power source and protected by a 20 amp circuit breaker. Source circuit shall be discrete and shall not share loads with wall plug receptacle and or appliances which may cause inductive AC interference. All wiring shall be in accordance with the National Electrical Code.
 4. The manufacturer's authorized representative shall perform a quality inspection of the final installation and in the presence of the Electrical Contractor and Engineer shall perform a complete functional test of the system.
- H. Guarantee: All components, parts, and assemblies supplied by the manufacturer shall be guaranteed against defects in materials and workmanship for a period of 12 months commencing upon start-up and beneficial use, provided such defects are not caused by misuse, abuse, unauthorized tampering or modification or acts of God. Warranty service shall be provided by a qualified factory-trained representative of the equipment manufacturer during normal working hours Monday through Friday excluding holidays. The representative shall be based in a fully staffed branch office located within a reasonable distance from the job site and an adequate supply of repair parts shall be maintained in the branch office. The manufacturer shall not be responsible for consequential damages. The manufacturer's statement of warranty shall be included in the submittals.

1.09 Closed Circuit Television System:

- A. General: Furnish and install a complete and operable closed circuit television system as herein described and shown on the drawings.
- B. Equipment:
 1. Cameras shall be RCA TC 2000 Series with V11-110 lenses with mounting arms V 17UM in an environmental housing V84-00H with blower and thermostat assembly Model V8400 HV.

2. Receiver sets shall be RCA TC-1109 (9" desktop monitor).
3. Cabling shall be coaxial Belden Type 8281.
4. Cabling:
 - a. All cabling shall be run in conduit.
 - b. Provide bushed single hole cover plates at outlets.
5. Guarantee: All components, parts and assemblies shall be guaranteed against defects in materials and workmanship for a period of 12 months commencing upon start-up.
6. Testing: The system shall be tested and demonstrated to the Owner prior to acceptance.

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