



CITY OF SACRAMENTO

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CITY OF SACRAMENTO

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CITY MANAGER'S OFFICE
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JUL 28 1982
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J.F. VAROZZA
CITY ENGINEER
M.H. JOHNSON
ASSISTANT CITY ENGINEER

DEPARTMENT OF ENGINEERING
915 I STREET
CITY HALL ROOM 207
SACRAMENTO, CALIFORNIA 95814
TELEPHONE (916) 449-5281

July 28, 1982

City Council
Sacramento, California

Honorable Members in Session:

SUBJECT: Approval of Plans and Specifications for the Garden Waste Processing Facility

SUMMARY:

Attached is a report to the Budget and Finance Committee recommending that staff be directed to forward plans and specifications for the Garden Waste Processing Facility to the City Council for approval. The Budget and Finance Committee approved staff's recommendation at their August 3, 1982 meeting.

RECOMMENDATION:

It is recommended that the plans and specifications be approved and that bids be received on August 24, 1982.

Respectfully submitted,

J. F. Varozza
J. F. VAROZZA
City Engineer

Recommendation Approved:

Walter J. Slips
Walter J. Slips, City Manager

F/Ref.
C.C. 1311

14-B-010-30-0

APPROVED
BY THE CITY COUNCIL

AUG -3 1982

OFFICE OF THE
CITY CLERK

August 3, 1982
All Districts



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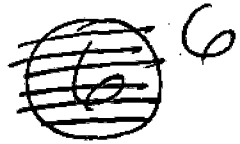
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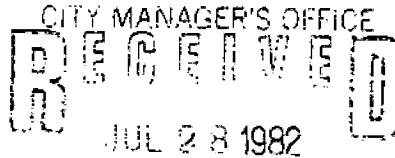
CITY OF SACRAMENTO



DEPARTMENT OF ENGINEERING

915 I STREET
CITY HALL ROOM 207

SACRAMENTO, CALIFORNIA 95814
TELEPHONE (916) 449-5281



J.F. VAROZZA
CITY ENGINEER
M.H. JOHNSON
ASSISTANT CITY ENGINEER

July 28, 1982

Budget and Finance Committee
Sacramento, California

Honorable Members in Session:

SUBJECT: Approval of Plans and Specifications for the Garden Waste
Processing Facility

SUMMARY:

The City Engineer's office has prepared plans and specifications for the subject project. Copy of said plans and specifications has been forwarded to the City Clerk and approval is recommended.

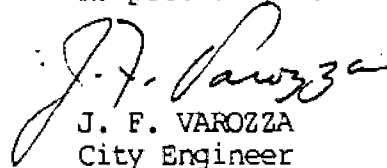
FINANCIAL:

The subject project is not budgeted at the present time. The current estimated construction cost is \$1,300,000.00. The budgetary recommendation, including source of funds, will be made upon receipt of bids.

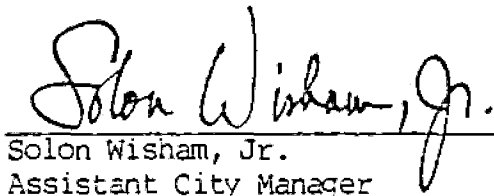
RECOMMENDATION:

The City Engineer recommends that the Budget and Finance Committee approve the subject project and forward the report to the full City Council for approval of the plans and specifications.

Respectfully submitted,


J. F. VAROZZA
City Engineer

Recommendation Approved:


Solon Wisham, Jr.
Assistant City Manager





CITY OF SACRAMENTO

DEPARTMENT OF ENGINEERING

915 I STREET
CITY HALL ROOM 207

SACRAMENTO, CALIFORNIA 95814
TELEPHONE (916) 449-5281

J.F. VAROZZA
CITY ENGINEER
M.H. JOHNSON
ASSISTANT CITY ENGINEER

F/Ref.
C.C. 1311

August 10, 1982

Gentlemen:

Enclosed herewith is Addendum No. 1 to the plans and specifications for the Garden Waste Processing Facility.

Please attach this addendum to your bid and acknowledge acceptance by noting on the proposal form.

Very truly yours,

J. F. VAROZZA
City Engineer

JFV:ls



ADDENDUM NO. 1

August 10, 1982

GARDEN WASTE PROCESSING FACILITY

This addendum is applicable to the work designated herein and shall be a part of and be included in the Contract. The Contractor shall acknowledge his acceptance of this addendum by writing the number designation of the addendum on the Proposal Form.

NOTE:

The Notice to Contractors should read as follows:

Sealed Proposals will be received by the City Clerk of the City of Sacramento at the office of the City Clerk, Room 203, City Hall, located on I Street between 9th and 10th Streets, up to the hour of 10:30 a.m. on August 24, 1982 and opened at 10:30 a.m., or as soon thereafter as business allows, in the Council Chambers, City Hall for the construction of:

GARDEN WASTE PROCESSING FACILITY

as set forth in the Construction Documents adopted August 3, 1982 by the City of Sacramento.





CITY OF SACRAMENTO

DEPARTMENT OF ENGINEERING

915 I STREET
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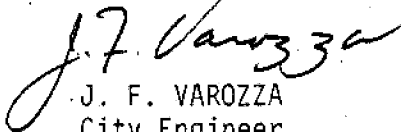
August 11, 1982

Gentlemen:

Enclosed herewith is Addendum No. 2 to the plans and specifications for the Garden Waste Processing Facility.

Please attach this addendum to your bid and acknowledge acceptance by noting on the proposal form.

Very truly yours,


J. F. VAROZZA
City Engineer

JFV:ls



ADDENDUM NO. 2

August 11, 1982

GARDEN WASTE PROCESSING FACILITY

This addendum is applicable to the work designated herein and shall be a part of and be included in the Contract. The Contractor shall acknowledge his acceptance of this addendum by writing the number designation of the addendum on the Proposal Form.

NOTE: Replacement Sheet Drawings for Construction Plans of Garden Waste Processing Facility

1. Replace old Sheet 5 of 35 (Drawing No. G202) with addendum Sheet 5 of 35 (Drawing No. G202). Title: General Paving and Grading Site Plan and Sections.
2. Replace old Sheet 6 of 35 (Drawing No. A101) with addendum Sheet 6 of 35 (Drawing No. A101). Title: Floor Plan, Typical Sections, and Schedules.
3. Replace old Sheet 11 of 35 (Drawing No. S101) with addendum Sheet 11 of 35 (Drawing No. S101). Title: Office Building Plans, Sections, and Details.
4. Replace old Sheet 18 of 35 (Drawing No. M101) with addendum Sheet 18 of 35 (Drawing No. M101). Title: Office Building Utility and Drainage System Plans and Equipment List.
5. Replace old Sheet 24 of 35 (Drawing No. H101) with addendum Sheet 24 of 35 (Drawing No. H101). Title: Plan, Sections and Equipment List.
6. Replace old Sheet 32 of 35 (Drawing No. E104) with addendum Sheet 32 of 35 (Drawing No. E104). Title: Office Building Conduit and Lighting Plan.



**CITY OF SACRAMENTO
DIVISION OF WASTE REMOVAL
SACRAMENTO, CALIFORNIA**

**PROJECT MANUAL
FOR THE CONSTRUCTION OF**

GARDEN WASTE PROCESSING FACILITY

VOLUME 1 OF 2

**PART A-BIDDING AND CONTRACT DOCUMENTS
PART B-TECHNICAL SPECIFICATIONS**

JULY 1982

APPROVED
BY THE CITY COUNCIL

AUG - 3 1982

OFFICE OF THE
CITY CLERK

**BC BROWN AND CALDWELL
CONSULTING ENGINEERS
WALNUT CREEK, CALIFORNIA**

**CITY OF SACRAMENTO
DIVISION OF WASTE REMOVAL
SACRAMENTO, CALIFORNIA**

**PROJECT MANUAL
FOR THE CONSTRUCTION OF**

GARDEN WASTE PROCESSING FACILITY

VOLUME 1 OF 2

**PART A-BIDDING AND CONTRACT DOCUMENTS
PART B-TECHNICAL SPECIFICATIONS**

JULY 1982

 **BROWN AND CALDWELL
CONSULTING ENGINEERS
WALNUT CREEK, CALIFORNIA**

PART A
BIDDING AND CONTRACT REQUIREMENTS

NOTICE TO CONTRACTORS

Sealed Proposals will be received by the City Clerk of the City of Sacramento at the office of the City Clerk, Room 203, City Hall, located on I Street between 9th and 10th Streets, up to the hour of 10:30 a.m. on _____ and opened at 10:30 a.m., or as soon thereafter as business allows, in the Council Chambers, City Hall for construction of:

GARDEN WASTE PROCESSING FACILITY

as set forth in the Construction Documents adopted _____
by the City of Sacramento.

All such proposals received and any work performed thereunder must comply with the requirements of Chapter 58 of the Sacramento City Code (Ordinance No. 3129, Fourth Series).

Non-refundable plan deposite of \$25.00 per set is required. Bid sets will be available at the Office of the City Clerk, Sacramento, California.

Bids must be submitted on the Proposal-Bid Forms and accompanying documents supplied by the City to the prospective bidders and enclosed in an envelope marked "Sealed Proposal for Garden Waste Processing Facility." Copies of the Sealed Proposal Forms and accompanying documents are available at the office of the City Clerk, 915 I Street, Room 203, Sacramento, California, for a non-refundable deposit of \$25.00 per set. Check should be made out to the City of Sacramento.

All contractors, subcontractors and all concerned must comply with the rates of wages established by the Director of Industrial Relations under provisions of Sections 1770 and 1773 of the Labor Code of the State of California, a copy of which is on file in the office of the City Clerk; or such other rate of wages as may hereafter be established by the Director of the Department of Industrial Relations in compliance with Section 1770 of the Labor Code of the State of California.

Pursuant to Government Code Section 4590, any contract awarded pursuant to this invitation for bid shall contain a provision permitting the substitution of securities for any moneys withheld to ensure performance under the contract. The terms of such provisions shall be according to the requirements of Government Code Section 4590.

Each bid must be accompanied by security consisting only of cash, California Bank Cashier's Check, certified check, California Bank Money Order, or bid bond made payable to the order of the City Director of Finance in the sum of ten percent (10%) of the sum of the proposal.

The right to reject any and all bids or to waive any informality in any bid received is reserved by the City Council.

LORRAINE MAGANA
CITY CLERK

Sacramento, California

To be considered, Proposals must be made in accordance with these Instructions to Bidders.

DOCUMENTS

Bidders may obtain Drawings and Project Manual from the Office of the City Clerk, Room 203, City Hall, "I" Street between 9th and 10th Streets, Sacramento, California.

Drawings and Project Manual may be examined at the City Clerk's office and at the following locations:

Daily Construction Newsletter, 4536 Auburn Blvd., Sacramento, CA 95841
Sacramento Builders' Exchange, 1331 T Street, Sacramento, CA 95807
Builders Exchange of Stockton, 7500 Northwest Lane, Stockton, CA 95204
Builders Exchange of Alameda County, 3055 Alvarado Street, San Leandro, CA 94577
Daily Pacific Builder, 2450 17th Street, San Francisco, CA 94119
Dodge-Scan, 2450 17th Street, San Francisco, CA 94119
San Francisco Builders Exchange, 850 S. Van Ness, San Francisco, CA 94110
Peninsula Builders Exchange, 735 Industrial Way, San Carlos, CA 94070

EXAMINATION

The bidder is required to examine carefully the site of the proposed work and the Contract Documents, including the Drawings and Project Manual. The submission of a Proposal shall be prima facie evidence that the bidder has made such an examination and has satisfied himself concerning the character, quality, and quantity of all work to be done and materials to be furnished.

QUESTIONS AND RESOLUTION OF DISCREPANCIES

Submit all questions about the Drawings and Project Manual to the office of the Architect:

Brown and Caldwell
1501 North Broadway
Walnut Creek, CA 94596

Written replies will be issued to all prime bidders on Addenda to the Drawings and Project Manual and will become a part of the Contract. The City, City Engineer, and Architect will not be responsible for oral clarifications. Questions received less than 120 hours before the bid opening cannot be answered in writing.

BASIS OF BID

No segregated proposals or assignments will be considered.

Sacramento, California

PREPARATIONS OF PROPOSAL

Proposals must be submitted on the unaltered forms furnished by the City, a copy of which is bound with the Project Manual. The Proposal must be in ink which is clearly legible and must be properly executed and signed. Signatures of all persons signing must be in longhand, with name typed below signature. Proposals submitted by corporation must be signed by a duly authorized officer, and the name of the State of incorporation must be indicated. Numbers shall be stated both in writing and in figures.

PROPOSAL GUARANTEE

The proposal shall be accompanied by a corporate surety bond in the form hereinafter set forth, or by a certified check on a solvent bank of the State of California, made payable on sight to the Finance Director, the City of Sacramento, the amount of which shall be not less than 10% of the base or lump sum bid for the proposed work. No proposal will be considered unless accompanied by such bond or check.

When proposals have been received and reviewed by the City, all bonds and checks will be returned to the respective bidders except those submitted by the two lowest responsible bidders, which checks will be returned after the Contract has been awarded and subsequently the successful bidder has executed the agreement and filed satisfactory bonds and proof of insurance as specified, or after all proposals have been rejected if no award is made. The proceeds of such bond or check will be retained by the City as damages should such bidder fail to enter into said contract within the specified time, unless the City, by resolution, approves the return of said bond or check.

PERFORMANCE AND PAYMENT BONDS

The successful bidder will be required to furnish a Payment Bond in the amount equal to one hundred percent (100%) of the Contract Price, and a Faithful Performance Bond in an amount equal to one hundred percent (100%) of the Contract Price. Said bonds to be secured from a surety company satisfactory to the City of Sacramento and shall be furnished to the City or Sacramento simultaneously with delivery of the signed contract.

SUBCONTRACTORS

Names of subcontractors that the Bidder proposes to use on the work must be listed in the space provided in the Sub-Bidder Form, pursuant to the provisions of Sections 4101 to 4107, inclusive, of the Government Code of the State of California.

These sections require, among other things, that the Contractor, in submitting his bid, must show the following:

- A. The name and location of the place of business of each subcontractor who will perform work or labor or render service to the Contractor in or about the construction of the work or improvement in an amount in excess of 1/2 of 1% of the prime Contractor's total bid.
- B. The portion of the work which will be done by each such subcontractor. The Contractor shall list only one subcontractor for each portion as is defined by the Contractor in his bid. If a Contractor fails to specify a subcontractor or if a Contractor specifies more than one subcontractor for the same portion of the work to be performed under the Contract in excess of 1/2 of 1% of the Contractor's total bid, he agrees to perform that portion himself.

OPENING OF BIDS

Bids will be opened and read aloud publicly at the time and place set forth in the advertised "Notice to Contractors". Bidders or their authorized representatives may be present at the opening of bids.

AWARD OF CONTRACT

In accordance with Section 58.102 of the City Code, the Council shall at any time within sixty (60) days after the date set for the opening of bids, either award the Contract or reject all bids.

EXECUTION OF CONTRACT

No Contract is binding upon the City until it has been executed on behalf of the City by the City Manager, attested by the City Clerk.

The individual, firm, partnership, joint venture, or corporation to whom or to which the Contract has been awarded shall sign the necessary Agreements entering into the Contract and shall furnish the surety bonds required within ten (10) calendar days after the award of the Contract by the City Council. A sample form of Agreement is included with the Project Manual.

Failure to comply with any of the requirements of these Instructions to Bidders, to execute the Contract as prescribed, or to furnish security as set forth, might be cause for the annulment of the award. In the event of an annulment of the award because of such failure to comply by the Bidder, the Proposal Guarantee shall become the property of the City, not as a penalty, but as liquidated damages. Award may then be made to the next best qualified bidder, or the work may be readvertised, as determined by the Council.

The successful bidder shall not, without the written consent of the subcontractor listed and the City Engineer, substitute any person as subcontractor in place of the subcontractor listed in the Sub-Bidder Form.

Sacramento, California

DELIVERY OF PROPOSAL

The Proposal must be delivered to the City Clerk by the time set forth in the Notice to Contractors. The proposal must be enclosed in the envelope provided by the City Clerk for that purpose. The envelope must be marked on the outside as indicated in the Notice to Contractors, and the envelope must be sealed.

REJECTION OF PROPOSALS

The City reserves the right to reject any or all bids.

Proposals containing any omissions, alterations of form, additions, or conditions not called for, conditional or alternate bids unless called for, bids or proposals, otherwise regular, which are not accompanied by a Proposal guarantee, will be considered irregular and may be rejected. The City of Sacramento reserves the right to waive technicalities as to changes, alterations, or reservations, and make the award to the best interest of the City.

BIDDER'S QUALIFICATIONS

Every bidder must hold a valid Contractor's license and the license must be registered in exactly the same individual, co-partnership, or corporation as that making the bid. The Contractor's license must be of a class which permits its holder to do the type of work contemplated in the project as of the date the Proposal is submitted, and such license must be maintained for the duration of the work.

The bidder shall indicate his license number in the space provided for that purpose on the Proposal Form.

LAWS AND REGULATIONS

All applicable Federal and State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

END OF INSTRUCTIONS TO BIDDERS

TO THE HONORABLE CITY COUNCIL
SACRAMENTO, CALIFORNIA:

In compliance with the advertised Notice to Contractors and Instructions to Bidders, the undersigned hereby proposes to furnish all required labor, materials, transportations, equipment, services, taxes and incidentals required to construct the

GARDEN WASTE PROCESSING FACILITY

in the City and County of Sacramento, California.

The Work is to be done in strict conformity with the Drawings and Project Manual now on file in the office of the City Clerk, for the following lump sum:

_____ (\$ _____ DOLLARS).

If awarded the contract, the undersigned agrees to sign said contract and furnish the necessary surety bonds within ten (10) days after notice of the award of said contract, and to begin work within fifteen (15) days after the date of the signing of the contract by the Contractor and the City.

It is understood that this bid is based upon completion of the Work within a period of three hundred sixty five (365) calendar days, commencing on the date set forth in the written "Notice to Proceed" issued by the City of the Contractor.

The undersigned has examined the location of the proposed Work and is familiar with the Drawings and Project Manual as well as the local conditions at the place where the Work is to be done, and is familiar with the liquidated damages provisions of the Supplementary Conditions.

The undersigned has checked carefully all of the foregoing figures and understands that the City of Sacramento will not be responsible for any error or omissions on the part of the undersigned in making up this bid.

Enclosed is bid security as required consisting of a bidder's bond or certified check for not less than 10% of the amount bid.

The undersigned agrees that all addenda received and acknowledged herein shall become a part of and be included in this bid. This bid includes the following addenda:

- Add. # _____ Date _____
- Add. # _____ Date _____
- Add. # _____ Date _____

NOTE: State whether your concern is a corporation, a co-partnership, private individual, or individuals doing business under a firm name.

If the bidder is a corporation, the bid must be executed in the name of the corporation and must be signed by a duly authorized officer of the corporation. If the bidder is a corporation, fill in the following sentence:

"This Corporation is organized and existing under and by virtue of the laws of the State of _____."

If the bidder is a partnership, the bid must be executed in the name of the partnership and one of the partners must subscribe his signature thereto as the authorized representative of the partnership.

AMOUNT OF BID DEPOSIT ENCLOSED:

(\$ _____) not less than 10% of amount bid

- _____ CERTIFIED CHECK
- _____ CASHIER'S CHECK
- _____ BID BOND
- _____ MONEY ORDER
- _____ CASH

CONTRACTOR:

By _____
(Signature)

Title _____

Address _____

Telephone No. _____

Date _____

Valid Contractor's License No. _____
is held by the Bidder.

Sacramento, California

KNOW ALL MEN BY THESE PRESENTS,

That we, _____

as Principal, and _____

a corporation duly organized under the laws of the State of _____,
and duly licensed to become sole surety on bonds required or authorized by the
State of California, as Surety, are held and firmly bound unto the City of
Sacramento, hereinafter called the City, in the penal sum of ten percent (10%)
of the (BASE OR LUMP SUM) bid of the Principal above named, submitted by said
Principal to the City for the work described below, for the payment of which
sum in lawful money of the United States, well and truly to be made, we bind
ourselves, our heirs, executors, administrators and successors, jointly and
severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH

That whereas the Principal has submitted the above-mentioned bid to the City
for certain construction specifically described as follows for which bids are
to be opened in the Council Chambers at City Hall, Sacramento, California, on
_____, for

GARDEN WASTE PROCESSING FACILITY

NOW, THEREFORE, if the aforesaid Principal is awarded the contract and within
the time and manner required under the Contract Documents, enters into a written
contract, in the prescribed form, in accordance with the bid, and files the two
(2) bonds with the City, one to guarantee faithful performance and the other to
guarantee payment for labor and materials, and files the required insurance
policies with the City, all as required by the Contract Documents or by law,
then the obligation shall be null and void; otherwise it shall be and remain
in full force and virtue.

In the event suit is brought upon this bond by the Obligee and judgment is
recovered, the Surety shall pay all costs incurred by the Obligee in such suit,
including a reasonable attorney's fee to be fixed by the court, which sums shall
be additional to the principal amount of this bond.

Sacramento, California

BIDDER'S BOND

Page 2

IN WITNESS WHEREOF we have hereunto set our hands and seals this _____
day of _____, 19____.

(seal)

PRINCIPAL

(seal)

SURETY

SPECIAL PROVISIONS

PART 1 - GENERAL INFORMATION

1.0 DEFINITIONS OF WORDS AND TERMS

Where used in the project manual, the following words and terms shall have the meanings indicated. The meanings shall be applicable to the singular, plural, masculine and feminine of the words and terms.

Construction Manager. The person designated, in writing, by the Owner to act as its representative at the construction site and to perform construction inspection services and administrative functions relating to this contract. Initial contact by the Contractor with the Owner shall be through the Construction Manager. Construction Manager and Engineer are interchangeable terms in this project manual.

Contract. The writings and drawings embodying the legally binding obligations between the Owner and the Contractor for completion of the work described in the project manual. The contract includes:

- Advertisement for Bids
- Information for Bidders
- Bid Documents
- Bonds
- Project Manual
- Agreement
- Notice of Award
- Notice to Proceed
- Change Orders
- Directives
- Addenda

Contract Drawings. The drawings included in the project manual plus those prepared by the Owner and the Contractor pursuant to the terms of the contract. They include:

1. Drawings in Part C of the project manual.
2. Modifying drawings issued by addenda.
3. Drawings submitted by the Contractor with his bids and accepted by the Owner as a proposed qualification and amendment.

1.0

4. Drawings submitted by the Contractor during the progress of the work and accepted by the Owner either as attachments to change orders or as nonmodifying supplements to drawings in Part C and drawings issued by addenda.
5. Drawings submitted by the Owner to the Contractor during the progress of the work either as attachments to the change orders or as explanatory supplements to drawings in Part C and drawings issued by addenda.

The words contract drawings and plans are interchangeable terms in this project manual.

Day. Calendar day.

Project Manual. Those contract documents which are bound into one or more volumes prior to bidding.

2.0 STANDARD SPECIFICATIONS

Sections one through eight of the Standard Specifications, City of Sacramento, May 1981, are part of this project manual. The Contractor shall comply with the requirements of these standard specifications.

END OF SECTION

SUB-BIDDER FORM

In accordance with Sections 4101 and 4107, inclusive, of the Government Code of the State of California, as amended, the following information is submitted concerning sub-bidders:

NAME SUB-BIDDER	ADDRESS SHOP, MILL OR OFFICE	CLASS OF WORK	PORTION OF WORK TO BE DONE

FOLLOWING FORMS TO BE FILLED OUT AND SIGNED

ONLY

IF AWARDED CONTRACT

WORKMEN'S COMPENSATION INSURANCE CERTIFICATION

TO THE CITY OF SACRAMENTO:

The undersigned does hereby certify that he is aware of the provisions of Section 3700 et seq. of the Labor Code which require every employer to be insured against liability for workmen's compensation claims or to undertake self-insurance in accordance with the provisions of said Code, and that he will comply with such provisions before commencing the performance of the work on this contract.

Bidder

By _____

Title _____

Address _____

Date _____

PLEASE READ CAREFULLY BEFORE SIGNING

To be signed by authorized corporate officer or partner or individual submitting the bid. If bidder is: (example)

1. An individual using a firm name, sign: "John Doe, an individual doing business as Blank Company."
2. An individual doing business under his own name, sign: your name only.
3. A co-partnership, sign: "John Doe and Richard Doe, co-partners doing business as Blank Company, by, John Doe, Co-Partner."
4. A corporation, sign: "Blank Company, by John Doe, Secretary." (or other title)

GUARANTEE

We hereby guarantee the

.....
which we propose to install in the City of Sacramento for one (1) year in accordance with the guarantee required in the specifications. We agree to repair or replace any or all such work, together with all or any other work which may be displaced in so doing, that may be proven defective in workmanship or material within the period from the date of acceptance without expense whatsoever to the City, ordinary wear and tear and unusual abuse or neglect excepted.

In the event of our failure to comply with the above mentioned conditions within five (5) days time after being notified in writing, we collectively or separately, do hereby authorize the City to proceed to have the defects repaired and made good at our expense and will pay the costs and damages therefor immediately upon demand.

Signed:

.....
.....
.....

Dated:

.....

AGREEMENT

THIS AGREEMENT, dated for identification as of _____, 19____,
between the CITY OF SACRAMENTO, a municipal corporation, (hereinafter called "City"),
and _____

(hereinafter called the "Contractor").

The parties hereto mutually agree to the terms and conditions set forth herein.

1. CONTRACT DOCUMENTS

Each of the items hereinafter referred to is incorporated herein by reference as if set forth in full in this contract.

Work called for in any one Contract Document and not mentioned in another is to be performed and executed as if mentioned in all Contract Documents. The table of contents, titles and headings contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect or limit the interpretations of the provisions to which they refer.

The Contract Documents, sometimes also referred to as "the Contract", consist of the Notice to Contractors, the completed Proposal Form submitted by Contractor to whom the Contract is awarded, the Instructions to Bidders insofar as they relate to events which occur or actions to be taken after the submission of the Proposal, this Agreement, the Standard Specifications, the Special Provisions, Plans and Technical Specifications, the drawings and other data and all developments thereof prepared by City pursuant to the Contract, and any modifications of any of the foregoing in the form of Addenda or otherwise effected in accordance with the terms of the Contract.

The Standard Specifications shall mean and refer to the current Standard Specifications of the City of Sacramento which are incorporated herein by this reference as if set forth in full at this place.

2. DEFINITIONS

Unless otherwise specifically provided herein, all words and phrases defined in the Standard Specifications shall have the same meaning and intent in this Agreement.

3. AGREEMENT CONTROLS

In the event of a conflict between the terms and conditions as set forth in this Agreement and the terms and conditions set forth in other Contract Documents, the terms and Conditions set forth in this Agreement shall prevail.

4. SCOPE OF CONTRACT

Contractor agrees to furnish all tools, equipment, apparatus, facilities, labor and material and transportation necessary to perform and complete in a good and workmanlike manner to the satisfaction of City, all the work called for, and in the manner designated in, and in strict conformity with the Contract Documents entitled:

including the following alternative bid items described in the Proposal Form:

5. CONTRACT AMOUNT AND PAYMENTS

City agrees to pay and Contractor agrees to accept, in full payment for the above work, the sum computed in accordance with the actual amount of each item of work performed or material furnished, at the unit price which Contractor bid for each such item in his Proposal Form, said unit price to be determined as provided in the Standard Specifications.

6. PROGRESS AND FINAL PAYMENTS

Subject to the terms and conditions of the Contract, City shall cause payments to be made upon demand of Contractor as follows:

- (A) On the first of the month, Contractor shall present to the City Engineer a statement showing the amount of labor and materials incorporated in the work during the preceding month; the City Engineer shall inspect the statement and, if the City Engineer approves the statement, shall issue a certificate for ninety percent (90%) of the amount it shall find to be due.
- (B) No inaccuracy or error in said monthly estimates shall operate to release Contractor or Surety from damages arising from such work or from enforcement of each and every provision of the Contract Documents, and City shall have the right subsequently to correct any error made in any estimate for payment.
- (C) Contractor shall not be paid for any defective or improper work.
- (D) City shall pay the remaining ten percent (10%) of the value of the work done under this contract, if unencumbered, thirty-five (35) days after final completion and acceptance of work by City. Acceptance by Contractor of said final payment shall constitute a waiver of all claims against City arising under the Contract Document.

7. RETENTION OF SUMS CHARGED AGAINST CONTRACTOR

When, under the provisions of this contract, City shall charge any sum of money against Contractor, City shall deduct and retain the amount of such charge from the amount of the next succeeding progress estimate, or from any other moneys due or that may become due Contractor from City. If, on completion or termination of the Contract, sums due Contractor are insufficient to pay City's charges against him, City shall have the right to recover the balance from Contractor or his sureties.

8. COMMENCEMENT AND PROSECUTION OF WORK

Contractor shall commence the work on or before ten (10) calendar days from and after receipt of written Notice to Proceed from City to Contractor and will diligently prosecute the work to final completion. The phrase "commence the work" means to engage in a continuous program on-site including, but not limited to, site clearance, grading, dredging, land filling and the fabrication, erection, or installation of the work. Said Notice to Proceed shall be issued following execution of the Agreement and the filing by Contractor of the required bonds and proof of insurance. The continuous prosecution of work by Contractor shall be subject only to Excusable Delays as defined in this Agreement.

9. TIME OF COMPLETION

The entire work shall be brought to completion in the manner provided for in the Contract Documents on or before _____, (____) calendar days (hereinafter called the "Completion Date") from and after the receipt by Contractor of the Notice to Proceed unless extensions of time are granted in accordance with the Contract Documents.

Failure to complete the work by the Competition Date and in the manner provided for by the Contract Documents shall subject Contractor to liquidated damages as hereinafter provided in this Agreement. Time is and shall be of the essence in these Contract Documents.

10. PAYMENTS DO NOT IMPLY ACCEPTANCE OF WORK

The payment of any progress payment, or the acceptance thereof by Contractor, shall not constitute acceptance of the work or any portion thereof and shall in no way reduce the liability of Contractor to replace unsatisfactory work or material, though the unsatisfactory character of such work or material may not have been apparent or detected at the time such payment was made.

11. ACCEPTANCE NOT RELEASE

Contractor shall correct immediately any unfaithful or imperfect work which may be discovered before final acceptance of the entire work. Any unsatisfactory materials shall be rejected, notwithstanding that they may have been overlooked by the proper inspector. The inspection of the work, or any part thereof, shall not relieve Contractor of any of his obligations to perform satisfactory work as herein prescribed.

Failure or neglect on the part of City or any of its authorized agents to condemn or reject bad or inferior work or materials shall not be construed to imply an acceptance of such work or materials if such becomes evident at any time prior to final acceptance of the entire work or all materials, nor shall such failure be construed as barring City at any subsequent time from recovering damages or of such a sum of money as may be required to build anew all portions of the work in which fraud was practiced or improper materials used whenever City may discover the same.

12. RELEASE

If requested to do so by City, at the time of final payment, as a condition precedent to final payment, Contractor and each assignee under any assignment in effect at the time of final payment shall execute and deliver a release in form and substance satisfactory to and containing such exemptions as may be found appropriate by City which shall discharge City, its officers, agents and employees of and from all liability, obligations and claims arising under this contract.

13. CITY'S RIGHT TO TAKE POSSESSION OF THE WORK
IN WHOLE OR IN PART

The City of Sacramento shall have the right at any time to enter upon the work and perform work not covered by this Contract, or to occupy and use a portion of the work, prior to the date of the final acceptance of the work as a whole, without in any way relieving Contractor of any obligations under this Contract.

Such use or occupation of the work shall not be construed as an acceptance of any portion of the work under this Contract.

14. NO WAIVER OF REMEDIES

Neither the inspection by City or its agents, nor any order or certificate for the payment of money, nor any payment for, nor acceptance of the whole or any part of the work by City, nor any extensions of time, nor any position taken by City or its agents shall operate as a waiver of any provision of this Agreement or of any power herein reserved to City or any right to damages herein provided, nor shall any waiver of any breach of this Agreement be held to be a waiver of any other or subsequent breach. All remedies provided in this Agreement shall be taken and construed as cumulative; that is, in addition to each and every other remedy herein provided, and City shall have any and all equitable and legal remedies which it would in any case have.

15. GUARANTEE

Except as otherwise expressly provided in the Specifications, and excepting only items of routine maintenance, ordinary wear and tear and unusual abuse or neglect, Contractor guarantees all work executed by him and all supplies, materials and devices of whatsoever nature incorporated in, or attached to the work, or otherwise delivered to City as a part of the work pursuant to the Contract, to be absolutely free of all defects of workmanship and materials for a period of one year after final acceptance of the entire work by the City of Sacramento. Contractor shall repair or replace any or all such work or material, together with all or any other work or material which may be displaced or damaged in so doing, that may prove defective in workmanship or material within said one year guarantee period without expense or charge of any nature whatsoever to City.

In the event that Contractor shall fail to comply with the conditions of the foregoing guarantee within ten (10) days time, after being notified of the defect in writing, City shall have the right, but shall not be obligated to repair, or obtain the repair of, the defect and Contractor shall pay to City on demand all costs and expense of such repair. Notwithstanding anything herein to the contrary, in the event that any defect in workmanship or material covered by the foregoing guarantee results in a condition which constitutes an immediate hazard to the health or safety, or any property interest, or any person, City shall have the right to immediately repair, or cause to be repaired, such defect, and Contractor shall pay to City on demand all costs and expense of such repair. The foregoing statement relating to hazards to health, safety or property shall be deemed to include either temporary or permanent repairs which may be required as determined in the sole discretion and judgment of City.

16. DETERMINATION OF DAMAGES

The actual fact of the occurrence of damages and the actual amount of the damages which City would suffer if the work were not completed within the specified times set forth are dependent upon many circumstances and conditions which could prevail in various combinations, and, from the nature of the case, it is impracticable and extremely difficult to fix the actual damages. Damages which City would suffer in the event of delay include loss of the use of the project, and, in addition, expenses of prolonged employment of an architectural and engineering staff; costs of administration, inspection, and supervision; and the loss suffered by the public within the City of Sacramento by reasons of the delay in the completion of the project to serve the public at the earliest possible time. Accordingly, the parties hereto agree, and by execution of this Agreement Contractor acknowledges that he understands, has ascertained and agrees, that the amounts set forth herein as liquidated damages shall be presumed to be the amount of damages sustained by the failure of contractor to complete the entire work within the times specified.

17. LIQUIDATED DAMAGES

The amount of the liquidated damages to be paid by Contractor to City for failure to complete the entire work by the Completion Date (as extended, if applicable) will be _____ (\$ _____) for each calendar day, continuing to the time at which the work is completed. Such amount is the actual cash value agreed upon as the loss to City resulting from Contractor's default.

18. PAYMENT OF DAMAGES

In the event Contractor shall become liable for liquidated damages, City, in addition to all other remedies provided by law, shall have the right to withhold any and all payments which would otherwise be or become due Contractor until the liability of Contractor under this section is finally determined. City shall have the right to use and apply such payments, in whole or in part, to reimburse City for all liquidated damages due or to become due to City. Any remaining balance of such payments shall be paid to Contractor only after discharge in full of all liability incurred by Contractor under this section or otherwise. If the sum so retained by City is not sufficient to discharge all

such liabilities of Contractor, Contractor and his sureties shall continue to remain liable to City until all such liabilities are satisfied in full. No failure by City to withhold any payment as hereinbefore specified shall in any manner be construed to constitute a waiver of any right to liquidated damages or any right to any such sum.

19. INDEMNITY AND HOLD HARMLESS

Contractor shall assume the defense of, and indemnify and save harmless, the City, its officers, employees, and agents, and each and every one of them, from and against all actions, damages, claims, losses or expenses of every type and description to which they may be subjected or put, by reason of, or resulting from, the performance of the work, provided that such action, damage, claim, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to, or destruction of property, whether upon or off the work, including the loss of use thereof, and is caused in whole or in part by any negligent act or omission of the Contractor, and subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, whether or not it is caused in part by a party indemnified hereunder.

20. CONTRACTOR SHALL ASSUME RISKS

Until the completion and final acceptance by City of all work under this Contract, the work shall be under Contractor's responsible care and charge. Contractor shall rebuild, repair, restore and make good all injuries, damages, reerections, and repairs occasioned or rendered necessary by accidental causes of any nature, to all or any portions of the work, except as otherwise stipulated.

21. GENERAL LIABILITY OF CONTRACTOR

Except as otherwise herein expressly stipulated, Contractor shall do all the work and furnish all the labor, materials, tools, power and light, and appliances, necessary or proper for performing and completing the work herein required in the manner within the time herein specified. The mention of any specific duty or liability of Contractor shall not be construed as limitation or restriction of any general liability or duty of Contractor and, any reference to any specific duty or liability shall be construed to be for the purpose of explanation.

22. INSURANCE

During the term of this Agreement and until final completion and acceptance of the work required by the Contract Documents, Contractor shall maintain in full force and effect at his own cost and expense the following insurance coverage:

(A) Worker's Compensation

Full Worker's Compensation Insurance and Employer's Liability policy or provide evidence of ability to undertake self-insurance. Limits of coverage shall be at least \$1,000,000 for any one person. In the event Contractor is self-insured, he shall furnish a Certificate of Permission to Self-Insure by the Department of Industrial Relations Administration of Self-Insurance, Sacramento.

(B) Comprehensive Auto and General Liability Insurance

Contractor must provide sufficient broad coverage to include:

Comprehensive Auto and General Liability Insurance
Products and Completed Operation Liability
Broad Form Property Damage Liability
Contractual Liability
Personal Injury Liability

The amount of the policy shall be no less than \$1,000,000 Single Limit per occurrence, issued by an admitted insurer or insurers as defined by the California Insurance Code, providing that the City of Sacramento, its officers, employees and agents are to be Named Insured under the policy, and the policy shall stipulate that this insurance will operate as Primary insurance and that no other insurance effected by City or other Named Insured will be called on to contribute to a loss covered thereunder.

(C) Certificate of Insurance

Contractor shall have City's standard Certificate of Insurance completed and filed with the Finance Director within fifteen (15) days of the execution of this Agreement. Said policies shall provide that no cancellation, major change in coverage, or expiration may be effected by the insurance company or the insured during the term of this Agreement, without first giving to City thirty (30) days written notice prior to the effective date of such cancellation or change in coverage.

(D) Worker's Compensation Certificate

Contractor shall sign and file with the Director of Finance of the City of Sacramento the following certification prior to commencing performance of the work of the Contract:

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

23. FAILURE TO MAINTAIN INSURANCE

If, at any time during the performance of this Contract, Contractor fails to maintain any item of the required insurance in full force and effect, Contractor shall immediately discontinue all work under the Contract and City will withhold all Contract payments due or that become due until notice is received by City that such insurance has been restored in full force and effect and that the premiums therefor have been paid for a period satisfactory to the Director of Finance.

Any failure to maintain any item of the required insurance will be sufficient cause for termination of the Contract.

24. EXTENSIONS OF TIME

In the event City deems it necessary, in its sole discretion, to extend the time of completion of the work to be done under this Contract beyond the required Completion Date herein specified, such extensions shall in no way release any guarantee given by contractor pursuant to the provisions of the Contract Documents, nor shall such extension of time relieve or release the sureties on the bonds executed pursuant to said provisions. By executing such bonds, the sureties shall be deemed to have expressly agreed to any such extension of time. The amount of time allowed in any extension of time shall be limited to the period of excusable delay as defined herein giving rise to the same as determined by City Council of City.

25. EXCUSABLE DELAYS

For the purpose of these Contract Documents, the term "Excusable Delays" shall mean, and is limited to, delays caused directly by acts of God; acts of the public enemy; fires, riots, insurrections; epidemics; quarantine restrictions; strikes; lockouts; sitdowns; acts of a governmental agency; priorities or privileges established for the manufacture, assembly, or allotment of materials necessary in the work by order, decree or otherwise of the United States or by any department, bureau, commission, committee, agent, or administrator of any legally constituted public authority; changes in the work ordered by City insofar as they necessarily require additional time in which to complete the work; the prevention by City of Contractor from commencing or prosecuting the work because of the acts of others, excepting Contractor's subcontractors; or the prevention of Contractor from commencing or prosecuting the work because of a city-wide failure of public utility service.

Inclement weather shall not be a reason for granting an extension of time. City may, however, grant an extension of time for unavoidable delay as a result of extraordinary inclement weather which shall then be classified Excusable Delay.

The term "Excusable Delay" shall specifically not include: (i) any delay which could have been avoided by the exercise of care, prudence, foresight and diligence on the part of Contractor (ii) any delay in the prosecution of parts of the work, which may in itself be unavoidable but which does not necessarily prevent or delay the prosecution of other parts of the work, nor the completion of the whole work within the time specified; (iii) any reasonable delay resulting from time required by City for review of plans and submittals required of Contractor and for the making of surveys, measurements and inspections; (iv) any delay arising from an interruption in the prosecution of the work on account of the reasonable interference from other Contractors employed by City, which does not necessarily prevent the completion of the work within the time specified; and, (v) any delay resulting from ordinary inclement weather. Excusable Delays, if any, shall operate only to extend the Completion Date (not in excess of the period of such delay as determined by City) but shall not under any circumstances increase the sum City is to pay Contractor as provided in these Contract Documents.

26. CONTRACTOR TO SERVE NOTICE OF DELAYS

Whenever Contractor foresees any delay in the prosecution of the work, and in any event immediately upon the occurrence of any delay which Contractor regards as an excusable delay, he shall notify the City Engineer in writing of the probability of such delay and its cause, in order that the City Engineer may take immediate steps to prevent if possible the occurrence or continuance of the delay, or if this cannot be done, may determine whether the delay is to be considered excusable, how long it continues, and to what extent the prosecution and completion of the work are delayed thereby. Said notice shall constitute an application for an extension of time only if the notice requests such an extension and sets forth Contractor's estimate of the additional time required together with a full description of the cause of the delay relied upon.

After the completion of any part or whole of the work, the City Engineer, in estimating the amount due Contractor, will assume that any and all delays which may have occurred in its prosecution and completion have been avoidable delays, except such delays as shall have been called to the attention of the City Engineer at the time of their occurrence and found by him to have been excusable. Contractor shall make no claim that any delay not called to the attention of the City Engineer at the time of its occurrence has been an excusable delay.

27. EXTENSION OF TIME

Should any delays occur which the City Council may consider excusable, as herein defined, Contractor shall, pursuant to his application, be allowed an extension of time beyond the time herein set forth proportional to said delay or delays in which to complete this Contract; and, during an extension which may have been granted because of an excusable delay or delays, City shall not charge liquidated damages against Contractor for such delay. Only the City Council may grant an extension of time on the Contract.

28. EXTENSION OF TIME DOES NOT WAIVE CITY'S RIGHTS

The granting of any extension of time on account of delays which in the judgment of the City Council are excusable delays shall in no way operate as a waiver on the part of City of its rights under this Contract excepting only the extension of the Completion Date.

29. NO PAYMENT FOR DELAYS

No damages or compensation of any kind shall be paid to Contractor or any subcontractor because of delays in the progress of the work whether such delays qualify for extension of time under this Agreement or not.

Contractor waives all claims against City, its officials and employees, for any loss or damage sustained by reason of delays beyond the Completion Date arising out of modifications of this Agreement, including modifications deemed necessary or desirable by City for the correction of errors or omissions in this Agreement, Plans or Specifications, it being expressly understood and agreed that no damages or compensation of any kind shall be paid to Contractor because of such delays.

30. CHANGES IN THE WORK

Changes in the work made pursuant to changes issued in accordance with the Standard Specifications and extensions of time of completion made necessary by reason thereof (beyond the Completion Date) shall not in any way release any guarantee given by Contractor pursuant to the provisions of the Contract Documents, or the Contract let hereunder, nor shall such changes in the work relieve or release the sureties on bonds executed pursuant to the said provisions. By executing such bonds, the sureties shall be deemed to have expressly agreed to any such change in the work and to any extension of time made by reason thereof.

31. TERMINATION AFTER COMPLETION DATE

In addition to any rights it may have, City may terminate this Contract at any time after the Completion Date as adjusted by any extensions of time for excusable delays that may have been granted. Upon such termination Contractor shall not be entitled to receive any compensation for services rendered by him before or after such termination, and he shall be liable to City for liquidated damages for all periods of time beyond such termination date until the work is completed.

32. CONTRACTOR BANKRUPT

If Contractor should commence any proceeding under the Bankruptcy Act, or if contractor be adjudged a bankrupt, or if Contractor should make any assignment for the benefit of creditors, or if a receiver should be appointed on account of Contractor's insolvency, then the City Council may, without prejudice to any other right or remedy, terminate the Contract and complete the work by giving notice to Contractor and his surety according to the provisions of Section 33. Contractor's Surety shall have the right to complete the work by commencing within thirty (30) days as specified in Section 33; and, in the event Contractor's Surety fails to commence work within thirty (30) days as specified in Section 33, City shall have the right to complete, or cause completion of the work, all as specified in Section 33.

33. TERMINATION FOR BREACH OF CONTRACT

If Contractor should abandon the work under this Contract, or if the Contract or any portion of the Contract should be sublet or assigned without the consent of the City Council, or if the City Engineer should be of the opinion that the conditions of the Contract in respect to the rate of progress of the work are not being fulfilled or any part thereof is unnecessarily delayed, or if Contractor should willfully violate or breach, or fail to execute in good faith, any of the terms or conditions of the Contract, or if Contractor should persistently refuse or fail to supply enough properly skilled labor or materials, or fail to make prompt payment to subcontractors for material or labor, or persistently disregard laws, ordinances or proper instruction or orders of the Engineer, then, notwithstanding any provision to the contrary herein, the City Council may give Contractor and his Surety written notification to immediately correct the situation or the Contract shall be terminated.

In the event that such notice is given, and, in the event such situation is not corrected, or satisfactory arrangement for correction is not made, within ten (10) calendar days from the date of such notice, the Contract shall upon the

expiration of said ten (10) calendar days cease and terminate. In the event of any such termination, City shall immediately serve notice thereof upon the Surety and Contractor; and the Surety shall have the right to take over and perform the Contract, provided, however, that if the Surety does not commence performance thereof within thirty (30) days from the date of the mailing to such Surety of notice of termination, City may take over the work and prosecute the same to completion by Contract, or otherwise, for the account and at the expense of Contractor, and his Surety shall be liable to City for any excess cost occasioned City thereby, as hereinafter set forth.

In the event City completes the work, or causes the work to be completed, as aforesaid, no payment of any sum shall be made to Contractor until the work is complete. The cost of completing the work, including but not limited to, extra contract costs, the costs of City forces, extra costs of administration and management incurred by City, either direct or indirect, shall be deducted from any sum then due, or which becomes due, to Contractor from City. If no sum sufficient to pay the difference between sums due to Contractor from City and the cost of completing the work, Contractor and the Surety shall pay City a sum equal to said difference on demand. In the event City completes the work, and there is a sum remaining due to Contractor after City deducts the aforementioned costs of completing the work, then City shall thereupon pay such sum to contractor and his Surety.

No act by City before the work is finally accepted including, but not limited to, exercise of other rights under the Contract, actions at law or in equity, extensions of time, payments, claims of liquidated damages, occupation or acceptance of any part of the work, waiver of any prior breach of the Contract or failure to take action pursuant to this section upon the happening of any prior default or breach by Contractor shall be construed to be a waiver by, or to estop, City from acting pursuant to this paragraph upon any subsequent event, occurrence of failure by Contractor to fulfill the terms and conditions of the Contract. The rights of City pursuant to this paragraph are cumulative and in addition to all other rights of City pursuant to this Agreement and at law or in equity.

IN WITNESS WHEREOF, the parties hereto have signed this Agreement on the date set forth opposite their names.

CONTRACTOR

DATE: _____

By _____

Title

CITY OF SACRAMENTO,
a municipal corporation

DATE: _____

By _____
City Manager

ATTEST:

City Clerk
ORIGINAL APPROVED AS TO FORM

FUNDING AVAILABLE:

City Attorney

Accounting Officer

SUBSTITUTION OF SECURITIES FOR MONEY WITHHELD

At any time prior to final payment, Contractor may request substitution of securities for any money withheld by the City to ensure performance of the contract. At the expense of Contractor, securities equivalent to the money withheld may be deposited with the City or with Wells Fargo Bank as escrow agent according to a separate Security Agreement. Securities eligible for substitution shall include those listed in Section 16430 of the Government Code or bank or savings and loan certificates of deposit. A fee set by the City Council shall be charged for such substitution.

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

WHEREAS, the City of Sacramento, a municipal corporation, has awarded to

_____ hereinafter designated as the "Principal", a contract for

_____ ; and

WHEREAS, said Principal is required to furnish a bond in connection with said contract, to secure payment of claims of laborers, mechanics, or materialmen employed on work under said contract, as provided by law;

NOW, THEREFORE, we the undersigned Principal and Surety are held and firmly bound unto the City of Sacramento in the sum of _____

_____ DOLLARS (\$ _____), said sum being equal to the estimated amount payable by the said City of Sacramento under the terms of the contract, for which payment well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, or assigns jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION ARE SUCH that if said Principal, his or its heirs, executors, administrators, successors, or assigns, or subcontractors shall fail to pay for any material, provisions, provender or other supplies or teams, implements or machinery used in, upon, for or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts due under the Unemployment Insurance Act with respect to such work or labor, as required by the provisions of Chapter 7, Title XV, Part 4, Division 3, of the Civil Code, and provided that the claimant shall have complied with the provisions of said code; or for any amounts required to be deducted, withheld, and paid over to the Franchise Tax Board from the wages of employees of the contractor and his subcontractors pursuant to Section 18806 of the Revenue and Taxation Code, with respect to such work and labor, the Surety or Sureties hereon will pay for the same and in an amount not exceeding the sum specified in this bond, otherwise the above obligation shall be void. In case suit is brought upon this bond, said Surety will pay a reasonable attorney's fee to be fixed by the Court.

This bond shall inure to the benefit of any and all persons, companies and corporations entitled to file claims under Section 3181 of the Civil Code of the State of California so as to give a right of action to them or their assigns in any suit brought upon this bond.

Said Surety, for value received, hereby stipulates and agrees that, in accordance with the Standard Specifications or Special Provisions, no change, extension of time, alteration or addition to the terms of the contract, or to the work to be performed thereunder, or to the specifications accompanying the same, shall in any wise affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their seals this _____ day of _____, the name and corporate seal of each corporate body being affixed thereto, and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

_____ PRINCIPAL

By _____

Title _____

_____ SURETY

By _____

APPROVED AS TO FORM:

_____ CITY ATTORNEY

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That

WHEREAS, the City of Sacramento, State of California, has awarded to

hereinafter designated as the "Principal", a contract for

; and

WHEREAS, said Principal is required under the terms of said contract to furnish a bond for the faithful performance of said contract.

NOW, THEREFORE, we the Principal, and

as Surety, are held and firmly bound unto the City of Sacramento in the penal sum of

DOLLARS

(\$ _____), lawful money of the United States for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, or assigns jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that if the above bounden Principal, his or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the said contract and any alteration thereof made as therein provided, on his or their part, to be kept and performed at the time and in the manner therein specified and in all respects according to their true intent and meaning; and shall indemnify and save harmless the City of Sacramento, its officers and agents as therein stipulated, then this obligation shall become null and void; otherwise it shall be and remain in full force and virtue.

And the surety, for value received hereby stipulates and agrees that, in accordance with the Standard Specifications or Special Provisions, no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any wise affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or additions to the terms of the contract or to the work or to the specifications.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their seals this _____ day of _____ the name and corporate seals of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Principal _____

By _____

Title _____

Surety _____

By _____

APPROVED AS TO FORM:

City Attorney

EXCERPTS FROM THE CALIFORNIA LABOR CODE
RELATING TO APPRENTICES ON PUBLIC WORKS

Chapter 4 of Division 3

THE SHELLEY-MALONEY APPRENTICE LABOR STANDARDS ACT OF 1974

(Note: Boldface type denotes key points.)

3098. An awarding agency whose public works contract falls within the jurisdiction of Section 1777.5 shall, within five days of the award, send a copy of the award to the Division of Apprenticeship Standards. When specifically requested by a local joint apprenticeship committee, the division shall notify the local joint apprenticeship committee regarding all such awards applicable to the joint apprenticeship committee making the request. Within five days of a finding of any discrepancy regarding the ratio of apprentices to journeymen, pursuant to the certificated fixed number of apprentices to journeymen, the awarding agency shall notify the Division of Apprenticeship Standards.

(Amended by Stats. 1974, Ch. 1095.)

Chapter 1 of Division 2
APPRENTICES ON PUBLIC WORKS

1776. Each contractor and subcontractor shall keep an accurate payroll record, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice or worker employed by him in connection with the public work. The contractor's and subcontractor's payroll records shall be available for inspection at all reasonable hours, and a copy shall be made available to the employee or his authorized representative, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards. The body awarding the contract may charge a reasonable fee for copying such records. The body awarding the contract shall be required to retain the records filed pursuant to this section for 90 days after completion of the contract. After a complaint has been filed with the awarding body or the Division of Labor Standards Enforcement alleging that a contractor or subcontractor has paid less than the prevailing wage on a public works project, the contractor or subcontractor shall upon written notice from either the awarding body or the Division of Labor Standards Enforcement within 10 days file with the body awarding the contract a certified copy of the payroll records.

(Amended by Stats. 1976, Ch. 599.)

1777.5. Nothing in this chapter shall prevent the employment of properly registered apprentices upon public works.

Every such apprentice shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which he is employed, and shall be employed only at the work of the craft or trade to which he is registered.

Only apprentices, as defined in Section 3077, who are in training under apprenticeship standards and written apprentice agreements under Chapter 4 (commencing at Section 3070), Division 3, of the Labor Code, are eligible to be employed on public works. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprentice agreements under which he is training.

When the contractor to whom the contract is awarded by the state or any political subdivision, or any subcontractor under him, in performing any of the work under the contract or subcontract, employs workmen in any apprenticeable craft or trade, the contractor and subcontractor shall apply to the joint apprenticeship committee administering the apprenticeship standards of the craft or trade in the area of the site of the public work for a certificate approving the contractor or subcontractor under the apprenticeship standards for the employment and training of apprentices in the area or industry affected; provided, however, that the approval as established by the joint apprenticeship committee or committees shall be subject to the approval of the Administrator of Apprenticeship. The joint apprenticeship committee or committees, subsequent to approving the subject contractor or subcontractor, shall arrange for the dispatch of apprentices to the contractor or subcontractor in order to comply with this section. There shall be an affirmative duty upon the joint apprenticeship committee or committees administering the apprenticeship standards of the craft or trade in the area of the site of the public work to ensure equal employment and affirmative action in apprenticeship for women and minorities. Contractors or subcontractors shall not be required to submit individual applications for approval to local joint apprenticeship committees provided they are already covered by the local apprenticeship standards. The ratio of apprentices to journeymen who shall be employed in the craft or trade on the public work may be the ratio stipulated in the apprenticeship standards under which the joint apprenticeship committee operates but in no case shall the ratio be less than one apprentice for each five journeymen, except as otherwise provided in this section.

The contractor or subcontractor, if he is covered by this section, upon the issuance of the approval certificate, or if he has been previously approved in such craft or trade, shall employ the number of apprentices or the ratio of apprentices to journeymen stipulated in the apprenticeship standards. Upon proper showing by the contractor that he employs apprentices in such craft or trade in the state on all of his contracts on an annual average of not less

than one apprentice to each five journeymen, the Division of Apprenticeship Standards may grant a certificate exempting the contractor from the 1-to-5 ratio as set forth in this section. This section shall not apply to contracts of general contractors involving less than thirty thousand dollars (\$30,000) or 20 working days or to contracts of specialty contractors not bidding for work through a general or prime contractor, involving less than two thousand dollars (\$2,000) or fewer than five working days.

"Apprenticeable craft or trade," as used in this section, shall mean a craft or trade determined as an apprenticeable occupation in accordance with rules and regulations prescribed by the Apprenticeship Council. The joint apprenticeship committee shall have the discretion to grant a certificate, which shall be subject to the approval of the Administrator of Apprenticeship, exempting a contractor from the 1-to-5 ratio set forth in this section when it finds that any one of the following conditions is met:

(a) In the event unemployment for the previous three-month period in such area exceeds an average of 15 percent, or

(b) In the event the number of apprentices in training in such area exceeds a ratio of 1 to 5, or

(c) If there is a showing that the apprenticeable craft or trade is replacing at least one-thirtieth of its journeymen annually through apprenticeship training, either (1) on a statewide basis, or (2) on a local basis.

(d) If assignment of an apprentice to any work performed under a public works contract would create a condition which would jeopardize his life or the life, safety, or property of fellow employees or the public at large or if the specific task to which the apprentice is to be assigned is of such a nature that training cannot be provided by a journeyman.

When such exemptions are granted to an organization which represents contractors in a specific trade from the 1-to-5 ratio on a local or statewide basis the member contractors will not be required to submit individual applications for approval to local joint apprenticeship committees, provided they are already covered by the local apprenticeship standards.

A contractor to whom the contract is awarded, or any subcontractor under him, who, in performing any of the work under the contract, employs journeymen or apprentices in any apprenticeable craft or trade and who is not contributing to a fund or funds to administer and conduct the apprenticeship program in any such craft or trade in the area of the site of the public work, to which fund or funds other contractors in the area of the site of the public work are contributing, shall contribute to the fund or funds in

each craft or trade in which he employs journeymen or apprentices on the public work in the same amount or upon the same basis and in the same manner as the other contractors do, but where the trust fund administrators are unable to accept such funds, contractors not signatory to the trust agreement shall pay a like amount to the California Apprenticeship Council. The contractor or subcontractor may add the amount of such contributions in computing his bid for the contract. The Division of Labor Standards Enforcement is authorized to enforce the payment of such contributions to the fund or funds as set forth in Section 227.

The body awarding the contract shall cause to be inserted in the contract stipulations to effectuate this section. Such stipulations shall fix the responsibility of compliance with this section for all apprenticeable occupations with the prime contractor.

All decisions of the joint apprenticeship committee under this section are subject to the provisions of Section 3031.

(Amended by Stats. 1976, Ch. 1179.)

1777.6. It shall be unlawful for an employer or a labor union to refuse to accept otherwise qualified employees as registered apprentices on any public works, on the ground of the race, religious creed, color, national origin, ancestry, sex, or age, except as provided in Section 3077, of such employee.

(Amended by Stats. 1976, Ch. 1179.)

1777.7. In the event a licensed contractor willfully fails to comply with the provisions of Section 1777.5, such licensee shall be denied the right to bid on any public works contract for a period of one year from the date the determination of non-compliance is made by the Administrator of Apprenticeship and, notwithstanding the provisions of Section 1727, upon receipt of such a determination the awarding body shall withhold from contract progress payments then due or to become due the sum of five thousand dollars (\$5,000). Any determination shall be issued after a full investigation, a fair and impartial hearing, and reasonable notice thereof in accordance with reasonable rules and procedures prescribed by the California Apprenticeship Council. Any funds withheld by the awarding body pursuant to this section shall be released to the contractor upon issuance of an order to that effect by the administrator, or upon completion of the contract.

The interpretation and enforcement of Sections 1777.5 and 1777.7 shall be in accordance with the rules and procedures of the California Apprenticeship Council.

(Amended by Stats. 1976, Ch. 538.)

GREATER SACRAMENTO AREA PLAN (GSAP) EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS
(Executive Order 11246)

The City of Sacramento is signatory to the "Greater Sacramento Area Plan" (hereinafter referred to as the "Plan") a joint industry-labor-minority representative agreement established for the purpose of increasing the employment of minorities in all phases and at all levels of skill in the building and construction industry within the greater Sacramento area. The City has adopted the "Plan" as its affirmative action program for City construction contracts and requires a contractor and his subcontractors be signatory to the Plan in order to be eligible for an award of a City contract. Additional information regarding the Plan is available at its headquarters office located at 4320 Stockton Boulevard, Sacramento, 95821, Telephone No. (916) 452-5832.

1. As used in these specifications:
 - a. "Covered area" means the geographical area within the following counties: Amador, El Dorado, Nevada, Placer, Sacramento, Sierra, and Yolo.
 - b. "Director" means Director, of GSAP, or any person to whom the Director delegates authority;
 - c. "Minority" includes:
 - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (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).
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 signatory under Part I of the GSAP 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 timetables) 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 the GSAP. Each Contractor or Subcontractor participating in the GSAP is individually required 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 timetables.
4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through p 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 toward 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, or the regulations promulgated pursuant thereto.
6. In order for the nonworking 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 efforts fully and shall 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, provided 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 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, specifically including minority and female 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 students and to 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 work force.
- 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 nonsegregated 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 other 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 Program. 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, those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

GSAP REPORTING REQUIREMENTS

- (1) All contract and subcontracts (over \$10,000) are subject to the reporting requirements.
- (2) Contractors must submit a CC 257 (Monthly Employee Utilization Report) to the GSAP at 4320 Stockton Boulevard, Sacramento, California 95829.
- (3) If the Contractor is already required to submit CC 257 there is no need to submit an additional form.
- (4) This report must arrive at the GSAP no later than the 5th working day of each month.
- (5) Failure to report is automatic cause to find the Contractor in noncompliance.
- (6) Each report is monitored by GSAP and measured against the specified goals for minorities and women.

U. S. DEPARTMENT OF LABOR
Employment Standards Administration, OFCCP

**MONTHLY EMPLOYMENT
 UTILIZATION REPORT**

1. COVERED AREA (State or FEA)

3. GOVERNMENT CONTRACT

4. REPORTING PERIOD

This report is required by Executive Order 11246, Sec. 203. Failure to report can result in contracts being cancelled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts of federally assisted construction contracts.

2. EMPLOYER'S I.D. NO.

MINORITY:

FROM:

FEMALE:

TO:

NAME AND LOCATION OF CONTRACTOR

FEDERAL
 FUNDING
 AGENCY

5. CONSTRUCTION TRADE	6. WORK HOURS OF EMPLOYMENT (Federal & Non-Federal) Classifications	6. WORK HOURS OF EMPLOYMENT (Federal & Non-Federal)										9. TOTAL NUMBER OF EMPLOYEES		10. TOTAL NUMBER OF MINORITY EMPLOYEES			
		6a. TOTAL ALL EMPLOYEES BY TRADE		6b. BLACK (Not of Hispanic Origin)		6c. HISPANIC		6d. ASIAN OR PACIFIC ISLANDERS		6e. AMERICAN INDIAN OR ALASKAN NATIVE		7. MINORITY PERCENTAGE	8. FEMALE PERCENTAGE	M	F	M	F
		M	F	M	F	M	F	M	F	M	F						
	Journey worker																
	APPRENTICE																
	TRAINEE																
	SUB-TOTAL																
	Journey worker																
	APPRENTICE																
	TRAINEE																
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	Journey worker																
	APPRENTICE																
	TRAINEE																
	SUB-TOTAL																
	TOTAL JOURNEY WORKERS																
	TOTAL APPRENTICES																
	TOTAL TRAINEES																
	GRAND TOTAL																

11. COMPANY OFFICIAL'S SIGNATURE AND TITLE

12. TELEPHONE NUMBER (Include area code)

13. DATE SIGNED

PAGE

OF

INSTRUCTIONS FOR FILING MONTHLY EMPLOYMENT UTILIZATION REPORT (CC-257)

The Monthly Utilization Report is to be completed by each subject contractor (both prime and sub) and signed by a responsible official of the company. The reports are to be filed by the 5th day of each month during the term of the contract, and they shall include the total work-hours for each employee classification in each trade in the covered area for the monthly reporting period. The prime contractor shall submit a report for its aggregate work force and collect and submit reports for each subcontractor's aggregate work force to the Federal compliance agency that has Executive Order 11246 responsibility. (Additional copies of this form may be obtained from the U.S. Department of Labor, Employment Standards Administration, OFCCP's regional office for your area.)

- Compliance Agency U.S. Government agency assigned responsibility for equal employment opportunity. (Secure this information from the contracting officer.)
- Federal Funding Agency U.S. Government agency funding project (in whole or in part). If more than one agency, list all.
- Contractor Any contractor who has a construction contract with the U.S. Government or a contract funded in whole or in part with Federal funds.
- Minority Includes Blacks, Hispanics, American Indians, Alaskan Natives, and Asian and Pacific Islanders—both men and women.
1. Covered Area Geographic area identified in Notice required under 41 CFR 60-4.2.
2. Employer's Identification Number Federal Social Security Number used on Employer's Quarterly Federal Tax Return (U.S. Treasury Department Form 941).
3. Current Goals (Minority & Female) See contract Notification.
4. Reporting Period Monthly, or as directed by the compliance agency, beginning with the effective date of the contract.
5. Construction Trade Only those construction crafts which contractor employs in the covered area.
6. Work-Hours of Employment (a-e) a. The total number of male hours and the total number of female hours worked by employees in each classification.
b-e. The total number of male hours and the total number of female hours worked by each specified group of minority employees in each classification.
- Classification The level of accomplishment or status of the worker in the trade (Journey Worker, Apprentice, Trainee)
7. Minority Percentage The percentage of total minority work-hours of all work-hours (the sum of columns 6b, 6c, 6d, and 6e divided by column 6a; just one figure for each construction trade).
8. Female Percentage For each trade the number reported in 6a. F divided by the sum of the numbers reported in 6a. M and F.
9. Total Number of Employees Total number of male and total number of female employees working in each classification of each trade in the contractor's aggregate work force during reporting period.
10. Total Number of Minority Employees Total number of male minority employees and total number of female minority employees working in each classification in each trade in the contractor's aggregate work force during reporting period.

GOALS AND TIMETABLES
SACRAMENTO, CALIFORNIA

APPENDIX A

The following goals and timetables for female utilization shall be included in all construction contracts and subcontracts in excess of \$10,000. The goals are applicable to the contractor's aggregate on-site construction workforce whether or not part of that workforce is performing work on a covered construction contract or subcontract.

AREA COVERED

Goals for Women apply Nationwide

GOALS AND TIMETABLES

Timetable	Goals (percent)
Until further notice	6.9

APPENDIX B

Until further notice the following goals and timetables for minority utilization shall be included in all construction contracts and subcontracts in excess of \$10,000 to be performed in the respective covered areas. The goals are applicable to the contractor's aggregate on-site construction workforce whether or not part of that workforce is performing work on a covered construction contract or subcontract.

SACRAMENTO, CALIFORNIA

Area covered - Sacramento, Yolo, and Placer Counties, California.

GOALS AND TIMETABLES

Timetable	Trade	Goal (percent)
Until further notice	All	17.5 to 20.0

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PART B - TECHNICAL SPECIFICATIONS

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SECTION 01050

SURVEY INFORMATION

The Owner has established the reference bench mark as the monument in the intersection of 25th Street and A Street as shown on the drawings. From the information provided, the Contractor shall develop and make such additional surveys as are needed for construction, such as control lines, slope stakes, batter boards, stakes for pipe locations and other working points, lines, and elevations. Survey work shall be performed under the supervision of a licensed land surveyor or registered civil engineer. Contractor shall reestablish reference bench marks and survey control monuments destroyed by his operations at no cost to the Owner.

END OF SECTION

SECTION 01060

SAFETY AND HEALTH

1.0 SAFETY AND HEALTH REGULATIONS

The Contractor shall comply with Safety and Health Regulations for Construction, promulgated by the Secretary of Labor under Section 107 of the Contract Work Hours and Safety Standards Act, as set forth in Title 29, C.F.R. Copies of these regulations may be obtained from Labor Building, 14th and Constitution Avenue NW, Washington, DC 20013.

The Contractor shall also comply with the provisions of the Federal Occupational Safety and Health Act, as amended.

2.0 CONSTRUCTION AND MONITORING MEASURES

Since the construction will be performed on a landfill, special construction procedures are required to prevent accidents. Monitoring at regular intervals shall be necessary during the construction of the facility.

Methane gas will be present during construction. Construction procedures with the greatest potential for gas influence are clearing and site leveling, trenching, and placement of structures during site work. Since methane gas mixes quickly with air, the greatest influence occurs near the ground or the excavated garbage surface.

A. CLEARING AND SITE LEVELING:

Significant gas will be present upon breaking the existing soil seal. The gas should dissipate quickly to the atmosphere. Equipment movement, structure placement, and personnel location should all be set to eliminate hazards.

B. TRENCHING:

Excavations for foundations and site utilities will break the soil seal. Construction procedures should provide for clearance of equipment, structures and personnel upon excavation. Special attention must be given to the proper ventilation of any trenches that are covered during construction.

C. PLACEMENT OF STRUCTURES:

Typical portable structures brought to the construction site are field offices and storage buildings. Care in placing these structures will eliminate the potential for gas accumulation. In no case shall a closed structure be placed directly on garbage exposed after site clearing.

3.0

3.0 MONITORING REQUIREMENTS

The safety of the facility during the construction phases should be enhanced by the use of monitoring devices. The Contractor shall use portable monitors such as are manufactured by Mine Safety Appliances, Bio-Marine Instruments, Bacharach, Gastech, and others, to spotcheck for the presence of combustible gas and oxygen in a quick, simple manner. One shall be with the Construction Manager.

END OF SECTION

SECTION 01071

STANDARD REFERENCES

Wherever used in the project manual, the following abbreviations will have the meanings listed:

AASHO	American Association of State Highway Officials 341 National Press Building Washington, DC 20004
ACI	American Concrete Institute P.O. Box 19150 Detroit, MI
AEIC	Association of Edison Illuminating Companies 51 East 42nd Street New York, NY 10017
AFBMA	Anti-Friction Bearing Manufacturer's Association 60 East 42nd Street New York, NY 10017
AGA	American Gas Association 8501 East Pleasant Valley Road Cleveland, OH 44131
AGMA	American Gear Manufacturer's Association 1330 Massachusetts Avenue, N.W. Washington, DC
AISC	American Institute of Steel Construction 101 Park Avenue New York, NY 10017
AISI	American Iron and Steel Institute 150 East 42nd Street New York, NY 10017
AITC	American Institute of Timber Construction 333 West Hampden Avenue Englewood, CO 80110
AMCA	Air Moving and Conditioning Association, Inc. 30 West University Drive Arlington Heights, IL 60004
ANSI	American National Standards Institute, Inc. 1430 Broadway New York, NY 10018
APA	American Plywood Association 1119 A Street Tacoma, WA 98401
API	American Petroleum Institute 1801 K Street N.W. Washington, DC 20006
ARI	Air-Conditioning and Refrigeration Institute 1814 North Fort Myer Drive Arlington, VA 22209
ASCE	American Society of Civil Engineers 345 East 47th Street New York, NY 10017

ASCII American Standard Code for Information Interchange
 United States of America Standards Institute
 10 East 40th Street
 New York, NY 10016

ASE American Standard Safety Code for Elevators,
 Code Dumbwaiter and Escalators
 American National Standards Institute
 1430 Broadway
 New York, NY 10018

ASHRAE American Society of Heating, Refrigeration and Air
 Conditioning Engineers
 United Engineering Center
 345 East 47th Street
 New York, NY 10017

ASME American Society of Mechanical Engineers
 345 East 47th Street
 New York, NY 10017

ASTM American Society for Testing and Materials
 1916 Race Street
 Philadelphia, PA 19103

AWPA American Wood Preservers Association
 1625 Eye Street
 Washington, DC 20006

AWS American Welding Society
 2501 N.W. 7th Street
 Miami, FL 33125

AWWA American Water Works Association
 Two Park Avenue
 New York, NY 10016

BOCA Building Officials and Code Administrators
 17926 Halstead
 Homewood, IL 60430

CALSPEC Standard Specifications, State of California,
 Department of Transportation
 State of California, Business and Transportation
 Agency
 P.O. Box 1499
 Sacramento, CA 95807

CALTEST Materials Manual, State of California, Business and
 Transportation Agency, Department of Public Works
 State of California, Department of Transportation
 6002 Folsom Boulevard
 Sacramento, CA 95819

CBM Certified Ballast Manufacturers
 2120 Keith Building
 Cleveland, OH 44115

CMAA Crane Manufacturers Association of America, Inc.
 (Formerly called: Overhead Electrical Crane
 Institute) (OECI)
 1326 Freeport Road
 Pittsburgh, PA 15238

CSA Canadian Standards Association
 178 Rexdale Boulevard
 Rexdale, Ontario, M9W IR3, Canada

DEMA Diesel Engine Manufacturer's Association
 122 East 42nd Street
 New York, NY 10017

DIS Division of Industrial Safety
 California Department of Industrial Relations
 2422 Arden Way
 Sacramento, CA 95825

EEI Edison Electric Institute
 90 Park Avenue
 New York, NY 10016

EIA Electronic Industries Association
 2001 Eye Street N.W.
 Washington, DC 20006

EJMA Expansion Joint Manufacturer's Association
 331 Madison Avenue
 New York, NY 10017

ESO Electrical Safety Orders, California Administrative
 Code, Title 8, Chap. 4, Subarticle 5
 Office of Procurement, Publications Section
 P.O. Box 20191
 8141 Elder Creek Road
 Sacramento, CA 95820

FEDSPEC Federal Specifications
 General Services Administration
 Specification and Consumer Information
 Distribution Branch
 Washington Navy Yard, Bldg. 197
 Washington, DC 20407

FEDSTDS Federal Standards
 (see FEDSPECS)

FM Factory Mutual Research
 1151 Boston-Providence Turnpike
 Norwood, MA 02062

HEI Heat Exchange Institute
 122 East 42nd Street
 New York, NY 10017

HI Hydraulic Institute
 1230 Keith Building
 Cleveland, OH 44115

IAPMO International Association of Plumbing
 and Mechanical Officials
 5032 Alhambra Avenue
 Los Angeles, CA 90032

ICBO International Conference of Building Officials
 5360 South Workman Mill Road
 Whittier, CA 90601

ICEA Insulated Cable Engineers Association
 P.O. Box P
 South Yarmouth, MA 02664

IEEE Institute of Electrical and Electronics Engineers, Inc.
 345 East 47th Street
 New York, NY 10017

IES Illuminating Engineering Society
 c/o United Engineering Center
 345 East 47th Street
 New York, NY 10017

ISA Instrument Society of America
 400 Stanwix Street
 Pittsburgh, PA 15222

JIC Joint Industrial Council
 2139 Wisconsin Avenue
 Washington, DC 20007

MILSPEC Military Specifications
 Naval Publications and Forms Center
 5801 Tabor Avenue
 Philadelphia, PA 19120

NAAMM National Association of Architectural Metal Manufacturers
 100 South Marion Street
 Oak Park, IL 60302

NACE National Association of Corrosion Engineers
 P.O. Box 986
 Katy, TX 77450

NEC National Electric Code
 National Fire Protection Association
 470 Atlantic Avenue
 Boston, MA 02210

NEMA National Electrical Manufacturer's Association
 155 East 44th Street
 New York, NY 10017

NESC National Electric Safety Code
 American National Standards Institute
 1430 Broadway
 New York, NY 10018

NFPA National Forest Products Association
 (Formerly National Lumber Manufacturer's Association)
 1619 Massachusetts Avenue, N.W.
 Washington, DC 20036

NFPA National Fire Protection Association
 470 Atlantic Avenue
 Boston, MA 02210

OSHA Occupational Safety and Health Act
 U.S. Department of Labor
 Occupational and Health Administration
 San Francisco Regional Office
 450 Golden Gate Avenue, Box 36017
 San Francisco, CA 94102

SAE Society of Automotive Engineers
 2 Pennsylvania Plaza
 New York, NY 10001

SAMA Scientific Apparatus Makers Association
 One Thomas Circle
 Washington, DC 20005

SBCB Southern Building Code Congress
1116 Brown-Marx Building
Birmingham, AL 35203

SSPWC Standard Specifications for Public Works Construction
Building News, Inc.
3055 Overland Avenue
Los Angeles, CA 90034

TEMA Tubular Exchanger Manufacturer's Association
331 Madison Avenue
New York, NY 10017

UBC Uniform Building Code
Published by ICBO

UL Underwriters Laboratories Inc.
207 East Ohio Street
Chicago, IL 60611

UMC Uniform Mechanical Code
Published by ICBO

UPC Uniform Plumbing Code
Published by IAPMO

USBR Bureau of Reclamation
U.S. Department of Interior
Engineering and Research Center
Denver Federal Center, Building 67
Denver, CO 80225

WWPA Western Wood Products Association
(Formerly called: West Coast Lumbermen's
Association (WCLA))
Yeon Building
Portland, OR 97204

END OF SECTION

SECTION 01300
SUBMITTAL PROCEDURE

1.0 GENERAL

Where required by the specifications, the Contractor shall submit descriptive information which will enable the Construction Manager to advise the Owner whether the Contractor's proposed materials, equipment or methods of work are in general conformance to the design concept and in compliance with the drawings and specifications. The information to be submitted shall consist of drawings, specifications, descriptive data, certificates, samples, test results and such other information, all as specifically required in the specifications.

2.0 CONTRACTOR'S RESPONSIBILITIES

Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment or method of work shall be as described in the submittal. The Contractor shall verify that the material and equipment described in each submittal conform to the requirements of the specifications and drawings. If the information shows deviations from the specifications or drawings, the Contractor shall, by statement in writing accompanying the information, identify the deviations and state the reason therefor. The Contractor shall insure that there is no conflict with other submittals and notify the Construction Manager in each case where his submittal may affect the work of another contractor or the Owner. The Contractor shall insure coordination of submittals among the related crafts and subcontractors.

The Contractor may authorize in writing a material or equipment supplier to deal directly with the Construction Manager or with the Owner with regard to a submittal. The Contractor, however, shall be responsible for the accuracy and completeness of information contained in all submittals.

3.0 TRANSMITTAL PROCEDURE

A. GENERAL:

Submittals regarding material and equipment shall be accompanied by Transmittal Form 01300-A specified in Section 01999. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete sections, for which the submittal is required. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.

3.0 B.

B. DEVIATION FROM CONTRACT:

If the Contractor proposes to provide material or equipment which does not conform to the specifications and drawings, he shall indicate so under "deviations" on the transmittal form accompanying the submittal copies. He shall prepare his reason for a change, including cost differential, and shall request a change order to cover the deviations.

C. SUBMITTAL COMPLETENESS:

Submittals which do not have all the information required to be submitted, including deviations, are not acceptable and will be returned without review.

4.0 REVIEW PROCEDURE

When the contract documents require a submittal, the Contractor shall submit the specified information as follows:

1. One reproducible original of all the submitted information. When individual sheets in the submittal exceed 8-1/2 inches x 11 inches, a sepia shall be submitted.
2. Three copies of all the submitted information.

Unless otherwise specified, within 35 calendar days after receipt of the submittal, the Construction Manager shall review the submittal and return two copies of the marked-up reproducible original noted in 1 above. The reproducible original will be retained by the Construction Manager. The returned submittal shall indicate one of the following actions:

1. If the review indicates that the material, equipment or work method is in general conformance with the design concept and complies with the drawings and specifications, submittal copies will be marked "NO EXCEPTIONS TAKEN". In this event the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.
2. If the review indicates limited corrections are required, copies will be marked "MAKE CORRECTIONS NOTED". The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in O&M data, a corrected copy shall be provided.

4.0

3. If the review reveals that the submittal is insufficient or contains incorrect data, copies will be marked "AMEND AND RESUBMIT". Except at his own risk, the Contractor shall not undertake work covered by this submittal until it has been revised, resubmitted and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".
4. If the review indicates that the material, equipment, or work method is not in general conformance with the design concept or in compliance with the drawings and specifications, copies of the submittal will be marked "REJECTED - SEE REMARKS". Submittals with deviations which have not been identified clearly may be rejected. Except at his own risk, the Contractor shall not undertake work covered by such submittals until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".

5.0 EFFECT OF REVIEW OF CONTRACTOR'S SUBMITTALS

Review of drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide, shall not relieve the Contractor of his responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Construction Manager or the Owner, or by any officer or employee thereof, and the Contractor shall have no claim under the contract on account of the failure, or partial failure, of the method of work, material, or equipment so reviewed. A mark of "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" shall mean that the Owner has no objection to the Contractor, upon his own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

END OF SECTION

SECTION 01380

PHOTOGRAPHS

1.0 PRECONSTRUCTION PHOTOGRAPHS

The Contractor shall provide preconstruction photographs prior to commencement of work on the site. The photographs shall be minimum 4-inch by 5-inch film size, and shall indicate on the front of each print the date, name of work, and the location where the photograph was taken. Before construction may start, two 8-inch by 10-inch glossy prints of each exposure, together with the negative, shall be delivered to the Construction Manager. Samples of prints of acceptable quality and identification are available in the office of the Construction Manager for examination. Preconstruction photographs shall be taken at locations to be designated by the Construction Manager. The photographer shall be equipped to photograph either interior or exterior exposures, with lenses ranging from wide angle to 135 mm.

2.0 CONSTRUCTION PHOTOGRAPHS

The Contractor shall provide construction photographs showing the progress of the work. The photographs shall be taken of such subjects as may be directed, shall be minimum 4-inch by 5-inch film size, and shall indicate on the front of each print the date, job title and brief description of the photograph including the location where the photograph was taken. Starting one month after the date of the preconstruction photographs and continuing as long as the work is in progress, ten monthly photographs shall be taken.

Upon acceptance of the work, two color exposure photographs shall be made of the work where directed by the Construction Manager. The photographer shall be equipped to take either interior or exterior exposures, with lenses ranging from wide angle to 135 mm.

Two 8-inch by 10-inch glossy prints of each exposure, together with the negative, shall be delivered to the Construction Manager within 10 days following each set of exposures.

****END OF SECTION****

SECTION 01500
CONTRACTOR'S UTILITIES

1.0 OFFICE

The Contractor shall maintain a suitable office at the site of the work.

2.0 POWER

The Contractor shall provide power for construction at the plant site. He shall make arrangements with the electrical utility and with the Owner for power takeoff points, voltage and phasing requirements, transformers and metering and shall pay the costs and fees arising therefrom. The Contractor shall provide the special connections required for his work.

3.0 TELEPHONE

The Contractor shall provide telephone service at his construction site office. Radio-telephone service is not acceptable as a substitute for telephone service.

4.0 SANITARY FACILITIES

The Contractor shall provide toilet and washup facilities for his work force at the site of work. They shall comply with applicable laws, ordinances, and regulations pertaining to the public health and sanitation of dwellings and camps.

END OF SECTION

SECTION 01560

ENVIRONMENTAL CONTROLS

1.0 SITE MAINTENANCE

The Contractor shall keep the work site clean and free from rubbish and debris. Materials and equipment shall be removed from the site when they are no longer necessary. Upon completion of the work and before final acceptance, the work site shall be cleared of equipment, unused materials, and rubbish to present a clean and neat appearance.

2.0 TEMPORARY DAMS

Except in time of emergency, earth dams are not acceptable at catch basin openings, local depressions, or elsewhere. Temporary dams of sand bags, asphaltic concrete, or other acceptable material will be permitted when necessary to protect the work, provided their use does not create a hazard or nuisance to the public. Such dams shall be removed from the site as soon as they are no longer necessary.

3.0 AIR POLLUTION CONTROL

The Contractor shall not discharge smoke, dust, and other contaminants into the atmosphere that violate the regulations of any legally constituted authority. He shall also abate dust nuisance by cleaning, sweeping, and sprinkling with water, or other means as necessary. The use of water, in amounts which result in mud on public streets, is not acceptable as a substitute for sweeping or other methods.

4.0 NOISE CONTROL

Between 7:30 p.m. and 7:00 a.m., noise from Contractor's operations shall not exceed limits established by applicable laws or regulations and in no event shall exceed 86 dBA at a distance of 50 feet from the noise source.

END OF SECTION

SECTION 01720

RECORD DRAWINGS

The Contractor shall provide the Construction Manager one neatly and legibly marked set of full-size contract drawings showing the final location of piping, equipment, electrical conduits, outlet boxes and cables. Marking of the drawings shall be kept current and shall be done at the time the material and equipment are installed. These drawings shall be available to the Construction Manager.

END OF SECTION

SECTION 01730

OPERATING AND MAINTENANCE INFORMATION

1.0 SCOPE

When specified, operating and maintenance information shall be provided and shall consist of the names and addresses of the manufacturer, the nearest representative of the manufacturer, and the nearest supplier of the manufacturer's equipment and parts. In addition, one or more of the following items of information will be provided when specified:

1. Lubrication Information: This shall consist of the manufacturer's recommendations regarding the lubricants to be used and the lubrication schedule to be followed.
2. Control Diagrams: Diagrams shall show internal and connection wiring.
3. Start-Up Procedures: These instructions consist of equipment manufacturer's recommendations for installation, adjustment, calibration, and troubleshooting.
4. Operating Procedures: These instructions consist of the equipment manufacturer's recommended step-by-step procedures for starting, operating, and stopping the equipment under specified modes of operation.
5. Preventive Maintenance Procedures: These instructions consist of the equipment manufacturer's recommended steps and schedules for maintaining the equipment.
6. Overhaul Instructions: These instructions consist of the manufacturer's directions for the disassembly, repair and reassembly of the equipment and any safety precautions that must be observed while performing the work.
7. Parts List: This list consists of the generic title and identification number of each component part of the equipment.
8. Spare Parts List: This list consists of the manufacturer's recommendations of number of parts which should be stored by the Owner and any special storage precautions which may be required.

1.0

9. Exploded View: Exploded or cut views of equipment shall be provided if available as a standard item of the manufacturer's information. When exploded or cut views are not available, plan and section views shall be provided with detailed callouts.
10. Specific Information: When items of information not included in the above list are required, they will be provided as described in the specification for the equipment.

2.0 TRANSMITTAL PROCEDURE

Three copies of the specified operating and maintenance information shall be provided. For ease of identification, each manufacturer's brochure and manual shall be appropriately labeled with the equipment name and equipment number as it appears in the project manual. The information shall be organized in the binders in numerical order by the equipment numbers assigned in the project manual. The binders shall be provided with a table of contents and tab sheets to permit easy location of desired information.

If manufacturer's standard brochures and manuals are used to describe operating and maintenance procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated.

3.0 PAYMENT

Acceptable operating and maintenance information must be delivered to the Construction Manager before the Contractor can be paid for more than 80 percent of the purchase value of that equipment. Purchase value shall be the net price for the equipment as given on the invoice. Acceptable operating and maintenance information for the project must be delivered to the Construction Manager prior to the project being 75 percent complete. Progress payments for work in excess of 75 percent completion will not be made until the specified acceptable operating and maintenance information has been delivered to the Construction Manager.

4.0 FIELD CHANGES

Following the acceptable installation and operation of an equipment item, the item's instructions and procedures shall be modified and supplemented by the Contractor to reflect any field changes or information requiring field data.

****END OF SECTION****

SECTION 01999

REFERENCE FORMS

The forms listed below and included in this section are referenced from other sections of the project manual:

<u>Form No.</u>	<u>Title</u>
01300-A	Submittal Transmittal
11000-A	Manufacturer's Installation Certification
11000-B	Manufacturer's Instruction Certification
11060-A	Motor Data Submittal

01300-A. SUBMITTAL TRANSMITTAL FORM:

Date: _____ Submittal No:^a _____
 To: _____ Contract No: _____
 _____ Spec. Section: _____
 _____ From: _____

 Attention: _____

The following is transmitted for submittal review:

<u>No.</u>	<u>Date</u>	<u>Copies</u>	<u>Description/Equipment No.</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

We have verified that the material transmitted herein is in compliance with the specifications:

_____ with no exceptions
 _____ except for the following deviations

<u>No.</u>	<u>Deviation</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Contractor's Signature

^aSubmittal No. is xxxxx-yyz: xxxxx is the spec. section, yy is a number for related submittals, and z is a letter for submittal iterations.

11000-A. MANUFACTURER'S INSTALLATION CERTIFICATION FORM:

Contract No: _____ Specification Section: _____

Equipment name: _____

Contractor: _____

Manufacturer of equipment item: _____

The undersigned manufacturer of the equipment item described above hereby certifies that he has checked the installation of the equipment and that the equipment, as specified in the project manual, has been provided in accordance with the manufacturer's recommendations and that the trial operation of the equipment item has been satisfactory.

Comments: _____

Date

Manufacturer

Signature of
Authorized Representative

Date

Contractor

Signature of
Authorized Representative

11000-B. MANUFACTURER'S INSTRUCTION CERTIFICATION FORM:

Contract No.: _____ Specification Section: _____

Equipment name: _____

Contractor: _____

Manufacturer of equipment item: _____

The undersigned manufacturer certifies that a service engineer has instructed the wastewater treatment plant operating personnel in the proper maintenance and operation of the equipment designated herein.

Operations Check List (check appropriate spaces)

Start-up procedure reviewed	_____
Shutdown procedure reviewed	_____
Normal operation procedure reviewed	_____
Others: _____	_____
_____	_____
_____	_____

Maintenance Check List (check appropriate spaces)

Described normal oil changes (frequency)	_____
Described special tools required	_____
Described normal items to be reviewed for wear	_____
Described preventive maintenance instructions	_____
Described greasing frequency	_____
Others: _____	_____
_____	_____
_____	_____

Date

Manufacturer

Signature of
Authorized Representative

Date

Contractor

Signature of
Authorized Representative

11060-A. MOTOR DATA SUBMITTAL FORM:

Project _____

Equipment Name _____ Site Location _____ Equipment No(s). _____

Nameplate Markings

Mfr _____ Mfr Type _____ Frame _____ HP _____

Volts _____ Phase _____ **Service factor _____

FLC _____ LRC _____ Freq _____ Ambient temp rating _____ °C

Time rating _____ **Design letter _____
(NEMA 1-10.35) (NEMA MG-1.16)

Code letter _____ Insulation class _____

**Required for 3-phase squirrel cage induction motors only.

Data Not Necessarily Marked on Nameplate

Type of enclosure _____ Enclosure material _____

Temp rise _____ °C (NEMA MG1-12.41,42) Max HP of load _____

Space heater included? ___ Yes ___ No; If Yes, ___ watts ___ volts

Type of thermal protection or overtemperature protection, if included:

(attach supplemental data for response time for overtemperature protection, if included, on drives 100 HP and over)

Is motor explosionproof? _____ If Yes, furnish the following:

A. Approved by UL for installation in Class _____, Div _____

B. Type and identification No. of overtemperature device _____
(T2, T3A per NEC Table 500-2(b))

The following information required for wound rotor motors only:

Max secondary volts _____ Max secondary amps _____

The following information required for high efficiency motors only:

Guaranteed minimum efficiency at full load or NEMA efficiency index _____

The following information required for low noise motors only:

Sound pressure at 3 ft _____ dbA or sound power _____ dbA

The following shall be attached to this form:

1. Motor outline, dimensions and weight.
2. Descriptive bulletins, including description of insulation system.

16000-A. WIRE AND CABLE RESISTANCE TEST DATA FORM:

Wire or Cable No.: _____

Temperature, °F _____

Location of Test

Insulation
Resistance,
megohms

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

CERTIFIED _____
Contractor's Representative

Date _____

WITNESSED _____
Owner's Representative

Date _____

16000-B. MOTOR TEST DATA FORM:

Motor Equipment Number _____

Equipment Driven _____

MCC Location _____

Resistance:

Insulation resistance phase-to-ground megohms:

Phase A _____, Phase B _____, Phase C _____

Current:

Phase _____ Current, amps _____

Phase _____ Current, amps _____

Phase _____ Current, amps _____

Thermal Overload Device:

Catalog number _____ Amperes _____

Motor Nameplate Markings:

Mfr _____ Mfr type _____ Frame _____ HP _____

Volts _____ Phase _____ **Service factor _____

Amps _____ Freq _____ Ambient temp rating _____ °C

Time rating _____ **Design letter _____
(NEMA 1-10.35) (NEMA MG-1.16)

Code letter _____ Insulation class _____

**Required for 3-phase squirrel cage induction motors only.

CERTIFIED _____
Contractor's Representative

Date _____

WITNESSED _____
Owner's Representative

Date _____

DIVISION 2

SITWORK

Section

Title

02100	SITE PREPARATION
02200	EARTHWORK
02350	SHEETING, SHORING AND BRACING
02445	CHAIN LINK FENCES
02500	PAVING

SECTION 02100

SITE PREPARATION

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies site preparation.

1.02 JOB CONDITIONS

A. EXISTING CONDITIONS:

The Contractor shall determine the actual condition of the site as it affects this portion of work.

B. PROTECTION:

Site preparation shall not damage structures or landscaping adjacent to the site. The Contractor shall repair, or replace any damaged property.

PART 2 - EXECUTION

2.01 GENERAL

Site preparation includes the area labeled "Limit of Site Preparation" as shown on the drawings. The Contractor shall grade the area outside the limit of site preparation to the new contours as shown on the drawings.

The project site is a landfill. The Contractor shall remove existing material in accordance with the requirements of Section 02200 and as shown on the drawings, where necessary, and the site subgrade, within the identified Site Preparation Area, shall be continuously compacted with a heavy vibrator for at least 7 working days prior to commencement of fill placement.

Continuous compaction shall comprise, as a minimum operation of a 6-ton vibratory roller in programmed full coverage of the entire area for a minimum of 8 hours per 24 hour day for 7 working days.

All areas within the Site Preparation Area shall have at least 4 feet of compacted imported material, of the type specified or shown for the respective areas, prior to placement of structures, pavement or finished grading.

The composition of the required fill is specified in Section 03300 and is detailed on the drawings.

2.01

The Contractor shall notify the Construction Manager when site preparation is complete. Further work shall not be started until the conditions of paragraph 02100-2.02 are satisfied.

2.02 PERFORMANCE

Unless otherwise specified, the Contractor shall remove obstructions such as brush, trees, logs, stumps, roots, heavy sod, vegetation, rock, stones larger than 6 inches in any dimension, broken or old concrete and pavement, debris, and structures where the completion of the work require their removal.

Material that is removed and is not to be incorporated in the work shall be disposed of approximately 100 feet north of the site. The exact location shall be determined by the Construction Manager. The Owner shall provide the fill cover for the disposed material.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies earthwork which consists of excavation, filling, grading, and excess material control. Site preparation requirements are specified in Section 02100.

1.02 DEFINITIONS

A. COMPACTION:

The degree of compaction is specified as percent compaction. Maximum or relative densities refer to dry soil densities obtainable at optimum moisture content.

B. EXCAVATION SLOPE:

Excavation slope shall be defined as an inclined surface formed by removing material from below existing grade.

C. EMBANKMENT SLOPE:

Embankment slope shall be defined as an inclined surface formed by placement of material above existing grade.

1.03 QUALITY ASSURANCE

A. REFERENCES:

This section references the following documents. They are a part of this section insofar as specified and modified herein. In case of conflict between the requirements of this section and the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
AASHO T176-73	Plastic Fines in Graded Aggregates and Soils by use of the Sand Equivilant Test
ASTM C136-76	Method of Test for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D1556-64	Method of Test for Density of Soil in Place by the Sand-Cone Method
ASTM D1557-70	Method of Test for Moisture-Density Relations of Soils, Using 10 Lb (4.5 kg) Rammer and 18 In. (457 mm) Drop

1.03 A.

<u>Reference</u>	<u>Title</u>
ASTM D3017-78	Method of Test for Moisture Content of Soil and Soil Aggregates In Place by Nuclear Methods (Shallow Depth)

B. TESTS:

The Construction Manager will take samples and perform moisture content, gradation, compaction, and density tests during placement of backfill materials to check compliance with these specifications. The Contractor shall remove surface material at locations designated by the Construction Manager and provide such assistance as necessary for sampling and testing. The Construction Manager may direct the Contractor to construct inspection trenches in compacted or consolidated backfill to determine that the Contractor has complied with these specifications.

Tests will be made by the Construction Manager in accordance with the following:

<u>Test</u>	<u>Standard Procedure</u>
Moisture content	ASTM D3017
Gradation	ASTM C136
Density in-place	ASTM D1556
Moisture-density relationships	ASTM D1557

C. SUBMITTALS:

Samples of fill materials to be used shall be submitted 60 days in advance of use. Samples shall consist of 0.5 cubic feet of each type of material.

PART 2 - MATERIALS

2.01 FILL MATERIALS

A. TYPE A:

Type A material shall be a clean gravel-sand mixture free from organic matter and shall conform to the following gradation:

<u>U.S. standard sieve size</u>	<u>Percent by weight passing</u>
3/4 inch	100
3/8 inch	70-100
No. 4	55-100
No. 10	35-95
No. 20	20-80
No. 40	10-55
No. 100	0-2

2.01 B.

B. TYPE B:

Type B material shall be a select granular material free from organic matter and of such size and gradation that the specified compaction can be readily attained. Material shall have a sand equivalent value of not less than 20 and shall conform to the following gradation:

<u>U.S. standard sieve size</u>	<u>Percent by weight passing</u>
3 inch	100
No. 4	35-100
No. 30	20-100

The coefficient of uniformity shall be 3 or greater.

The material may be an imported quarry waste, clean natural sand or gravel, select trench excavation or a mixture thereof.

C. TYPE C:

(NOT IN CONTRACT)

D. TYPE D:

Type D material shall be granular material commonly known as pea gravel and shall conform to the following gradation:

<u>U.S. standard sieve size</u>	<u>Percent by weight passing</u>
1/4 inch	100
No. 8	0-5

E. TYPE E:

Type E material shall be crushed rock commonly known as drain rock and shall conform to the following gradation:

<u>U.S. standard sieve size</u>	<u>Percent by weight passing</u>
1-1/2 inch	100
3/4 inch	30-75
1/2 inch	15-55
1/4 inch	0-5

2.01 E.

Type E material shall be composed of hard, durable, sound pieces having a specific gravity of not less than 2.65

F. TYPE F:

Type F material shall be crushed rock and shall conform to the following gradation:

<u>U.S. standard sieve size</u>	<u>Percent by weight passing</u>
1-1/2 inch	87-100
3/4 inch	45-90
No. 4	20-50
No. 3	6-29
No. 200	0-12

Type F material shall be composed of hard, durable, sound pieces having a specific gravity of not less than 2.65.

G. TYPE G:

Type G material shall be pervious backfill. Pervious backfill material, shall conform to the following gradation:

<u>U.S. standard sieve size</u>	<u>Percent by weight passing</u>
2 inch	100
No. 50	0-100
No. 100	0-8
No. 200	0-4

H. TYPE H:

(NOT IN CONTRACT)

I. TYPE I:

Type I material shall be 12-inch riprap. Riprap shall be graded rock having a range of individual rock weights as follows:

<u>Weight of stone</u>	<u>Percent smaller by weight</u>
160 pounds	100
100 pounds	80-100
50 pounds	45-80
20 pounds	15-45
5 pounds	5-15
1 pound	0-5

2.01 I.

Specific gravity shall be between 2.5 and 2.82.

J. TYPE J:

(NOT IN CONTRACT)

PART 3 - EXECUTION

3.01 GENERAL

A. CONTROL OF WATER:

The Contractor shall keep excavations reasonably free from water during construction. The static water level shall be drawn down a minimum of 1 foot below the bottom of excavations to maintain the undisturbed state of natural soils and allow the placement of any fill to the specified density. Disposal of water shall not damage property or create a public nuisance. The Contractor shall have on hand pumping equipment and machinery in good working condition for emergencies and shall have workmen available for its operation. Dewatering systems shall operate continuously until backfill has been completed to 1 foot above the normal static groundwater level.

Groundwater shall be controlled to prevent softening of the bottom of excavations, or formation of "quick" conditions. Dewatering systems shall not remove natural soils.

Release of groundwater to its static level shall be controlled to prevent disturbance of the natural foundation soils or compacted fill and to prevent flotation or movement of structures or pipelines.

B. OVEREXCAVATION:

Where the undisturbed condition of natural soils is inadequate for support of the planned construction, the Construction Manager will direct the Contractor to overexcavate to adequate supporting soils. The excavated space shall be filled to the specified elevation with backfill. The overexcavated space under footings may be filled with concrete. The quantity and placement of such material will be paid for as extra work.

C. SURPLUS MATERIAL:

Surplus excavated material shall be disposed of approximately 100 feet north of the construction site. This exact area will be determined by the Construction Manager.

3.01 C.

If the quantity of surplus material is specified, the quantity specified is approximate. The Contractor shall satisfy himself that there is sufficient material available for the completion of the embankments before disposing of any material inside or outside the site. Shortage of material, caused by premature disposal of any material by the Contractor, shall be replaced by the Contractor.

Material shall not be stockpiled to a depth greater than 5 feet above finished grade within 25 feet of any excavation or structure except for those areas designated to be preconsolidated. For these areas, the depth of stockpiled material shall be as specified. The Contractor shall maintain stability of the soil adjacent to any excavation.

D. BORROW MATERIAL:

If the quantity of acceptable material from excavation is not sufficient to construct the embankments required by the work, the quantity of material needed to complete the embankments shall consist of imported borrow conforming to specified requirements.

E. HAULING:

When hauling is done over highways or city streets, the loads shall be trimmed and the vehicle shelf areas shall be cleaned after each loading. The loads shall be watered after trimming to eliminate dust.

F. HAUL ROADS:

The Contractor shall construct haul roads required to transport materials on site. Haul roads shall be removed after completion of embankment construction.

G. FINISH GRADING:

Finished surfaces shall be smooth, compacted and free from irregularities. The degree of finish shall be that normally obtainable with a blade-grader.

Finished grade shall be as specified by the contours plus or minus 0.10 foot except where a local change in elevation is required to match sidewalks, curbs, manholes and catch basins, or to ensure proper drainage. Allowance for topsoil and grass cover, and subbase and pavement thickness shall be made so that the specified thickness of topsoil can be applied to attain the finished grade.

When the work is an intermediate stage of completion, the lines and grades shall be as specified plus or minus 0.5 foot to provide adequate drainage.

3.01 G.

If the soil is to be cultivated or straw is to be incorporated into the surface, rocks larger than 2-1/2 inches in maximum dimension, roots and other debris on the surface of the slope shall be removed and disposed of prior to cultivation or placement of straw.

H. CONTROL OF EROSION:

The Contractor shall maintain earthwork surfaces true and smooth and protected from erosion. Where erosion occurs, the Contractor shall provide fill or shall excavate as necessary to return earthwork surfaces to the grade and finish specified.

3.02 CLASSIFICATION OF FILL

Fill material shall be placed in horizontal layers and compacted with power operated tampers, rollers, idlers, or vibratory equipment. Material type, maximum layer depth, relative compaction, and general application are specified in Table A. Unless otherwise specified, fill classes shall be used where specified in Table A under general application.

Table A, Fill Classifications

<u>Fill Class</u>	<u>Material type</u>	<u>Maximum uncompressed layer depth, inches</u>	<u>Minimum relative compaction, percent</u>	<u>General application</u>
A1	A	8	95	Slabs on grade (other than specified for Class E1)
A2	A	48	95	Initial and subsequent pipeline backfill when ponded or jetted
B1	B	8	95	Structure backfill, initial pipeline backfill
B2	B	8	100	Bedding for pipe
B3	B	8	90	Site fill
D1	D	-	95	Bedding for plastic pipe, initial and subsequent pipeline backfill
E1 ^a	E	8	-	Fill under slabs for structures and tank slabs with pressure relief valves, pipeline bedding
F1	F	12	95	Structure backfill, initial and subsequent pipeline backfill
G1	G	8	95	Bedding for plastic pipe, initial and subsequent pipeline backfill
I1 ^b	I	-	-	Embankment slope face, channel slope face

^aCompaction of layers shall be accomplished in two passes of equipment with complete coverage across the width of the field.

^bFill material shall be grouted as specified in 02200-3.08.

3.03 A.

3.03 EARTHWORK FOR STRUCTURES

A. STRUCTURE EXCAVATION:

Ground shall not be dug by machinery nearer than 3 inches from any finished subgrade. The last 3 inches shall be removed without disturbing the subgrade.

The bottom shall not be more than 0.15 foot above or below the lines and grades specified. If the elevation of structure excavation is not specified, the excavation shall be not more than 0.15 foot above or below the elevation specified for fill material below the structure. Slopes shall vary no more than 0.5 foot from specified grade unless the excavation is in rock where the maximum variation shall be 2 feet.

Should the excavation be carried below the lines and grades specified on the drawings or should the bottom of the excavation be disturbed because of the Contractor's operations and require overexcavation and backfill, the Contractor shall refill such excavated space to the proper elevation in accordance with the procedure specified for backfill.

Unless otherwise specified, excavations shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, installation of services, and for inspection, except where concrete is specified to be placed directly against excavated surfaces.

B. FOUNDATION TREATMENT:

Rock foundations for concrete or masonry footings shall be excavated to sound material. The rock shall be roughly leveled or cut to steps and shall be roughened. Seams in the rock shall be grouted under pressure as directed by the Construction Manager and paid for as extra work.

When footings are to be supported on piles, excavations shall be completed to the bottom of the footings before any piles are drilled or driven therein. When swell or subsidence results from driving piles, the Contractor shall excavate, or backfill the footing area to the grade of the bottom of the footing with suitable material as specified. If material under footings is such that it would mix into the concrete during footing placement or would not support the weight of the fluid concrete, the Contractor shall replace the material with suitable material, install soffit forms or otherwise provide a suitable platform on which to cast the footing as directed by the Construction Manager. This shall be paid for as extra work.

Whenever any structure excavation is substantially completed to grade, the Contractor shall notify the Construction Manager who will make an inspection of the foundation. No concrete or masonry

3.03 B.

shall be placed until the foundation has been inspected by the Construction Manager. The Contractor shall, if directed by the Construction Manager, dig test pits and make test borings and foundation bearing tests. If the material tested is undisturbed soil, the cost thereof will be paid for as extra work.

C. STRUCTURE BACKFILL:

Unless otherwise specified, structure backfill shall be Class Bl.

After completion of construction below the elevation of the final grade, and prior to backfilling, forms shall be removed and the excavation shall be cleaned of debris.

Structure backfill shall not be placed until the subgrade portions of the structure have been inspected by the Construction Manager. No backfill material shall be deposited against concrete structures until the concrete has developed a strength of not less than 2500 pounds per square inch in compression, or until the concrete has been in place for 28 days, whichever occurs first.

Backfill material shall be placed in uniform layers and shall be brought up uniformly on all sides of the structure. When compaction is done by ponding and jetting, thickness of uncompacted layers shall not exceed 4 feet.

Compaction of structure backfill may be performed by ponding and jetting if the backfill material is of such character that it will be self-draining when compacted and that foundation materials will not be damaged by the applied water and no damage from hydrostatic pressure will result to the structure. Ponding and jetting shall not be used within 4 feet of finished grade and shall be performed in such a manner that water will not be impounded.

Unless otherwise specified, backfill around and above pipelines within the excavation line of any structure shall be the same as that specified for structures.

3.04 EARTHWORK FOR PIPELINES AND CONDUITS

Earthwork for pipelines and conduits is specified in Table A and in the standard details.

3.05 EARTHWORK FOR EMBANKMENTS

A. FOUNDATION PREPARATION:

The surface of the foundation shall not contain standing water and shall be free of loose material, foreign objects and rocks

3.05 A.

greater than 6 inches in maximum dimension. After the preparation has been completed, the Contractor shall promptly place and compact the first lift of embankment on the foundation to prevent damage to the surface. If the foundation surface is damaged, the Contractor shall repair the surface to the specified condition. In any areas where materials become soft or yielding, such materials shall be removed, disposed of, and replaced with specified material. The surface of the embankment shall be maintained to permit travel of construction equipment. Ruts in the surface of any layer shall be filled and leveled before compacting.

B. EMBANKMENT FILL:

Rocks, broken concrete, or other solid materials, which are larger than 4 inches in greatest dimension, shall not be placed in embankment areas where piles are to be placed or driven.

Fill material having a sand equivalent value less than 10 shall be placed in the lower portions of embankments and shall not be placed within 2.5 feet of finished grade.

When the embankment material consists of large, rocky material, or hard lumps, such as hardpan or cemented gravel which cannot be broken readily, such material shall be well distributed throughout the embankment. Sufficient earth or other fine material shall be placed around the larger material as it is deposited so as to fill the interstices and produce a dense, compact embankment.

Unless otherwise specified, the embankment shall be raised to form an approximately horizontal plane extending transversely to the final slopes. The embankment shall be crowned at all times during construction so that water will drain readily off the embankment.

The temporary differential elevation between any two adjoining zones of the embankment due to construction operations shall not exceed 24 inches.

If the compacted surface of any layer of material is too smooth to bond properly with the succeeding layer, the surface shall be scarified. If required, the surface shall be sprinkled or otherwise moisture conditioned before the succeeding lift is placed. Any surface crust formed on a layer of fill material that has been dumped and spread shall be broken up by harrowing and, if required, the full depth of the affected layer shall be moisture conditioned immediately prior to rolling.

3.05 C.

C. KEY CONSTRUCTION:

Where specified, a key shall be excavated along the length of the toe of fill slopes. The exposed soils along the key and under fill areas shall be disced and/or scarified to a depth of at least 12 inches, moisture conditioned to within 3 percent of optimum moisture content, and compacted to at least 90 percent of maximum dry density.

D. EMBANKMENT TOLERANCES:

1. GENERAL: Embankment slopes within 4 feet of shoulder grade shall vary less than 0.5 foot from the designated slope. Slopes beyond 4 feet from shoulder grade shall vary less than 1 foot from the designated slope. Measurements for variance shall be made perpendicular to the slope. Slopes which are 6 to 1 or flatter shall vary less than 0.2 foot from the designated slope.

If embankments are constructed of rock greater than 12 inches in diameter, the slopes more than 4 feet below shoulder grade may vary up to 2 feet from the designated slope.

2. ROADWAY EMBANKMENT TOLERANCES: The excavated surface shall be less than 0.08 foot above or below the grades specified after deducting for the roadway pavement thickness.

Vertical alignment tolerances permitted on the roadway surface shall not exceed plus or minus 0.30 feet from the vertical alignment specified, with the provision that within the tolerance range local surface irregularities shall not exceed 0.15 feet as measured by the gap between the roadway surface and a 10-foot straightedge placed on any flat graded surface. On vertical curves, the same standards will apply except that an additional gap allowance will be made for the road surface curvature over the 10-foot length of the straightedge.

Horizontal alignment tolerances permitted shall not exceed plus or minus 1 foot providing the departure is relatively uniform over over any specific length of the roadway.

Roadway median strips shall be graded to drain and shall not vary more than 0.1 foot from the specified grade.

E. SURCHARGE EMBANKMENT:

The surcharge embankment shall remain in place for the required settlement period before excavation for footings or construction of foundation piles.

Surcharge embankments shall not encroach upon traveled ways nor upon existing improvements that are subject to damage. The Contractor shall restrain the embankment material.

3.06

3.06 SUBGRADE FOR PAVEMENT

The prepared subgrade shall be scarified to a depth of at least 12 inches and recompactd to at least 90 percent of the maximum density.

3.07 SITE FILL

Unless otherwise specified, site fill shall be Class C2 fill. If the existing slope in an area to be filled is greater than 5:1, the Contractor shall bench the area prior to filling.

END OF SECTION

SECTION 02350

SHEETING, SHORING, AND BRACING

PART 1 - GENERAL

1.01 SCOPE

This section specifies requirements for sheeting, shoring, and bracing of trenches greater than 5 feet in depth.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
CAL OSHA	State of California Construction Safety Orders
--	California State Labor Code

1.03 SUBMITTALS

The Contractor shall submit to the Owner information required by Section 6705 of the California State Labor Code. Submittals shall be made in accordance with Section 01300 of this project manual.

1.04 DESIGN REQUIREMENTS

The Contractor shall design sheeting, shoring, and bracing in accordance with Article 6 of CAL OSHA and the California State Labor Code. The standards of design referred to in the Labor Code shall be those of CAL OSHA.

PART 2 - EXECUTION

2.01 GENERAL

The construction of sheeting, shoring, and bracing shall not disturb the state of soil adjacent to the trench and below the excavation bottom.

2.02 SEQUENCE

Trench excavation shall not be started until the design for trench support has been accepted by the Owner.

END OF SECTION

SECTION 02445
CHAIN LINK FENCE

PART 1 - GENERAL

1.01 DESCRIPTION

This section provides specifications for galvanized chain link fencing.

1.02 SUBMITTALS

Submittals shall comply with Section 01300 and paragraph 11000-1.03.

1.03 STANDARDS

Reference is made to various sections of the standard specifications, State of California, Department of Transportation (CALSPEC).

PART 2 - PRODUCTS

2.01 MATERIALS

A. CHAIN LINK FENCE:

Materials for the chain link fencing shall conform to Section 80-4 of Caltrans Standard Specifications, January 1981. Dimensions are as shown on the drawings.

B. CONCRETE:

Concrete for post footings shall conform to the provisions of Section 03300 of these specifications.

C. WIRE FABRIC:

Wire fabric of chain link fencing shall be 9-gage woven into approximately 2-inch mesh and galvanized after fabrication. Posts shall be galvanized steel.

3.01 A.

PART 3 - EXECUTION

3.01 GENERAL

A. CHAIN LINK FENCE:

Chain link fence construction shall conform to Section 80-4 of CALSPEC.

END OF SECTION

SECTION 02500

PAVING

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies paving which consists of aggregate base, pavement, walkways, curbs and gutters.

1.02 QUALITY CONTROL

A. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

ASTM D1557-70 Methods of Test for Moisture-Density Relations of Soils, Using 10-Lb. (4.5-kg) Rammer and 18-In. (457-mm) Drop.

ASTM D994-77 Preformed Expansion Joint Filter for Concrete (Bituminous Type)

CALTRANS Standard Specification, State of California Business and Transportation Agency, Department of Transportation, 1978.

B. TESTING:

Testing will be conducted by the Construction Manager to determine compliance with the specified degree of compaction and moisture content.

PART 2 - PRODUCTS

2.01 MATERIALS

A. AGGREGATE BASE:

Aggregate base shall be Class 2, 3/4-inch maximum grading conforming to Caltran Section 26. Aggregate base under the gas collection piping system shall be 24 inches deep. Aggregate base under other paved areas shall be 12 inches deep.

B. LIQUID ASPHALT:

Liquid asphalt for tack coats and treatment of aggregate base shall be Grade MC 250 and shall comply with Caltran Section 93.

2.01 C.

C. ASPHALT CONCRETE:

Aggregate shall be Type B, 1/2 inch maximum medium grading, conforming to Caltran Section 39. Asphalt binder shall be paving asphalt, Grade AR-4000, and shall comply with Caltran Section 92. Asphalt concrete mixing and proportioning shall comply with Caltran Section 39.

D. (NOT IN CONTRACT)

E. CONCRETE AND REINFORCING STEEL:

Concrete and reinforcing steel for walkways, curbs and gutters shall be as specified in Section 03300.

F. EXPANSION JOINT FILLER:

Expansion joint filler shall be premolded, composed of asphalt fiber and mineral filler with asphalt impregnated liners on both sides, and shall conform to ASTM D994.

PART 3 - EXECUTION

3.01 GENERAL

Construction shall conform to the details, dimensions and grades specified. Maximum variations in finished grade of paving shall be plus or minus 0.05 feet.

3.02 AGGREGATE BASE PLACEMENT

A. SUBGRADE:

Areas to be paved shall be graded and compacted in accordance with Section 02200.

Where specified, the subgrade shall be treated with lime in accordance with Caltran Section 24 utilizing 5 percent (dry weight) hydrated lime.

B. AGGREGATE BASE:

Placing of aggregate base shall comply with Caltran Section 26. Relative compaction shall be a minimum of 95 percent as determined by ASTM D1557.

3.03 A.

3.03 ASPHALT CONCRETE PAVEMENT

A. ASPHALT CONCRETE:

Placement of asphalt concrete pavement shall comply with Caltran Section 39. Berms shall be shaped and compacted with an extrusion machine.

B. PAINT BINDER APPLICATION:

Immediately prior to construction of asphalt concrete berms, or where specified, a continuous paint binder shall be applied to the pavement surface. Application shall be in accordance with Caltran Section 39-4.02 and shall not cause a slip or weakened plane between the two joined surfaces.

3.04 CONCRETE WALKWAYS, CURBS AND GUTTERS

A. GENERAL:

Concrete work shall be performed in accordance with Section 03300 of these specifications and Caltran Section 79.

B. EXPANSION JOINT INSTALLATION:

Unless otherwise specified, expansion joints shall be provided in concrete work at intervals not to exceed 20 feet and against structures abutting concrete curbs and walkways.

END OF SECTION

DIVISION 3

CONCRETE

Section

Title

03200	CONCRETE REINFORCEMENT
03300	CAST-IN-PLACE CONCRETE
03600	GROUT

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies reinforcing steel for use in reinforced concrete.

1.02 QUALITY ASSURANCE

A. QUALITY CONTROL BY CONTRACTOR:

To demonstrate conformance with the specified requirements for cast-in-place concrete, the Contractor shall provide the services of an independent testing laboratory which complies with the requirements of ASTM E329. The testing laboratory shall sample and test concrete materials as required in Section 03300. Costs of testing laboratory services shall be borne by the Contractor.

B. REFERENCE STANDARDS:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ASTM A82-79	Standard Specification for Cold-Drawn Steel Wire for Concrete Reinforcement
ASTM A185-79	Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement
ASTM A615-81a	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM E329-77	Standard for Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction
ASTM D12.1-79	Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction

	1.02 B.
CALSPEC	State of California, Department of Transportation, Standard Specification, 1981
CRSI	Placing Reinforcing Bars, 1978
CRSI	Manual of Standard Practice, 1980
FEDSPEC QQ-W-461G	Wire, Steel, Carbon (Round, Bare, and Coated)

1.03 INFORMATION TO BE PROVIDED

The following information shall be provided:

1. Bar placement drawings
2. Bar lists and bending details
3. Certified mill test reports
4. Bar tags
5. Welder qualification certificate in accordance with AWS D1.4-79.

PART 2 - PRODUCTS

2.01 BAR REINFORCEMENT

Reinforcing bars, except No. 2 bars, shall be deformed billet-steel conforming to ASTM A615, Grade 40, including supplementary requirements.

2.02 WIRE FABRIC

Wire fabric shall be 6-inch by 6-inch welded steel mesh conforming to ASTM A185.

2.03 WIRE AND PLAIN BARS

Wire used as reinforcement and bars used as spiral reinforcement in structures as shown on the drawings shall be cold drawn steel conforming to ASTM A82-79.

2.04 TIE WIRE

The wire shall be minimum 16 gage annealed steel conforming to FEDSPEC QQ-W-461H.

2.05

2.05 BAR SUPPORTS

Bar supports shall be located in accordance with CRSI Manual of Standard Practice and placed in accordance with CRSI 78. Concrete block supports shall be provided for footing and slabs. Standard steel supports shall be provided for other work.

PART 3 - EXECUTION

3.01 GENERAL

The Owner is defining the quality of concrete reinforcement by specifying some of the means, methods, techniques, sequences and procedures for installation of concrete reinforcement. The Contractor, without relinquishing authority and responsibility for supervision and direction of the work, agrees to follow the specified means, methods, techniques, sequences and procedures.

3.02 FABRICATION

Reinforcing steel shall not be bent or straightened in a manner which will injure the material. Bars with kinks or with bends not shown shall not be used. Heating or welding bars shall be performed in accordance with CALSPEC Section 52.1.08B. Bars shall not be welded at the bend. Tack welding of cross bars is not acceptable.

3.03 PLACEMENT

Reinforcing steel shall be placed in accordance with CALSPEC Section 52.1.07.

Reinforcing steel shall be positioned accurately and secured against displacement by using annealed iron wire or clips at intersections and shall be supported by concrete or metal chairs, spacers or metal hangers. Steel rods and pegs may be used to support reinforcing steel on rock foundations. Reinforcing steel shall be placed in such a manner as to not damage waterproofing membrane or plastic lining which have been previously applied or constructed. Reinforcing steel shall be bent or slightly relocated where necessary to clear waterstop. Reinforcing steel shall not be placed on fresh concrete or forced into fresh concrete.

Positioning support for embedded items shall not be welded to the reinforcement. Additional reinforcement may be provided for this purpose.

3.04 SPLICING

Reinforcing steel shall be spliced as shown.

3.04

In slabs, beams, girders and walls subject to lateral pressure, reinforcing steel shall not be spliced in areas of maximum stress. Splices of adjacent bars shall be staggered. Splices in welded wire fabric shall be at least 1-1/2 meshes wide.

3.05 CLEANING

Reinforcing steel shall be cleaned of mill rust scale, dried concrete, or other coatings that may reduce bond. Reinforcement reduced in section is not acceptable. When concrete placement is delayed, reinforcement shall be cleaned by sandblasting.

****END OF SECTION****

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 QUALITY ASSURANCE

A. QUALITY CONTROL BY CONTRACTOR:

To demonstrate conformance with the specified requirements for cast-in-place concrete, the Contractor shall provide the services of an independent testing laboratory which complies with the requirements of ASTM E329. The testing laboratory shall sample and test concrete materials as specified in paragraphs 03300-2.01, 2.02, and 3.16. Costs of testing laboratory services shall be borne by the Contractor.

B. BASIS FOR QUALITY:

(NOT IN CONTRACT)

C. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ACI 211.1-81	Recommended Practice for Selecting Proportions for Normal and Heavy Weight Concrete
ACI 214-77	Recommended Practice for Evaluation of Strength Test Results of Concrete
ACI 301-72 (1981)	Specifications for Structural Concrete for Buildings
ACI 305R-77	Hot Weather Concreting
ACI 306R-78	Recommended Practice for Cold Weather Concreting
ACI 347-78	Recommended Practice for Formwork
ASTM C33-81	Standard Specification for Concrete Aggregate

1.01 C.

<u>Reference</u> (cont'd)	<u>Title</u>
ASTM C39-80	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94-81	Standard Specification for Ready-Mixed Concrete
ASTM C136-81	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C143-78	Standard Test Method for Slump of Portland Cement Concrete
ASTM C150-81	Standard Specification for Portland Cement
ASTM C157-80	Standard Test Method for Length Change of Hardened Cement Mortar and Concrete
ASTM C260-77	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309-81	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C618-80	Standard Specification for Fly Ash or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM D75-71 (1978)	Standard Methods of Sampling Aggregates
ASTM E329-77	Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials As Used in Construction

1.02 SUBMITTALS

A. CONCRETE MIX DESIGN AND TESTS:

Reports of concrete mix designs shall be submitted in accordance with Section 01300. Requirements for the reports are specified in paragraph 2.02 C.

1.02 B.

B. LABORATORY TEST REPORTS:

Before delivery of materials, three copies of the reports of the tests specified herein shall be provided. Test reports on previously tested materials shall be accompanied by the manufacturer's statement that the previously tested material is the same type, quality, manufacture and make as that proposed for use in this project. Test reports are required for the following:

1. Cement
2. Aggregates
3. Pozzolan
4. Admixtures
5. Curing compounds
6. Retardants
7. Bonding compounds

PART 2 - PRODUCTS

2.01 MATERIALS

A. CEMENT:

Portland cement shall be ASTM C150, Type II or Type V, low alkali, containing less than 0.60 percent alkalies. Portland-pozzolan cement shall be ASTM C595, Type IP(MS), interground, low alkali.

B. AGGREGATES:

1. GENERAL: Except as modified herein, fine and coarse aggregates shall conform to ASTM C33. Fine and coarse aggregates shall be regarded as separate ingredients. Aggregates shall be nonreactive and shall be washed before use.

When sources of aggregates are changed, test reports shall be provided for the new material.

The tests specified shall be performed prior to commencing concrete work.

2. FINE AGGREGATE: Fine aggregate shall be hard, dense, durable particles of either sand or crushed stone regularly graded from coarse to fine. When tested in accordance with ASTM C136, gradation shall conform within the following limits:

2.01 B.2.

<u>U.S. Standard Sieve Size</u>	<u>Percent by Weight Passing</u>
3/8 inch	100
No. 4	95-100
No. 8	65-95
No. 16	47-70
No. 30	27-45
No. 50	10-21
No. 100	2-8
No. 200	0-2

Fine aggregate shall not exceed 40 percent by weight of combined aggregate total, except for concrete with coarse aggregate of less than maximum size 1/2 inch.

Variations from the specified gradations in individual tests will be acceptable if the average of three consecutive tests is within the specified limits and the variation is within the permissible variation listed below:

<u>U.S. Standard Sieve Size</u>	<u>Permissible Variation in Individual Tests, Percent</u>
30 and coarser	2
50 and finer	0.5

3. COARSE AGGREGATE: Coarse aggregate shall be hard, dense and durable gravel or crushed rock free from injurious amounts of soft and friable particles, alkali, organic matter and other deleterious substances.

Before and during field trial mixes, the Contractor may make minor adjustments to the above gradation to produce the specified concrete.

During progress of the work, variations from the specified gradations will be acceptable in individual tests if the average of three consecutive tests is within the specified limits.

C. POZZOLAN:

Pozzolan shall be Class N, natural pozzolan, or Class F, fly ash, conforming to ASTM C618. Fly ash pozzolan shall contain less than 1 percent by weight carbon and less than 3 percent by weight sulfur trioxide. Pozzolan supplied during the life of the project shall have been formed at the same single source.

The pozzolan color shall not substantially alter the resulting concrete from the normal grey color and appearance.

2.01 D.1.

D. ADMIXTURES:

1. GENERAL: Admixtures shall be compatible with the concrete. Calcium chloride or admixtures containing calcium chloride are not acceptable. Admixtures shall be used in accordance with the manufacturer's recommendations and shall be added separately to the concrete mix.

2. WATER REDUCING RETARDER: Water reducing retarder shall be ASTM C94, Type D, and shall be Master Builders, Pozzolith 300-R; Sika Chemical Corp., Plastiment; or equal.

The water reducing retarder shall reduce the water required at least 11 percent for a given concrete consistency and shall comply with the water/cement ratio standards of ACI 211.1-77.

3. AIR ENTRAINING AGENT: Air entraining agent shall be Master Builders, MB-AE10; W. R. Grace and Co., DaraVair; or equal. The air entraining agent added shall produce an entrained air content between 3 and 5 percent in accordance with ASTM C260.

E. WATER:

Water for washing aggregate, for mixing and for curing shall be free from oil and deleterious amounts of acids, alkalies, and organic materials; shall not contain more than 1000 mg/l of chlorides as Cl, nor more than 1300 mg/l of sulfates as SO₄; and shall not contain an amount of impurities that may cause a change of more than 25 percent in the setting time of the cement nor a reduction of more than 5 percent in the compressive strength of the concrete at 14 days when compared with the result obtained with distilled water. Additionally, water used for curing shall not contain an amount of impurities sufficient to discolor the concrete.

2.02 CONCRETE CHARACTERISTICS

A. MIX PROPORTIONING:

Concrete shall be normal weight concrete composed of specified cement, pozzolan, admixtures, aggregates and water proportioned and mixed to produce a workable, strong, dense, and impermeable concrete. The Contractor may substitute interground portland-pozzolan cement conforming to ASTM C595, containing the specified amount of pozzolan in lieu of portland cement and pozzolan. Pozzolan may be omitted in concrete exposed to normal atmospheric conditions and concrete not in contact with the ground or liquid.

2.02 A.

Concrete shall be provided in accordance with the following:

Maximum coarse aggregate size, inch	Min. cement content, sacks/cu yd concrete	Pozzolan, percent by weight of portland cement	Air entraining agent	Water reducing retarder	Minimum (a) 28-day compressive strength, psi
1-1/2	4.75	18-20	Yes	Yes	3000
1-1/2	5.0	0	Yes	Yes	3000

Notes for table:

(a) Compressive strength shall be determined at the end of 28 days based on test cylinders made and tested in accordance with ASTM C39.

Concrete slump sampled in accordance with ASTM C172 and tested in accordance with ASTM C143 shall be 4-1/2 inches maximum to 2 inches minimum.

B. CONTROL TESTS:

1. MIX DESIGN: Before beginning concrete work, the Contractor shall determine the proper proportions of materials for each strength and class of concrete. The mix shall consist of specified cement, pozzolan, admixtures, aggregate and water. Methods for selecting and adjusting proportions of the ingredients shall be in accordance with ACI 211.1. The laboratory reports of each mix design shall state whether the items reported comply with the specifications and shall show (1) the expected strength, (2) corresponding slump, (3) expected drying shrinkage, (4) weights and test results of the ingredients, and (5) other physical properties necessary to check each mix design.

2. FIELD TRIAL MIX: After acceptance of laboratory mix design and prior to concrete placement, the Contractor shall establish, based upon the accepted design mixes. Field trial concrete shall be manufactured using the equipment to be used for the work. Minor adjustments shall be made in the design mixes to provide a dense, homogeneous, durable concrete with good workability and finishing qualities. Six standard test cylinders shall be obtained from the field trial mixes for concrete and tested as specified for mix design test cylinders. Drying shrinkage shall be measured as specified in paragraph 2.02 C.3. The Construction Manager shall be notified one week in advance of field trial mix work; field trial mix work shall be performed with representatives of the Construction Manager and the testing laboratory being present. Certified copies of the laboratory test results shall be submitted to the Construction Manager.

2.02 B.2.

Concrete shall not be placed in the field prior to acceptance of the field trial mix.

3. DRYING SHRINKAGE: Drying shrinkage specimens shall be prepared from the same concrete used for preparing compression test cylinders for mix design and for field trial mix. From each mix, three specimens shall be prepared. The drying shrinkage specimens shall be 4 x 4 x 11 inch prisms with an effective gage length of 10 inches, prepared, cured, dried and measured in accordance with ASTM C157 and as modified herein. Specimens shall be removed from molds at an age of 23 ± 1 hour after batching and shall be placed immediately in water at 73 ± 3 degrees F. Expansion, expressed as a percentage of original length, shall be measured at age 7 days. This length at age 7 days shall be the base length for drying shrinkage calculations. Specimens shall then be stored immediately in a humidity control room maintained at 73 ± 3 degrees F and 50 ± 4 percent relative humidity for the remainder of the test. Measurement, to determine the drying shrinkage, expressed as percentage of base length, shall be made and reported separately for 7, 14, 21 and 28 days of drying after 7 days of moist curing.

The average drying shrinkage of each group of the test specimens after 28 days of drying shall not exceed the following:

<u>Specimen</u>	<u>Drying shrinkage, percent</u>
Mix design	0.043
Field trial	0.055

2.03 WATERSTOPS

(NOT IN CONTRACT)

2.04 JOINT FILLERS AND SEALANTS

Preformed joint fillers, mastic sealant, and rubber sealant shall be as specified in Section 07600.

2.05 BONDING COMPOUNDS

Epoxy resin bonding compounds shall be used for wet areas and shall be Adhesive Engineering, Concrete Nos. 1001, 1001-LPL or 1180 as applicable; Sika Chemical Corporation, Sikastix 350, 370 or 390 as applicable; or equal.

Nonepoxy bonding compounds shall be used for dry areas and shall be Burke Concrete Accessories, Inc., BondCrete PVA; Standard Dry Wall Products, Inc., Acryl 60; Thorobond; or equal.

Bonding compounds shall be applied in accordance with the manufacturer's instructions.

2.06 RETARDANT

Retardant for exposing aggregates for nonformed surfaces in construction joints shall be Sika Rugasol-C, Horn Aggretex-H, or Burke Aggreveal-C, or equal. Retardant shall be applied in accordance with manufacturer's instructions sufficient to assure a minimum penetration of 1/8 inch.

2.07 SURFACE HARDENER

Surface hardener shall be premixed, noncolored, nonmetallic Master Builders, Mastercron; W. R. Grace and Co., Duraflex; or equal. Surface hardener shall be applied in accordance with manufacturer's instructions.

PART 3 - EXECUTION

3.01 GENERAL

As provided in paragraph 00710-2.03 B, the Owner is defining the quality of cast-in-place concrete by specifying in this part some of the means, methods, techniques, sequences and procedures for construction of cast-in-place concrete. The Contractor, without relinquishing authority and responsibility for supervision and direction of the work, agrees to follow the specified means, methods, techniques, sequences and procedures. Concrete formwork shall be in accordance with ACI 374-78.

3.02 CONCRETE

Concrete shall be truck-mixed, ready-mixed concrete conforming to the applicable portions of ASTM C94. Materials shall be proportioned by weighing. Pozzolan shall be introduced into the mixer with cement and other components of the concrete mix; pozzolan shall not be introduced into a wet mixer ahead of other materials or with mixing water. Water shall be introduced at the time of charging the mixer; additional water may be introduced within 45 minutes from charging the mixer, provided the specified slump is not exceeded; or the Contractor shall be responsible for producing concrete of the specified characteristics. He shall arrange with his testing laboratory for inspection as required to comply with these specifications.

Concrete shall be delivered to the site of work and discharge shall be completed within 1-1/2 hours after introduction of the water to the mixture.

3.03 A.

3.03 CONVEYING AND PLACING CONCRETE

A. CONVEYING CONCRETE:

Concrete shall be conveyed from the mixer to the forms in accordance with ACI 301, Chapter 8. Concrete which has segregated in conveying shall be removed from the site of the work.

B. PLACING CONCRETE:

1. GENERAL: Concrete shall be placed in accordance with ACI 301, Chapter 8, and ACI 304, Chapter 6.

2. PLACING CONCRETE BY PUMPING: Pumped concrete shall be the consistency specified in paragraph 2.02 A.

Slump shall be measured at the hose discharge. Slump loss in pumping, measured between the pumping unit inlet hopper and the hose discharge, shall not exceed 1 inch. Before starting each pumping operation, the pump and line shall be primed with a cement slurry to lubricate the system. Cement slurry shall be wasted outside the forms.

3. PLACING CONCRETE IN HOT WEATHER: In hot weather, concrete shall be placed in accordance with ACI 305R.

4. PLACING CONCRETE IN COLD WEATHER: In cold weather, concrete shall be placed in accordance with ACI 306R.

3.04 CONSOLIDATING CONCRETE

Concrete shall be consolidated in accordance with ACI 301, Chapter 8. Concrete placing shall be suspended if proper consolidation is not being secured until proper consolidation can be achieved.

3.05 CURING AND SEALING

Concrete shall be kept wet continuously for a minimum of 10 days after placement. Absorptive mats or fabric may be used to retain moisture during the curing period. Repairs or treatment of concrete surfaces shall be coordinated so that interruption of the curing will not be necessary. Concrete surface temperature shall be maintained between 50 degrees F and 80 degrees F for at least 5 days.

After 48 hours of water cure, and except as specified below, concrete curing may be completed using a membrane curing compound.

3.06 PROTECTION

Concrete shall be protected from injurious action by sun, rain, flowing water, frost and mechanical injury, and shall not be allowed to dry out from the time it is placed until the expiration of curing periods.

Steel troweled slabs shall be protected with kraft paper, 6 mil thick polyethylene membrane, or other similar waterproof material for at least two weeks after placement. Joints between adjacent strips of the paper shall be sealed. Float or broom finished slabs need be protected after curing only in areas subject to damage during construction.

3.07 CONSTRUCTION JOINTS

A. GENERAL:

Concrete in each unit of construction shall be placed continuously. Before new concrete is placed on or against concrete which has set, forms shall be retightened and the surface of the set concrete shall be cleaned of foreign matter. Concrete surfaces on which new concrete is placed shall not be wetted. Watertight joints shall be provided as specified in paragraph 3.10.

B. CONSTRUCTION:

Construction joints shall be formed as specified. A rough surface of exposed concrete aggregates shall be produced using a surface retardant at construction joints. The limit of the treated surfaces shall be 1 inch away from the joint edges. Within 24 hours after placing, retarded surface mortar shall be removed either by high pressure water jetting or stiff brushing or combination of both so as to expose coarse aggregates. A rough surface of exposed aggregate may also be produced by sandblasting followed by high pressure water jetting. Sandblasting, if used, shall remove 1/8 inch of laitance film and shall expose coarse aggregate to insure adequate bond and watertightness at the construction joints. Unless shown otherwise, walls and slab shall be cast in panels not to exceed 40 feet in length.

Vertical construction joints shall be grooved at exposed faces. Grooves subjected to wetting or weather shall be calked with joint sealer as specified.

3.08 INSERTS AND EMBEDMENTS

A. INSERTS:

Where pipes, castings or conduits are to pass through structures, the Contractor shall place such pipes or castings in the forms before placing the concrete, or he may provide

3.08 A.

openings in the concrete for subsequent insertion of such pipes, castings or conduits. Such openings shall be provided with waterstops and V-shaped construction joint as shown and shall have a slight flare to facilitate grouting and permit the escape of entrained air during grouting.

Additional reinforcement shall be provided around large openings as shown. The grout shall be nonshrink grout as specified in Section 03600.

B. EMBEDMENTS:

Special castings, channels or other miscellaneous metal parts that are to be embedded in the concrete shall be set and secured in the forms prior to concrete placement. Unless otherwise specified, anchor bolts and inserts shall be embedded in concrete as shown. The Contractor shall provide inserts, anchors or other bolts necessary for the attachment of piping, valves, metal parts and equipment. Nailing blocks, plugs, strips, and the like necessary for the attachment of trim, finish and similar work shall be provided. Voids in sleeves, inserts and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids.

3.09 EXPANSION JOINTS

Expansion joints shall be as shown. Joint fillers and sealants shall be as specified in Section 07600. Reinforcement or other embedded metal items bonded to the concrete shall not extend through expansion joints.

3.10 WATERSTOPS

(NOT IN CONTRACT)

3.11 MODIFICATION OF EXISTING CONCRETE

(NOT IN CONTRACT)

3.12 FORMED SURFACE FINISHES

A. REPAIR OF SURFACE DEFECTS:

Surface defects, including tie holes, minor honeycombing or otherwise defective concrete shall be repaired in accordance with ACI 301, Chapter 9. Areas to be patched shall be cleaned. Minor honeycombed or otherwise defective areas shall be cut out to solid concrete to a depth of at least 1 inch. The edges of the cut shall be perpendicular to the surface of the concrete. Patches on exposed surfaces shall be finished to match the adjoining surfaces

3.12 A.

after they have set. Patches shall be cured as specified for the concrete. Finished surfaces shall be protected from stains and abrasions. Finishes shall be equal in workmanship, texture and general appearance to that of the adjacent concrete. Concrete with honeycombing which exposes the reinforcing steel or with defects which affect structural strength shall be corrected.

B. FORMED SURFACE FINISHING:

Formed surfaces shall be finished as soon as practicable after form removal and repair of surface defects. Finishes shall be as follows.

1. FINISH A: Finish A shall be a grout clean finish in accordance with ACI 301, Section 10.3.2. Surfaces shall be lightly sandblasted prior to sacking. For interior areas not exposed to moisture or weather, water used in the mortar shall be mixed with a PVA bonding compound as recommended by the manufacturer. Finish A shall be provided for painted and unpainted surfaces; and exposed vertical and sloped surfaces.

2. FINISH B: Finish B shall be the same as Finish A, except that the final burlap rubbing may be omitted, providing the steel trowel scraping removes the loose buildup from the surface. Finish B shall be provided for waterproof and moistureproof coated surfaces.

3. FINISH C: Finish C shall be referred to as a finish which has surface imperfections less than 3/8 inch in any dimension. Surface imperfections greater than 3/8 inch shall be repaired or removed and the affected areas neatly patched. Finish C or smoother shall be provided for interior surfaces of wet areas from 1 foot below minimum water surfaces and down and otherwise unfinished interior surfaces.

4. FINISH D: Finish D shall be the finish for surfaces which may be left as they come from the forms, except that tie holes shall be plugged and defects greater than 1/2 inch in any dimension shall be repaired.

3.13 SLAB FINISHES

A. GENERAL:

The finishes specified herein include surface finishes, treatments and toppings for floors and slabs. Floors shall be sloped to drain uniformly. Unless otherwise specified, slope shall be minimum 1/8 inch per foot towards nearest drain. Where finish is not specified, floor slabs shall receive steel troweling. Dry cement shall not be used on new concrete surfaces to absorb excess moisture. Edges shall be rounded to a radius

3.13 A.

of 1/2 inch. Joints shall be grooved to a radius and depth of 1/4 inch each. Finishes shall match the sample panels provided under paragraph 1.04.

B. FLOAT FINISH:

Float finish shall conform to ACI 301, Section 11.7.2. Floating shall be performed with a hand or power-driven float. Floating of any one area shall be the minimum necessary to produce the finish specified. Floating shall compact and smooth the surface and close any cracks and checking of surfaces. Float finish shall be applied to surfaces of channel and tank bottom slabs and to footings.

C. STEEL TROWEL FINISH:

Steel trowel finish shall conform to ACI 301, Section 11.7.3. Immediately after final troweling, the surface shall be cured and protected as specified in paragraphs 3.04 and 3.05. Steel trowel finish shall be provided on floors unless specified otherwise. Surface hardener shall be troweled into the finished surface where specified.

D. BROOMED FINISH:

Broomed finish shall conform to ACI 301, Section 11.7.4. Broomed finish shall be provided for walks, tops of tanks, slabs on grade exposed to atmosphere, and where otherwise indicated or specified.

3.14 TOPPING CONCRETE

(NOT IN CONTRACT)

3.15 RELATED SURFACES

A. MONOLITHIC SURFACING:

Monolithic surfacing shall be provided on floor areas as shown and specified. Monolithic surfacing shall consist of a steel trowel finish hardened with a surface hardener as specified in paragraph 2.07. Surface hardener shall be applied in an amount of at least 0.75 pounds per square foot. Surface hardener shall be applied in accordance with the manufacturer's recommendations and directions.

B. STAIR TREAD:

Stair tread shall be constructed with nonskid nosing as specified in Section 05530. Tread shall have a steel trowel finish with surface hardener and shall have a slope of 1/8 inch per foot toward the front. Ends of treads shall have a 1/16 to 1/8 inch cut between concrete and metal tread to allow for expansion.

3.15 C.1.

C. FINISHING OF UNFORMED SURFACES:

1. RELATED UNFORMED SURFACES: Tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of the adjacent formed surfaces. Final treatment of formed surfaces shall continue uniformly across the unformed surfaces.

2. PAVEMENTS AND SIDEWALKS: The surfaces of the concrete shall be screeded to grade and sloped to drain. After screeding, the surface shall receive a broomed finish as specified in paragraph 3.13 D. Edges and expansion joints shall be rounded to a radius of 1/2 inch. Joints shall be grooved to a radius and depth of 1/4 inch each.

3.16 FIELD SAMPLING AND TESTS

A. GENERAL:

Field sampling and testing shall be performed by the independent testing laboratory specified in paragraph 1.01 A. Samples of aggregates and concrete shall be taken at random locations and at such times to represent the quality of the materials and work throughout the project. The laboratory shall provide the necessary labor, materials and facilities for sampling the aggregate and for casting, handling and storing the concrete samples at the site of work. Aggregates shall be sampled in accordance with paragraph 3.16 B not less than 30 days prior to the use of such aggregates in the work. The minimum number of samples and tests are specified in paragraph 3.16 C.

B. SAMPLING:

Materials shall be sampled as follows and tested in accordance with paragraph 3.16 C.

1. AGGREGATES:

a. GENERAL: Fine and coarse aggregates shall be sampled in accordance with ASTM D75. Samples shall be taken at the discharge gates of the bins feeding the weigh hopper. The Contractor shall provide safe and suitable facilities for obtaining samples. Samples shall be obtained at the concrete batch plant at the frequency specified in paragraph 3.16 C. Sampling shall be repeated when the source of material is changed or when unacceptable deficiencies or variations from the specified requirements of materials are found in testing. Aggregate samples shall be tagged and their sources identified.

3.16 B.1.b.

b. COARSE AGGREGATE: A sample weighing between 50 and 60 pounds shall be taken after the batch plant is brought up to full operation. The samples shall be taken so that a uniform cross section, accurately representing the materials on the belt or in the bins, is obtained.

c. FINE AGGREGATE: Samples shall be taken as specified for coarse aggregate. The samples shall be taken for sieve analysis of fine aggregate and specific gravity tests. Samples of sand shall be taken when the sand is moist.

2. CONCRETE: Samples of plastic concrete shall be obtained in accordance with ASTM C172. Samples for pumped concrete shall be taken at the hose discharge point. Samples for other concrete shall be taken at the hopper of concreting equipment or transit mix truck.

Samples taken in accordance with this paragraph shall be tested as follows.

C. TESTING:

1. AGGREGATE: A minimum of one test of coarse aggregate per 400 cubic yards of concrete and a minimum of one test of fine aggregate per 200 cubic yards of concrete used shall be made to confirm continuing conformance with specifications for gradation, cleanliness and sand equivalent. A maximum of one test per day of each aggregate is required. The full test program is required before source changes will be accepted.

2. CONCRETE:

a. STRENGTH TESTS: The strengths specified for the design mix shall be verified by the testing laboratory during placement of the concrete. Verification shall be accomplished by testing standard cylinders of concrete samples taken at the job site.

Standard cylinders shall represent the concrete placed in the forms. One set of four standard cylinders shall be cast of each class of concrete for each 100 cubic yards or less or for each 4000 square feet of surface area poured per day in each separate structure of each class of concrete. A fifth cylinder shall be cast for every three sets of four cylinders. Casting, handling and curing of cylinders shall be in accordance with ASTM C31. Additional cylinders shall be provided when an error in batching is suspected. For the first 24 hours after casting, the cylinders shall be kept moist in a storage box constructed and located so that its interior air temperature will be between 60 and 80 degrees F. At the end of 24 hours, the cylinders shall be transported to the testing laboratory.

3.16 C.2.a.

Testing of specimens for compressive strength shall be in accordance with ASTM C39. Tests shall be made at 7 and 28 days from time of casting. Two test cylinders from each group of four shall be tested at the end of 7 days and two shall be tested at the end of 28 days. The fifth cylinder shall be tested at the end of 90 days only. A strength test shall consist of the average strength of two cylinders cast from material taken from a single load of concrete.

Each strength test result shall be the average of the strengths of two test cylinders at 28 days, except that if one cylinder in a set of two shows evidence of low strength due to improper sampling, casting, handling or curing, the result of the remaining one cylinder shall be used.

The average of any three consecutive 28-day strength test results of the cylinders representing each class of concrete for each structure shall be equal to or greater than the specified strength and not more than 10 percent of the strength test results shall have values less than the specified 28-day strength for the total job concrete. No individual strength test results shall be less than the specified strength by more than 500 pounds per square inch.

Certified reports of the test results shall be provided directly to the Construction Manager. Test reports shall include sufficient information to identify the mix used, the stationing or location of the concrete placement, and the quantity placed. Slump, air content, temperature of concrete, and ambient temperature shall be noted. The 28-day strength test results shall be evaluated in accordance with ACI 214. Quality control charts showing field test results shall be included with the test results for each class of concrete in each major structure. Charts shall be prepared in accordance with ACI 214. Quality control charts shall be maintained throughout the entire job and shall be available for the Construction Manager's inspection at any time.

If the 28-day test results fall below the specified compressive strength for the class of concrete required for any portion of the work, adjustment in the proportions, water content, or both, shall be made as necessary at the Contractor's expense. Changes and adjustments shall be reported in writing to the Construction Manager.

If compressive test results indicate concrete in place may not meet structural requirements, tests shall be made to determine if the structure or portion thereof is structurally sound. Tests may include, but not be limited to, cores in accordance with ASTM C42 and any other analyses or load tests acceptable to the Construction Manager. Costs of such tests shall be borne by the Contractor.

3.16 C.2.a.

b. TESTS FOR CONSISTENCY OF CONCRETE. The slump shall be as specified when measured in accordance with ASTM C143. Samples for slump determination shall be taken from the concrete during placing. Tests shall be made at the beginning of concrete placement operation and at subsequent intervals to insure that the specification requirements are met. Slump tests shall also be performed whenever standard cylinders are cast.

c. TESTS FOR TEMPERATURE AND AIR CONTENT: Temperature tests shall be made at frequent intervals during hot or cold weather conditions until satisfactory temperature control is established. Whenever standard cylinders are cast, temperature tests shall be performed.

Air content shall be as specified when measured in accordance with ASTM C231. Air content shall be measured whenever standard cylinders are cast.

D. FINAL LABORATORY REPORT:

A final report, prepared by the testing laboratory, shall be provided at the completion of all concreting. This report shall summarize the findings concerning concrete used in the project and provide totals of concrete used by class and structure. Final quality control charts for compressive strength tests for classes of concrete specified in each major structure shall be included. The report shall also include the concrete batch plant's coefficient of variation and standard deviation results for each class of concrete as determined in accordance with ACI 214.

3.17 WATERTIGHTNESS, TESTING AND REPAIR

(NOT IN CONTRACT)

3.18 CLEANUP

Upon completion of the work and prior to final inspection, the Contractor shall clean all concrete surfaces, except outside sidewalks or paved areas and those having curing and sealing compound. The cleaning procedures shall be as follows: After sweeping with an ordinary broom to remove the loose dirt, the finish shall be wetted with soapsuds and rubbed with a scrubbing machine fitted with a wire brush or fine steel wool. The suds shall be mopped up, and the surface shall be flushed with clean water. Final scrubbing by hand or machine shall follow.

Floors having curing and sealing compound shall be cleaned of loose dirt and debris by sweeping with ordinary brooms. They shall then be washed and mopped with clean water. Finally, one additional coat of the same curing and sealing compound shall be applied in the same manner as specified.

****END OF SECTION****

SECTION 03600

GROUT

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies grout for uses other than masonry.

1.02 QUALITY ASSURANCE

A. QUALITY CONTROL BY CONTRACTOR:

To demonstrate conformance with the specified requirements for grout, the Contractor shall provide the services of an independent testing laboratory which complies with the requirements of ASTM E329. The testing laboratory shall sample and test grout materials as required in this section. Costs of testing laboratory services shall be borne by the Contractor.

B. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ASTM C33-81	Standard Specification for Concrete Aggregate
ASTM C40-79	Standard Test Method for Organic Impurities in Sand for Concrete
ASTM C88-76	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117-80	Standard Test Method for Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing
ASTM C136-81	Standard Test Method for Sieve or Screen Analysis of Fine and Course Aggregates
ASTM C150-81	Standard Specification for Portland Cement

1.02 B.

<u>Reference</u>	<u>Title</u>
ASTM C289-81	Standard Test Method for Potential Reactivity of Aggregates (Chemical Method)
ASTM C494-80	Standard Specification for Chemical Admixtures for Concrete
ASTM E329-77	Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction
Cal Test No. 217-I-1981	Method of Test for Sand Equivalent
CRD-G588-78	Corps of Engineers Specification for Nonshrink Grout

1.03 INFORMATION TO BE PROVIDED

The following information shall be provided.

A. PRODUCT DATA:

Three copies of manufacturer's data shall be provided for the following:

1. Bonding compounds
2. Nonshrink grout
3. Pressure grout
4. Retardants

B. LABORATORY TEST REPORTS:

Before delivery of materials, three copies of the reports of the tests specified herein shall be provided. Test reports on previously tested materials shall be accompanied by the manufacturer's statement that the previously tested material is the same type, quality, manufacture, and make as that proposed for use in this project. Test reports are required for the following:

1. Cement
2. Aggregates
3. Retardants
4. Bonding compounds

1.03 C.

C. EVIDENCE OF TESTING LABORATORY COMPETENCE:

The Contractor shall require that the laboratory provide directly to the Construction Manager evidence of the most recent inspection of its facilities by the Cement and Concrete Reference Laboratory of the National Bureau of Standards. The evidences shall show that deficiencies mentioned in the report of that inspection have been corrected. The evidence of inspection shall be provided prior to delivery of materials to the job site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. CEMENT:

Portland cement shall be ASTM C150 Type II or Type V, Low Alkali, containing less than 0.60 percent alkalies.

B. AGGREGATE:

1. GENERAL: Aggregate shall be nonreactive and shall be washed before use.

When sources of aggregate are changed, test reports shall be provided for the new material. The tests specified shall be performed prior to commencing grout work.

2. FINE AGGREGATE: Fine aggregate shall be hard, dense, durable particles of either sand or crushed stone regularly graded from coarse to fine and shall conform to ASTM C33 as modified herein. When tested in accordance with ASTM C136, gradation shall be such that 100 percent by weight will pass a standard No. 8 mesh sieve and no less than 45 percent by weight will pass a standard No. 40 mesh sieve.

Variation from the specified gradations in individual tests will be acceptable if the average of three consecutive tests is within the specified limits and the variation is within the permissible variation listed below.

<u>U.S. standard sieve size</u>	<u>Permissible variation in individual tests, percent</u>
30 or coarser	2
50 or finer	0.5

Other tests shall be in accordance with the following specifications:

2.01 B.2.

<u>Test</u>	<u>Test Method</u>	<u>Requirements</u>
Organic Impurities	ASTM C40	Color lighter than standard
Amount of Material		
Passing No. 200 Sieve	ASTM C117	3% maximum by weight
Soundness	ASTM C88	10% maximum loss with sodium sulfate
Reactivity	ASTM C289	Innocuous aggregate
Sand Equivalent	Cal Test 217	Minimum 80

C. ADMIXTURES:

1. GENERAL: Admixtures shall be compatible with the grout. Calcium chloride or admixtures containing calcium chloride are not acceptable. Admixtures shall be used in accordance with the manufacturer's recommendations and shall be added separately to the grout mix.

2. WATER REDUCING RETARDER: Water reducing retarder shall be ASTM C494 Type D and shall be Master Builders Pozzolith 300-R; Sika Chemical Corp. Plastiment; or equal.

3. LUBRICANT FOR CEMENT PRESSURE GROUTING: Lubricant additive for cement pressure grouting shall be Intrusion Prepackt Intrusion Aid, Sika Chemical Corporation Intraplast, or equal.

D. WATER:

Water for washing aggregate, for mixing and for curing shall be free from oil and deleterious amounts of acids, alkalis, and organic materials; shall not contain more than 1000 mg/l of chlorides as Cl, nor more than 1300 mg/l of sulfates as SO₄; and shall not contain an amount of impurities that may cause a change of more than 25 percent in the setting time of the cement nor a reduction of more than 5 percent in the compressive strength of the grout at 14 days when compared with the result obtained with distilled water. Additionally, water used for curing shall not contain an amount of impurities sufficient to discolor the grout.

2.02 GROUT

A. DRYPACK GROUT:

Drypack grout shall be a mixture of approximately one part cement, 1-1/2 to 2 parts sand, water reducing retarder, and sufficient water to make a stiff workable mix.

B. CEMENT GROUT:

Cement grout shall be a mixture of one part cement, two parts sand, proportioned by volume, admixtures for pressure grouting, and sufficient water to form a workable mix.

2.02 C.

C. NONSHRINK GROUT:

Nonshrink grout shall be nonrusting metallic aggregate grout and shall be Master Builders Embecco 636; U.S. Grout Corp. Five Star Grout; or equal.

D. EPOXY GROUT:

Epoxy grout shall be Adhesive Engineering Concrevice 1380 as applicable; Sika Chemical Corporation Sikastix 350; or equal.

2.03 PRESSURE GROUTING EQUIPMENT

Pressure grouting equipment shall include a mixer and holdover agitator tanks and shall be designed to place grout at pressures up to 50 psi. Gages shall be provided to indicate pressure used. The mixer shall be provided with a meter capable of indicating to one-tenth of a cubic foot the volume of grout used.

PART 3 - EXECUTION

3.01 GENERAL

Holes required for grouting shall be blown clean. Horizontal holes for grouting shall be drilled at a slight downward angle to facilitate holding the grout until setting is complete. Bolts or reinforcing steel installed in horizontal grout holes shall be bent slightly accordingly.

Bonding compound for use with grout is specified in Section 03300.

3.02 DRYPACK GROUT

Drypack grout shall be used for built-up surfaces, setting miscellaneous metal items and minor repairs.

Surfaces required to be built up with drypack grout shall be roughened by brushing, cleaned, and coated with the bonding compound specified in paragraph 03300-2.05 before the application of the grout. The drypack grout shall be applied immediately following the application of the bonding compound in bands or strips to form a covering of the required thickness. The covering shall be smooth. Construction joints in the grout shall be sloped and shall be cleaned and wetted before application is resumed.

Drypack grout shall be cured in accordance with Section 03300.

Grout shall not be placed during freezing weather unless adequate protection is provided.

3.03

3.03 CEMENT GROUT

Cement grout shall be used for filling nonbearing portions of equipment pads and pressure grouting.

Except for the specialized equipment for pressure grouting, mixing and placing apparatus shall be similar to that normally used for cast-in-place concrete. Grout shall be mixed for a period of at least one minute. Diluted grout shall be agitated to keep ingredients mixed.

3.04 NONSHRINK GROUT

Nonshrink grout shall be used for the bearing surfaces of machinery and equipment bases, column baseplates and bearing plates. It also shall be used for setting bolts and reinforcing steel in holes for grouting.

Where specified, grout shall meet CRD-G588-78.

Grout shall be placed in accordance with manufacturer's instructions.

3.05 EPOXY GROUT

Epoxy grout shall be used for repairing cracks by pressure grouting, repairing structural concrete, and setting reinforcing dowels into holes for grouting. Concrete shall be primed in accordance with the grout manufacturer's instructions.

3.06 PRESSURE GROUTING

Prior to grouting, systems and holes to be grouted shall be washed clean. Washing is not required for grouting soil voids outside pipe cylinders or casing pipes. Grouting, once commenced, shall be completed without stoppage. In case of breakdown of equipment, the Contractor shall wash out the grouting system sufficiently to ensure fresh grout and adequate bond and penetration will occur upon restarting the grouting operation. Grout pressure shall be maintained until grout has set.

****END OF SECTION****

DIVISION 4

MASONRY

(NOT IN CONTRACT)

DIVISION 5

METALS

<u>Section</u>	<u>Title</u>
05501	ANCHOR BOLTS
05505	MISCELLANEOUS METALWORK
05520	HANDRAILING
05530	GRATING AND STAIR TREADS
05910	HOT-DIP ZINC COATING
05911	MECHANICAL ZINC COATING

SECTION 05501

ANCHOR BOLTS

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies anchor bolts complete with washers and nuts. Unless otherwise specified, anchor bolts shall be hot-dip galvanized.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ASTM A36-81a	Structural Steel
ASTM A307-80	Carbon Steel Externally Threaded Standard Fasteners
ASTM A320-81	Alloy-Steel Bolting Materials for Low Temperature Service

1.03 INFORMATION TO BE PROVIDED

For equipment with an operating weight greater than 1000 pounds (250 pounds in the case of vibration isolated equipment having seismic restraints), the Contractor shall provide detailed calculations which demonstrate that the anchor bolting will not fail in shear or in tension. Calculations shall be signed by a registered engineer and include the following steps as a minimum:

1. Determination of the operating weight and centroid of the equipment, if not already completed.
2. Determination of the shear and overturning forces at each anchorage due to a force equal to 0.4 times the operating weight of the equipment being applied at the centroid in each direction along the three principal orthogonal axes (use the values obtained in the dynamic analysis in the case of seismically restrained vibration isolated equipment).

1.03

3. Determination of the shear and tension forces which must be developed by the anchor bolts at each support to resist the forces calculated in step 2.
4. Selection of anchor bolting patterns to be provided based on the maximum shear and tension forces calculated in step 3.

PART 2 - PRODUCTS

2.01 GENERAL

Anchor bolt holes in equipment support frames shall not exceed the bolt diameters by more than 25 percent, up to a limiting maximum oversizing of 1/4 inch. Minimum anchor bolt diameter shall be 1/2 inch. Anchor bolts shall be furnished with leveling nuts, the faces of which shall be tightened against flat surfaces as shown to not less than 10 percent of the bolt's safe tensile stress.

Tapered washers shall be provided where mating surface is not square with the nut.

Expansion shields set in holes drilled in the concrete after the concrete is placed will not be permitted in substitution for anchor bolts except where otherwise specified. Upset threads shall not be acceptable.

2.02 MATERIALS

Anchor bolt materials shall be as specified in Table A.

PART 3 - EXECUTION

Field work, including cutting and threading, shall not be permitted on galvanized items.

Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators.

Anchor bolts to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed or, if specified, recesses or blockouts shall be formed in the concrete and the metalwork shall be grouted in place in accordance with Section 03300. The surfaces of metalwork in contact with concrete shall be thoroughly cleaned.

After anchor bolts have been embedded, their threads shall be protected by grease and the nuts run on.

Table A, Anchor Bolt Materials

<u>Material</u>	<u>Specification</u>
Steel bolts	ASTM A307, Grade A
Fabricated steel bolts	ASTM A36
Stainless steel bolts, nuts, washers	ASTM A320, type 304
Expansion anchors	HILTI-BOLT, McCulloch Industries, or equal
Wedge anchors	ITT, Phillips Drill Co., or equal.

END OF SECTION

SECTION 05505

MISCELLANEOUS METALWORK

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies miscellaneous metalwork, which consists of custom fabricated steel metalwork other than structural metalwork.

1.02 QUALITY ASSURANCE

A. GENERAL:

Shop and field welding shall conform to the requirements of AISC, eighth edition.

The use of salvaged, reprocessed or scrap materials will not be permitted.

B. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
AISC 8th edition	Manual of Steel Construction
ASTM A36-81a	Structural Steel
ASTM A48-76	Gray-Iron Castings
ASTM A283-81	Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars
ASTM A307-80	Carbon Steel Externally Threaded Standard Fasteners
ASTM A320-81	Alloy-Steel Bolting Materials for Low Temperature Service
ASTM A500-81a	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

PART 2 - PRODUCTS

2.01 MATERIALS

Materials for miscellaneous metalwork are specified in Table A.

2.02 FABRICATION

A. GENERAL:

Holes shall be punched 1/16 inch larger than the nominal size of the bolts, unless otherwise specified. Whenever needed, because of the thickness of the metal, holes shall be subpunched and reamed or shall be drilled.

Fabrication including cutting, drilling, punching, threading and tapping required for miscellaneous metal or adjacent work shall be performed prior to hot-dip galvanizing.

B. SEAT ANGLES, SUPPORTS AND BRACKETS:

Seat angles over slide gate guides shall be welded to the guides. Seat angles for grating, supports for floor plates, clips for precast panels and brackets for piping shall be steel, hot-dip galvanized after fabrication unless otherwise specified.

C. POWER DRIVEN PINS:

Power driven pins may be used in interior locations of nonprocess areas. Pins shall be heat treated steel alloy in accordance with AISI 1062 or 4063 and shall be zinc-plated. Pins shall have capped or threaded heads capable of transmitting the loads the shanks are required to support. Pins that are connected to steel shall have longitudinal serrations around the circumference of the shank. Complete information describing pin capacities and connections shall be provided to the Construction Manager. Proposed use and locations shall be approved by the Construction Manager prior to their use.

D. IRON CASTINGS:

Castings shall be as specified on the drawings. Castings weighing less than 100 pounds shall be hot-dip galvanized after machining. Castings weighing greater than 100 pounds shall be galvanized where specified.

E. OTHER MISCELLANEOUS STEEL METALWORK:

Other miscellaneous steel metalwork including embedded and nonembedded steel metalwork, hangers and inserts shall be as specified on the drawings and shall be hot-dip galvanized after fabrication.

Table A, Materials for Miscellaneous Metalwork

<u>Material</u>	<u>Specification</u>
Nonstructural steel bars, angles, clips, and similar items	ASTM A36 or ASTM A283
Iron castings	ASTM A48
Structural steel tubing	ASTM A500, Grade B
Steel bolts (except flanges and anchor bolts)	ASTM A307, Grade A
Stainless steel	ASTM A320, type 304

3.01 A.

PART 3 - EXECUTION

3.01 INSTALLATION

A. GENERAL:

Fieldwork shall not be permitted on galvanized items. Drilling of bolts or enlargement of holes to correct misalignment will not be allowed.

Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators.

Metalwork to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed or, if specified, recesses or blockouts shall be formed in the concrete. The surfaces of metalwork in contact with or embedded in concrete shall be thoroughly cleaned. If accepted, recesses may be neatly cored in the concrete after it has attained its design strength and the metalwork grouted in place. Embedments shall be as specified in Section 03300.

B. SEAT ANGLES, SUPPORTS AND GUIDES:

Seat angles for grating and supports for floor plates shall be set so that they are flush with the floor and also maintain the grating and floor plates flush with the floor.

C. POWER DRIVEN PINS:

Power driven pins shall be set by a craftsman who is certified by the manufacturer. Pins shall be driven in one initial movement by an instantaneous force that has been selected to attain the required penetration. Driven pins shall conform to the following:

<u>Material penetrated by pin</u>	<u>Penetrated material's minimum thickness</u>	<u>Penetration of pin's shank in supporting material</u>	<u>Minimum space from center of pin's shank to edge of penetrated matl.</u>	<u>Minimum pin spacing</u>
Concrete	16D	6D minimum	14D	20D
Steel	1/4 inch	Steel thickness plus 2D	4D	7D

Where D = pin shank diameter.

When required by the Construction Manager, pullout tests shall be carried out by the Contractor to prove the effectiveness of the anchorage and the capacity of the pin.

3.02

3.02 CLEANING

After installation, damaged surfaces of shop primed metals shall be cleaned and touched up with the same material used for the shop coat. Damaged surfaces of galvanized metals shall be repaired as specified in Section 05910.

END OF SECTION

SECTION 05520

HANDRAILING

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies prefabricated welded steel galvanized handrailing and galvanized chain railing.

1.02 QUALITY ASSURANCE

A. GENERAL:

Handrailing shall meet the requirements of the standards of the Occupational Safety and Health Administration, the Division of Industrial Safety of the State of California, and the Uniform Building Code.

B. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ASTM A120-79	Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized) Welded and Seamless for Ordinary Uses
ASTM A320-81	Alloy-Steel Bolting Materials for Low Temperature Service

PART 2 - PRODUCTS

2.01 MATERIALS

Materials for welded steel handrailing shall be as specified in Table A.

2.01

Table A, Materials for Handrailing

<u>Material</u>	<u>Specification</u>
Bolts, nuts, washers	ASTM A320, type 304, stainless steel
Steel	ASTM A120

2.02 FABRICATION OF WELDED STEEL HANDRAILING

A. GENERAL:

Pipe cuts shall be clean, straight, square and accurate for minimum joint gap. Work shall be done in conformance with the handrail manufacturer's instructions. Work shall be free from blemishes, defects, and misfits of any type which can affect durability, strength or appearance.

Holes shall be punched 1/16 inch larger than the nominal size of the bolts, unless otherwise specified. Whenever needed, because of the thickness of the metal, holes shall be subpunched and reamed or drilled. Pieces with mismatched holes shall be replaced. No drifting of bolts nor enlargement of holes will be allowed to correct misalignment.

B. STEEL:

Welded steel handrails shall be 1-1/2-inch black steel pipe made by welding. Railing shall be galvanized in shop after fabrication.

Chain railing shall be 3/16-inch link chain.

PART 3 - EXECUTION

3.01 INSTALLATION

Measurements shall be verified at the site.

Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators. Aluminum in contact with concrete or grout shall be protected with a heavy coat of bituminous paint.

Metal to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed or, if specified, recesses or blockouts shall be formed in the concrete

3.01

and the metalwork shall be grouted in place after concrete has attained its design strength in accordance with Section 03300. The surfaces of metalwork in contact with or embedded in concrete shall be thoroughly cleaned.

Unless otherwise specified, no field welding of steel handrails shall be permitted. Where field welding is specified, weld shall be ground smooth to match adjacent pipe and coated as specified in paragraph 05910-3.01.

****END OF SECTION****

SECTION 05530

GRATING AND SAFETY STAIR TREADS

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies floor grating and safety stair treads.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
AISC 8th edition	Manual of Steel Constructions
ASCE Vol. 88-ST6	Suggested Specifications for Structures of Aluminum Alloys 6061-T6 and 6063-T6
ASTM A36-81a	Structural Steel
ASTM B210-80	Aluminum-Alloy Drawn Seamless Tubes
ASTM B221-80	Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes

PART 2 - PRODUCTS

2.01 MATERIALS

A. ALUMINUM:

Aluminum grating bearing bars and aluminum floor plates and cover plates shall be of alloy 6061-T6 conforming to ASTM B221. Aluminum grating cross bars shall be of an alloy conforming to either ASTM B221 (extrusions) or B210 (drawn).

B. STEEL:

(NOT IN CONTRACT)

2.02 A.

2.02 FABRICATION

A. GENERAL:

Rough weld beads and sharp metal edges on gratings and plates shall be ground smooth. Welds exposed to view shall be uniform and neat. Welds to be galvanized shall be sandblasted prior to galvanizing.

Holes shall be punched 1/16 inch larger than the nominal size of the bolts, unless otherwise specified. Whenever needed, because of the thickness of the metal, holes shall be subpunched and reamed or shall be drilled.

Cutting, drilling, punching, threading and tapping shall be performed prior to hot-dip galvanizing.

B. GRATING:

1. GENERAL: Grating shall be as specified. Both bearing bars and cross bars shall be continuous. Openings shall be banded with bars having the same dimensions as the bearing bars. Perimeter edges shall be banded with bars flush at the top surface of the grating and 1/4 inch clear of the bottom surface. Bars terminating against edge bars shall be welded to the edge bars when welded construction is used. When crimped or swaged construction is used, bars at edges shall protrude a maximum of 1/16 inch and shall be peened or ground to a smooth surface.

2. ALUMINUM GRATING: Unless otherwise specified, grating shall be fabricated of aluminum. Bearing bars shall be punched to receive the cross bars. After insertion in the bearing bars, cross bars shall be deformed by a hydraulic press or similar means to permanently lock the bars into the bearing bar openings. Fabrication methods employing bending or notching of cross bars will not be permitted. Aluminum grating shall be Gary Galok, Seidelhuber, or equal.

C. SAFETY STAIR TREADS:

Safety stair treads shall be 4 inches wide and shall be Alumogrit, Type 101, as manufactured by Wooster Products, Incorporated; Alumalum, Style A, as manufactured by American Abrasive Metals Company; Style AX as manufactured by Safe-T-Metal Company, Incorporated, or equal.

3.01 A.

PART 3 - EXECUTION

3.01 INSTALLATION

A. GENERAL:

Fieldwork shall not be permitted on galvanized items. Drilling of bolts or enlargement of holes to correct misalignment will not be allowed.

Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators. Aluminum in contact with concrete shall be protected by a heavy coat of bituminous paint.

Metalwork to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed or, if specified, recesses or blockouts shall be formed in the concrete after it has attained its design strength and the metalwork grouted in place as specified in Section 03300. The surfaces of metalwork in contact with or embedded in concrete shall be thoroughly cleaned. If accepted, recesses may be neatly cored in the concrete.

B. GRATING:

Grating shall be field measured for proper cutouts and proper sizes. Field welding of aluminum grating, if required, shall be in accordance with Suggested Specifications for Structures of Aluminum Alloys 6061-T6 and 6063-T6, Section K, Fabrication, published by ASCE.

C. SAFETY STAIR TREADS:

Safety stair treads shall be installed on concrete stairs as specified on the drawings. Treads shall be secured to concrete with suitable anchors at 15 inches on centers and not more than 4 inches from the ends. Rubber tape, 1/8 inch thick, shall be provided at both ends and cut to fit shape of tread prior to concrete placement.

3.02 CLEANING

After installation, damaged surfaces of shop primed metals shall be cleaned and touched up with the same material used for the shop coat. Damaged surfaces of galvanized metals shall be repaired as specified in Section 05910.

END OF SECTION

SECTION 05910

HOT-DIP ZINC COATING

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies hot-dip zinc coating. Unless otherwise specified, steel items weighing 100 pounds or less shall be hot-dip zinc coated. Anchor bolts and nuts 5/8 inch and larger shall be hot-dip zinc coated. Anchor bolts and nuts smaller than 5/8 inch shall be mechanically zinc coated. All other bolts, screws, nuts, washers and other minor steel fasteners shall be mechanically zinc coated as specified in Section 05911.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ASTM A90-81	Standard Test Methods for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
ASTM A120-81	Pipe, Steel, Black and Hot-Dipped Zinc Coated Welded and Seamless, for Ordinary Uses
ASTM A123-78	Zinc Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip
ASTM A143-74 (1979)	Recommended Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products for Detecting Embrittlement
ASTM A153-80	Zinc Coating on Iron and Steel Hardware
ASTM A384-76 (1980)	Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
ASTM A385-80	Providing High Quality Zinc Coatings on Assembled Products
ASTM A386-78	Zinc Coating on Assembled Steel Products
MILSPEC DOD-P-21035-77	Paint, High Zinc Dust Content, Galvanizing Repair

2.01

PART 2 - PRODUCTS

2.01 MATERIALS

The coating material shall be as specified in ASTM A153.

PART 3 - EXECUTION

3.01 FIELD REPAIR

Where zinc coating has been damaged, substrate surface shall be cleaned and repaired with zinc dust-zinc oxide coating in accordance with MILSPEC DOD-P-21035. Field repair of zinc coated surfaces shall be accomplished with Z.R.C., as manufactured by Z.R.C. Chemical Products Co.; Galvicon, as manufactured by Galvicon Co.; or equal. Application shall be as recommended by the manufacturer.

END OF SECTION

SECTION 05911

MECHANICAL ZINC COATING

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies mechanically applied zinc coating. This coating shall be used on steel fasteners including bolts, screws, nuts and washers. Anchor bolts are coated as specified in Section 05910. Electroplated corrosion protection is not an acceptable substitute for mechanical zinc coating.

1.02 QUALITY ASSURANCE

A. ZINC COATING THICKNESS:

Coating thickness shall be Class 50 as specified in ASTM B454.

B. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ASTM A153-78	Zinc Coating on Iron and Steel Hardware
ASTM B454-76	Mechanically Deposited Coatings of Cadmium and Zinc on Ferrous Metals

1.03 INFORMATION TO BE PROVIDED

Information shall be provided that describes materials and method of coating used.

PART 2 - PRODUCTS

2.01 MATERIALS

The coating material shall be as specified in ASTM A153.

PART 3 - EXECUTION

3.01 FIELD REPAIR

Damaged surfaces of zinc coated metals shall be repaired as specified in Section 05910.

END OF SECTION

DIVISION 6
WOOD AND PLASTICS

<u>Section</u>	<u>Title</u>
06100	ROUGH CARPENTRY
06113	PLYWOOD WALL SHEATHING
06220	FINISH CARPENTRY AND MILLWORK

SECTION 06100
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 DESCRIPTION

This section provides specifications for all rough carpentry.

1.02 QUALITY ASSURANCE

A. LUMBER:

Lumber shall be manufactured, graded and grade-marked in compliance with the following reference specifications and grading rules. Grades and species shall be as specified or shown.

1. DOUGLAS FIR: Douglas fir shall be graded in compliance with one of the following:

- a. "Standard Grading and Dressing Rules No. 16 for Douglas Fir, West Coast Hemlock, Sitka Spruce, Western Red Cedar," issued by the West Coast Lumber Inspection Bureau.
- b. "1970 Grading Rules," issued by the Western Wood Products Association, Portland, Oregon.

2. REDWOOD: Redwood shall be graded in compliance with "Standard Specifications for Grades of California Redwood Lumber," latest edition, issued by the Redwood Inspection Service.

3. WESTERN LARCH - WESTERN HEMLOCK: Lumber of these species of equal or better stress grade and quality than the grades of douglas fir specified, if graded in compliance with either of the grading rules specified above, may be used in lieu of douglas fir.

4. PLYWOOD: Plywood shall comply with U.S. Department of Commerce Product Standard PS 1-74, graded and grade-marked by the American Plywood Association.

B. BOLTS:

Bolts, nuts and washers for use in locations subject to moisture, for outside use, or in portions of the structure which are not completely enclosed, or as specified or indicated elsewhere, shall be galvanized in compliance with ASTM A153.

1.02 C.

C. LUMBER SEASONING:

Before surfacing, lumber shall be air or kiln dried, to a moisture content not to exceed 9 percent. Before incorporation into the work, lumber shall be allowed to attain a state of equilibrium with the local atmosphere. All lumber shall be air seasoned not less than 30 days before covering with finish materials.

If specifications for pressure treating state the maximum percentages of moisture content at the time of treatment, the lumber shall comply with those requirements.

D. PRESSURE TREATMENT:

Where specified or shown, lumber shall be pressure treated in compliance with FEDSPEC TT-W-5711.

E. WORKMANSHIP:

All of the work shall be performed in accordance with the best standards of practice relating to the trade. Work shall be carefully planned and laid out as required. The work of other trades shall be properly accommodated.

1.03 SUBMITTALS

Submittals shall comply with applicable paragraphs of Section 01300. The Contractor shall submit to the Construction Manager a detailed list of equipment and type of fasteners proposed to be used on the project.

PART 2 - PRODUCTS

2.01 MATERIALS

A. LUMBER AND PLYWOOD:

Lumber and plywood shall be as specified under paragraph 1.02, Quality Assurance, in this section and as follows:

1. Joists, beams and truss members: Select structural grade.
2. Studs: Douglas fir No. 2.
3. Other: Standard grade.
4. Plywood sheathing, walls and roofs: Sheathing grade.
5. Plywood sheathing, floors: T&G, tight face, sheathing grade.

2.01 A.

6. Decking: Select grade where exposed to view, commercial grade where concealed.

B. BOLTS:

Bolts shall conform to ASTM A307, Grade A, and have square or hexagonal heads. Sizes and spacing shall be as required by the drawings. All heads and nuts bearing on wood shall be fitted with washers.

C. NAILS:

Sizes and types of nails shall be as indicated, specified or required for the purpose. They shall comply with FEDSPEC FF-N-105A. Unless otherwise specified, galvanized or aluminum nails shall be used for nailing redwood or cedar.

D. SPECIAL PURPOSE NAILS:

Nails shall be as manufactured by the Independent Nail Corporation, Bridgewater, Mass., Philstone Nail Corp., Needham Heights, Mass., or equal, as accepted by the Construction Manager. Requirements for galvanizing or other types of noncorrosive coating shall be as specified above. Special purpose nails include:

1. "Screw Tite" common spiral thread nails.
2. "Screw Tite" hardened steel, knurled masonry nails (0.148 inch - 0.177 inch dia.) or "Heavy Duty" masonry nails (0.250 inch dia.).
3. Concrete stub nails (0.148 inch dia.).

E. TIMBER CONNECTORS:

Connectors shall be as shown.

F. PLYCLIPS:

Plyclips shall be extruded aluminum with tapered edges, as manufactured by the Simpson Co., Silver Metal Products, Inc., or equal. Sizes and spacing shall be as shown.

2.02 PRESSURE TREATMENT - MATERIAL IN CONTACT WITH CONCRETE OR MASONRY

Lumber in contact with concrete or masonry shall be untreated redwood (Foundation Grade, Par. 316), western red cedar (Foundation Lumber, Rules No. 16, Par. 128) or pressure treated douglas fir, larch or hemlock.

2.02

When treated members are cut to shape or size, such cutting or shaping shall be performed before treatment. Where members are cut after treatment or countersunk for flush installation of bolt heads, the cut surfaces shall be painted with two saturating coats of treating liquid before installation.

Acceptable treatments:

<u>Preservative</u>	<u>Applicable FEDSPEC for formula</u>	<u>Final retention lb/cu ft</u>
Chromated zinc chloride	TT-W-551	0.75
Wolman salts	TT-W-573	0.35
Acid cupric chromate	TT-W-546	0.50
Chemonite	TT-W-571c	0.30

2.03 CONNECTIONS

Lumber shall be accurately saw-cut and fitted into the respective locations, true to line, grade and level, as indicated or required, and permanently secured in proper position with spikes, nails, lag screws, bolts, hangers, or other fastenings, to make the work substantial and rigid in all parts and connections.

Connections between members shall be made tight, accurate and secure. Fastenings shall be placed without splitting wood using predrilling when required. Bolt holes shall be drilled to the same size as bolt diameters. Holes for lag screws shall be drilled to the same size as thread root diameters, and counterbored to the same depth and diameter as the shank. Lag screws shall be turned into place, not driven. Bolts and lag screws shall be provided with washers under every head and nut that bear on the wood. Bolts and lag screws shall be tightened at installation and carefully retightened just prior to closing in or at completion of the project.

2.04 ROOF AND FLOOR FRAMING

Members shall be fabricated in the longest practicable lengths, and placed with crown side up. Splices shall be made only over the bearings. Solid blocking shall be cut in at the ends and over the bearings. All headers and trimmers shall be doubled up wherever normal joist spacing is interrupted by mechanical work or any other penetration.

2.05 FRAMING DEVICES

Stock framing devices shall be provided, including joist hangers, 3-way framing anchors, clips, shear plates, metal straps, timber connectors, post caps, post anchors, and other stock iron work. Items shall be securely fastened to the structure, using the size and quantity of nails, screws and bolts recommended by the manufacturer of the device, unless otherwise shown.

3.01 A.

PART 3 - EXECUTION

3.01 ROOF AND FLOOR FRAMING

A. GIRDERS, BEAMS, JOISTS AND RAFTERS:

Members shall be placed with crown side up. Solid blocking shall be cut in at ends and over the bearings.

B. LEDGERS, HEADERS AND NAILERS:

Members shall be accurately cut to required sizes and securely fastened to the structure. Wood nailers on steel frames shall be fastened with recessed bolt heads and installed with washers.

C. BRIDGING:

The bridging provided shall be spaced 8 feet o.c. maximum, using two crossed two by threes, or full depth 2-inch thick solid blocking, or approved metal cross-bridging. Bridging shall be placed at midspan where the span is greater than 8 feet and less than 16 feet, or as otherwise shown.

D. PLYWOOD:

All plywood nailing shall be inspected and approved before covering. Nailing shall be in accordance with the drawings.

E. ROOF TRUSSES:

Roof trusses shall be designed and detailed based on the loadings shown on the drawings. The design shall be undertaken and attested by a registered professional engineer licensed in the State of California. Designs and details shall be provided for the Construction Manager.

3.02 FASTENERS

A. BOLTS:

Holes for bolts in steel plates and angles shall be drilled 1/16 inch greater than bolt diameter.

B. POWDER-ACTUATED FASTENERS:

Powder-actuated fasteners may be used only where specifically permitted hereinafter, or when subsequently approved, provided all available safety features and guards are used. If adequate, low velocity equipment is to be used. A detailed list of equipment and type of fasteners shall be submitted for the Construction Manager's approval prior to use.

3.03 A.

3.03 WOOD STUD PARTITIONS

A. FLOOR SILLS:

Sills shall be attached to concrete floors with anchor bolts. Fasteners shall be located between 4 and 10 inches from each end of each piece and at not more than 48 inches o.c. Each piece shall be attached with a minimum of two fasteners.

B. PLATES:

Plates shall be doubled, with splices staggered at least 4 feet, with corners and intersections lapped and nailed.

C. STUDS ADJACENT TO CONCRETE OR MASONRY:

Studs shall be attached to concrete or masonry with three powder-driven fasteners to each stud.

D. OPENINGS:

Openings shall be framed with a full height stud at each jamb, with adjacent cripple supporting header and nailed to stud. Headers shall be single members, full width of studs, with vertical dimension as indicated.

E. BLOCKING:

Firestops shall be provided at the ceiling line, either composed of continuous plates or blocking of 2 inch by width of studs installed between studs. Intermediate blocking between floor and ceiling shall be provided where required by code.

Two-inch thick blocking, cut between studs shall be provided and properly located where required for attachment of handrails, wall hung equipment, and similar accessories and equipment.

Horizontal blocking shall be provided and installed at the proper height above the floor for installation of electrical switch boxes, receptacle boxes, and similar items of equipment. This blocking may be omitted only where a stud is properly located for attachment of the box.

F. OPENINGS FOR RECESSED EQUIPMENT:

Openings shall be framed out as required for installation of recessed equipment. Locations and sizes of openings shall be verified with the trade furnishing the equipment.

G. CORNERS AND INTERSECTIONS:

Corners and intersections shall be framed with at least three studs.

3.03 H.

3.03 WOOD STUD PARTITIONS

A. FLOOR SILLS:

Sills shall be attached to concrete floors with powder-actuated attachments (Ramset No. 3330 or equal). Fasteners shall be located between 6 and 10 inches from each end of each piece and at not more than 32 inches o.c. Each piece shall be attached with a minimum of two fasteners.

B. PLATES:

Plates shall be doubled, with splices staggered at least 4 feet, with corners and intersections lapped and nailed.

C. STUDS ADJACENT TO CONCRETE OR MASONRY:

Studs shall be attached to concrete or masonry with three powder-driven fasteners to each stud.

Metal straps shall be of 13 gage by 12 inches long carbon steel and shall be drilled or punched to receive three 8d "Holdfast" or "Screw-Tite" spiral shank nails at each end. Steel angles shall be 1 inch by 1 inch by 1/8 inch, nailed to the face of the stud as specified above. To avoid interference with gypsum board or lath, angles shall be installed flush or slightly back from the edge of the stud.

Where necessary, plates may be cut in two, provided the cut is bridged with a metal strap or angle as specified above on each face and the alignment of the plate is maintained.

D. FURRING AND STRIPPING:

Furring and stripping shall be provided and shimmed where indicated or where necessary to align faces of finish materials in a single plane.

END OF SECTION

SECTION 06113
PLYWOOD WALL SHEATHING

1.0 PLYWOOD WALL SHEATHING

Siding shall be identified as premium grade saw textured V-groove Western Red Cedar exterior plywood, manufactured in accordance with PS-1-74.

The face of each panel shall be grooved 4 inches on center. Grooves shall be 1/4 inch wide by 1/8 inch deep, "V" shaped. All long edges shall be shiplapped. Panel thickness shall be 5/8 inch plus or minus 1/32 inch. All adhesives shall be waterproof type phenolic formaldehyde resins. Center and back plys to be of "C" grade Western softwood. All panels shall be stamped with approved APA 303 grade trademark and FHA 4M64 designation.

END OF SECTION

SECTION 06220

FINISH CARPENTRY AND MILLWORK

PART 1 - GENERAL

1.01 DESCRIPTION

This section provides specifications for all finish carpentry, millwork, cabinet hardware and installation of finish hardware.

1.02 QUALITY ASSURANCE

A. GENERAL:

Unless otherwise indicated or specified, all materials, fabrication, and workmanship shall conform to the applicable requirements of the Woodwork Institute of California "Manual of Millwork" current edition, for custom grade work. All millwork shall be of flush construction. A certified compliance grade stamp shall be affixed to every item.

Kiln drying or equivalent air drying is required for all lumber used for finish. Tests of lumber upon delivery to the site shall show a moisture content of not more than 12 percent by weight.

B. DESIGN REQUIREMENTS (GRADING):

1. LUMBER AND PLYWOODS: Grading shall conform to the current grading rules of the associations which have jurisdiction over various lumber species.

2. IDENTIFICATION: Grade-mark and mill identification of the association having jurisdiction shall appear on each piece of softwood lumber when delivered to the site. Each delivery of hardwood and plywood to the site shall be identified with a certificate of grading issued by the association or member manufacturer. In the absence of specific association bureau for a species, grading of hardwood lumber shall conform to rules of the National Hardwood Lumber Association.

1.03 SUBMITTALS

Submittals shall comply with applicable paragraphs of Section 01300. The Contractor shall submit to the Construction Manager samples of laminated plastic and shop drawings. The submitted shop drawings of all mill and cabinet shop assemblies shall be based on the drawings and specifications and shall conform to measurements taken at the buildings.

2.01 A.

PART 2 - PRODUCTS

2.01 MATERIALS

A. MATERIALS FOR OPAQUE FINISH:

Hardwood solid stock shall be stain grade birch.

B. WATERPROOF GLUE:

Glue shall be a polyvinyl acetate emulsion with 55 percent solids. "Wilhold" as manufactured by Acorn Adhesives, "Weldwood" as manufactured by U.S. Plywood, or equal, approved by the Construction Manager, will be acceptable.

C. PEGBOARD:

Pegboard shall be 1/4-inch thick tempered pressed wood hardboard with 1/8-inch diameter holes at 1 inch on center.

D. EXPOSED NAILS:

All exposed nails shall be finished or casing nails.

E. MISCELLANEOUS ITEMS:

Miscellaneous items shall be as shown or as specified.

2.02 CONSTRUCTION

A. GENERAL:

Lumber shall be accurately saw-cut and fitted into respective locations. It shall be true to line, grade, and level, and permanently secured in proper position with nailings, lag screws, boltings, or other fastenings and fittings as detailed, specified, as directed, and as required. In addition, it shall be substantial and rigid in all parts and connections. Predrilled holes shall be provided for screws or lag bolts on wood backup.

B. FINISH WOODWORK:

Finish woodwork shall be smoothly dressed, belt-sanded at the mill, and hand-sanded prior to erection. The finish shall be free from open joints, hammer and machine marks, structural defects, and surface blemishes. Wherever practicable, the means of fastening various parts and members together shall be concealed. Where surface nailing is unavoidable, nails shall be set neatly for putty stopping. All work shall be performed by skilled mechanics, true to detail, with all arrises in finished work slightly rounded by sanding.

2.02 C.

C. SURFACE MOUNTED HARDWARE:

Pilot holes shall be drilled for all screws. Holes shall be accurately and neatly made from templates, from the finish hardware, or furnished by the hardware supplier.

PART 3 - EXECUTION

3.01 PEGBOARD

Pegboard shall be installed over strapping with countersunk screws as indicated on the drawings.

3.02 GLAZED WOOD DOOR

Glazed wood door constructed per door schedule of kiln-dried douglas fir with mortise and tenon joints. Glazing as specified in Section 08800.

END OF SECTION

DIVISION 7
THERMAL AND MOISTURE PROTECTION

<u>Section</u>	<u>Title</u>
07100	GAS BARRIER MEMBRANE
07200	BUILDING INSULATION
07410	PREFORMED ROOFING AND SIDING
07600	FLASHING AND SHEET METAL
07900	JOINT FILLERS, CALKING AND SEALANTS

SECTION 07100

GAS BARRIER MEMBRANE

PART 1 - GENERAL

This section specifies gas barrier membrane.

PART 2 - PRODUCTS

2.01 MATERIALS

A. GAS BARRIER MEMBRANE:

1. PLASTIC MEMBRANE: Gas barrier membrane shall be 30 mil hypalon.
2. PRESSURE SENSITIVE TAPE: Pressure sensitive tape shall be 2-inch wide tape.

PART 3 - EXECUTION

3.01 CONSTRUCTION

A. GAS BARRIER MEMBRANE:

1. LOCATION: Gas barrier membrane shall be provided as shown on the drawings.
2. SURFACE PREPARATION: Backfilled surfaces to receive gas barrier membrane shall be leveled off and smoothed over to minimize contact with sharp edges.
3. APPLICATION: At joints, gas barrier membrane shall be lapped 6 inches and sealed with pressure sensitive tape. Where pipes and conduits pass through the membrane, they shall be wrapped tightly with separate sheets of membrane which shall then be sealed with tape to the main membrane. Reinforcing steel or mesh shall be supported by small chairs designed with flat bases to protect the membrane. The Contractor shall maintain the integrity of the membrane at all times.

END OF SECTION

SECTION 07200

BUILDING INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION

This section provides specifications for all thermal insulation in walls and ceilings and below roof decks.

1.02 QUALITY ASSURANCE

Thermal insulation above ceiling shall conform to FEDSPEC HH-I-521E, Type II, noncombustible mineral fiber batts or blankets. Thermal insulation board on walls shall conform to FEDSPEC HH-I-558B.

PART 2 - PRODUCTS

2.01 THERMAL INSULATION IN ROOF

Thermal insulation shall be "Thermafiber" as manufactured by U.S. Gypsum, or an equivalent product by Mineral Wool Insulations, Owens-Corning Fiberglas, Johns-Manville, or equal. Insulation shall be provided with foil facing and flanges one side. Material shall be of sufficient thickness to provide an insulation value of R-19.

2.02 THERMAL INSULATION ON WALLS

Thermal insulation shall be "Thermafiber" as manufactured by U.S. Gypsum, or an equivalent product by Mineral Wool Insulations, Owens-Corning Fiberglas, Johns-Manville, or equal. Insulation shall be provided with foil facing and flanges one side. Material shall be of sufficient thickness to provide an insulation value of R-19.

PART 3 - EXECUTION

3.01 INSTALLATION

A. THERMAL INSULATION:

1. ROOF: Batt or blanket type thermal insulation shall be installed between roof joists, as indicated, in accordance with manufacturer's recommendations.

3.01 A.2.

2. ON WALLS: Insulation shall be installed between studs, as indicated, in accordance with manufacturer's recommendations.

B. CUTTING AND FITTING:

Insulation shall be installed snugly against adjacent pieces and against all obstructions. Cutting and fitting shall be performed as required to leave no voids.

****END OF SECTION****

SECTION 07410

PREFORMED ROOFING AND SIDING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

The extent of preformed roofing is indicated on the drawings and by provisions of this section.

All types of panels required include the following: formed sheet panels, intended for lapped-seam installation.

1.02 QUALITY ASSURANCE

A. MANUFACTURER:

Provide products by the following manufacturer, or equal: Curoco Co., Albany, California.

1.03 SUBMITTALS

A. PRODUCT DATA:

Submit manufacturer's product specifications, standard details, certified product test results, installation instructions, and general recommendations, as applicable to materials and finishes for each component and for total system of preformed panels.

B. SAMPLES:

Submit two samples, 12-inch square, of each exposed finish material.

PART 2 - PRODUCTS

2.01 SHEET MATERIALS

Aluminum sheets: ASTM B209; alloy, temper and mill finish as recommended by panel manufacturer.

Embossed: Provide sheet manufacturer's standard "stucco" embossed sheet finish.

2.02 METAL FINISHES

A. GENERAL:

Apply coatings either before or after forming and fabricating panels, as required by coating process and as required for maximum

2.02 A.

coating performance capability. Protect coating promptly after application and cure by application of strippable film or removable adhesive cover and retain until installation has been completed. Provide colors or color matches as indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

B. FLUROCARBON COATING:

Full-strength 70 percent "Kynar 500" coating baked-on for 15 minutes at 450 degrees F (232 degrees C) in a dry film thickness of 1.0 mils, 30 percent reflective gloss (ASTM D523), over 0.3 mil baked-on epoxy primer.

Durability: Provide coating which has been field tested under normal range of weathering conditions for minimum of 20 years without significant peel, blister, flake, chip, crack or check in finish and without chalking in excess of 8 (ASTM D659) and without fading in excess of 5 NBS units.

2.03 MISCELLANEOUS MATERIALS

A. FASTENERS:

Manufacturer's standard noncorrosive types, with exterior heads gasketed.

B. ACCESSORIES:

Except as indicated as work of another specification section, provide components required for a complete roofing system, including trim, copings, fascias, corner units, ridge closures, clips, seam covers, flashings gutters, sealants, gaskets, fillers, closure strips, and similar items. Match materials/finishes of preformed panels.

C. BITUMINOUS COATING:

Cold-applied asphalt mastic, SSPC Paint 12, compounded for 15-mil dry film thickness per coat.

2.04 PANEL FABRICATION; PERFORMANCES

A. GENERAL:

Fabricate and finish panels and accessories at the factory to the greatest extent possible, by manufacturer's standard procedures and processes, and as required to fulfill performance requirements, which have been demonstrated by factory testing. Comply with indicated profiles and dimensional requirements and with structural requirements.

2.04 A.

Metal gages: Thicknesses required for structural performances, but not less than manufacturer's recommended minimums for profiles and applications indicated, and not less than 0.019 gage for exterior panels.

B. REQUIRED PERFORMANCES:

Fabricate panels and other components of roof/wall system for the following installed-as-indicated performances:

Water penetration: no significant, uncontrolled leakage at 4 pounds per square foot pressure with spray test.

Air infiltration: 0.02 cfm per square foot for gross roof areas, with 4 pounds per square foot differential pressure.

C. BITUMINOUS COATING:

Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with substrate materials which are noncompatible or could result in corrosion or deterioration of either material or finishes.

D. PANEL JOINTS:

Fabricate panel joints with captive gaskets or separator strips, which provide a tight seal and prevent metal-to-metal contact in a manner which will minimize noise from movements within panel system.

E. CONDENSATION:

Fabricate panels for control of condensation, including proper inclusion of seals and provisions for breathing, venting, weeping, and draining.

PART 3 - EXECUTION

3.01 INSTALLATION

A. GENERAL:

Comply with panel fabricator's and material manufacturers' instructions and recommendations for installation, as applicable, to project conditions and supporting substrates. Anchor panels and other components of the work securely in place, with provisions for thermal/structural movement.

3.01 A.

Install panels with exposed exterior fasteners, prefinished to match panel finishes.

Joint sealers: Install gaskets, joint fillers and sealants where indicated and where required for weatherproof performance of panel systems. Provide types of gaskets and sealants/fillers indicated or, if not otherwise indicated, types recommended by panel manufacturer.

3.02 CLEANING AND PROTECTION

A. DAMAGED UNITS:

Replace panels and other components of the work which have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures.

B. CLEANING:

Remove protective coverings and strippable films (if any) at time in project construction sequence which will afford greatest protection of work. Clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

C. PROTECTION:

Installer shall advise Contractor of protection and surveillance procedures, as required to ensure that work of this section will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 DESCRIPTION

This section provides specifications for all flashing and sheet metal not specifically described in other sections of these specifications but required to prevent penetration of water through the exterior shell of the building.

1.02 QUALITY ASSURANCE

The Contractor shall comply with pertinent recommendations of "Architectural Sheet Metal Manual," latest revision, by Sheet Metal and Air Conditioning Contractors National Association as a minimum standard, and to normal good practice in the area except where in conflict with these specifications, which shall govern.

PART 2 - PRODUCTS

2.01 SHEET METAL

Unless otherwise noted, sheet metal shall be mill standard 3008 alloy aluminum sheet. All sheet metal shall be 22 gage, except where noted.

2.02 NAILS, SCREWS, BOLTS, RIVETS AND FASTENERS

Material shall be aluminum or aluminum sheet metal.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. INSPECTION

The Contractor shall verify that surfaces to be covered are smooth, clean, and free from holes. All projecting nails shall be driven flush. The Contractor shall verify that the installed work of the other trades is complete to the point that this work may properly commence.

3.01 B.

B. DISCREPANCIES:

The Construction Manager shall be notified immediately of any discrepancies, and the Contractor shall not proceed with any installation or fabrication in the areas of discrepancies until they have been resolved.

3.02 WORKMANSHIP

A. GENERAL:

All sheet metal shall be accurately formed to the dimensions and shapes required, finishing all molded and broken surfaces with true, sharp, and straight lines and angles, and, where intercepting other members, coping to an accurate fit.

Plane surfaces shall be free from waves and buckles.

Sheet metal shall be installed in 8-foot lengths where possible.

Unless otherwise specifically permitted by the Construction Manager, all exposed edges shall be turned back 1/2 inch.

Flashings shall be separated from dissimilar materials by a heavy bitumastic coating on the flashing.

B. EXPANSION:

All sheet metal shall be formed, fabricated, and installed to adequately provide for expansion and contraction in the finished work.

C. JOINTS:

All parts shall be jointed with rivets or sheet metal screws where necessary for strength or stiffness.

Suitable watertight expansion joints shall be provided for all runs of more than 40 feet except where closer spacing is indicated on the drawings or required for proper installation.

D. FASTENING:

Whenever possible, metal shall be secured by means of clips or cleats without nailing through the metal.

In general, all nails, rivets, and screws shall be spaced not more than 8 inches apart, and, where exposed to the weather, lead washers shall be used.

3.02 D.

For nailing into wood, 11-gage barbed roofing nails long enough to penetrate 3/4 inch shall be used.

3.03 EMBEDMENT

All metal in connection with roofs shall be embedded in a solid bed of calking, using materials and methods described in Section 07900 of these specifications.

3.04 TESTING

The Contractor shall demonstrate to the satisfaction of the Construction Manager by hose or standing water testing that all flashing and sheet metal work is completely watertight.

END OF SECTION

SECTION 07900

JOINT FILLERS, CALKING AND SEALANTS

PART 1 - GENERAL

1.01 DESCRIPTION

This section provides specifications for all joint filler, calking and sealant materials. Individual requirements for calking and sealing are described in various other sections of this project manual.

1.02 QUALITY ASSURANCE

A. GENERAL:

Calking, sealing and filler work shall be performed to provide a positive barrier against penetration of air and moisture at joints between materials.

B. PROTECTION:

All necessary means shall be used to protect calking materials before, during and after installation, and to protect the installed work and materials of all other trades. In the event of damage, the Contractor shall immediately make all repairs and replacements necessary to the approval of the Construction Manager and at no additional cost to the Owner.

C. APPLICATION:

1. FILLERS:

a. LOCATION: Preformed asphalt fiberboard joint fillers shall be used for all expansion joints in sidewalks, curbs and roadways. Preformed resin-bonded cork joint filler shall be used for all joints in isolated concrete slabs on grade. Preformed self-expanding cork joint filler shall be used for all structural expansion joints without waterstops and on the dry side of all structural expansion joints with waterstops. Preformed resin-bonded cork joint filler shall be used on the wet or immersed side of all structural expansion joints with waterstops. Joint fillers around pump and engine bases shall be 3/4 inch thick and shall be of resin-bonded cork type.

Polyethylene rod shall be used to back up calking compound when suitable mortar backstops are not indicated.

Expanding joint sealer shall be compressed so that sealant occupies not more than 20 percent of its original volume.

1.02 C.1.b.

b. APPLICATION: All preformed joint fillers shall be placed into position before concrete is poured. Where it is necessary for the filler to be fixed to existing concrete or other building materials, a suitable adhesive recommended by the filler manufacturer shall be used. Care shall be exercised to assure clean, dry filler surfaces prior to the placement of the concrete. Self-expanding cork fillers expand when brought in contact with moisture; therefore, they shall be protected from washwater, rain or standing water until incorporated into the concrete. In the areas where concrete dries out unusually fast, self-expanding cork fillers shall be kept moist by applying cold water to the exposed edges in order to insure expansion of the cork as concrete contracts.

2. SEALERS:

a. LOCATION: Mastic sealant (gun grade) shall be used to seal all vertical, inclined and overhead joints located in dry interior conditions. Unless otherwise noted, mastic sealant (extruded grade) shall be used to seal all submerged or exposed-to-moisture joints. Class A (self-leveling), Type I rubber sealant shall be used to seal horizontal nonoverhead joints located in dry interior conditions. Class A, Type II rubber sealant shall be used to seal all interior horizontal joints exposed to pedestrian and vehicular traffic.

b. APPLICATION: Prior to being sealed, all joints shall be dry and completely cleaned of all grease, dust, scale, dirt, grit, surface laitance, form oil, and loose stones. All joints shall be wire brushed and blown out with compressed air. Application of all primers and sealants shall be in strict accordance with the manufacturer's printed instructions.

3. CALKING:

a. LOCATION: Calking compound shall be used in all joints around wood and metal frames built into concrete, concrete block or brick structures, all joints around and between precast concrete wall panels, and in all other joints indicated or specified.

b. GENERAL: Calking compound shall be applied by gun method, using nozzles of proper sizes to fit the several widths of joint. Type of gun used for application shall be acceptable to the Construction Manager. Calking compound in joints shall be a minimum of 3/4 inch in depth and 1/4 inch in width, unless otherwise indicated.

c. JOINT PREPARATION: Where joint depth requires over 1 inch of compound, the joint may be filled to a depth of 3/4 inch from surface with a 1:1 mortar or tightly packed polyethylene rod.

1.02 C.3.c.

Where adequate grooves have not been provided, they shall be prepared by cutting and cleaning out mortar or concrete to the minimum depth and width, taking care to see that any adjoining sheet metalwork or metal frames are not reduced in section. Prior to priming the joint, all dust, old sealing compound, laitance and loose material shall be removed by wire brush. All oil and grease shall be carefully removed with an acceptable cleaner. Application of the primer shall be in strict conformance with the manufacturer's printed instructions.

d. APPLICATION: Calking compound preparation, mixing, cartridge filling and joint application shall be strictly in accordance with the manufacturer's printed instructions. Calking compound shall be forced into the joint grooves with sufficient pressure to expel all air and solidly fill joint grooves. Exposed calking shall be free of wrinkles and uniformly smooth. Joints in sills and other wash surfaces shall be filled slightly convex to obtain a flush joint when dry. The entire perimeter of openings in masonry or concrete surfaces shall be calked. Joints found only partially filled shall be roughened and filled as specified and shall have their exposed surface tooled smooth.

4. CLEANUP: Surfaces of all materials adjoining sealed and calked joints shall be cleaned of all smears, compound or other soiling due to sealing or calking operation.

1.03 SUBMITTALS

Submittals shall comply with applicable paragraphs of 01300. The Contractor shall forward all submittals to the Construction Manager. These shall include complete manufacturer's data and recommendations for handling and application of materials, including primers. A 1-foot sample of each joint filler to be used shall be submitted.

1.04 DELIVERY AND STORAGE

Materials shall be delivered in original unopened containers bearing manufacturer's label and marks and shall show date of blending and code identification.

PART 2 - PRODUCTS

2.01 FILLERS

A. PREFORMED:

1. ASPHALT FIBERBOARD: Preformed joint fillers shall be composed of asphalt fiber and mineral filler, with asphalt

2.01 A.1.

impregnated liners on both sides, and shall conform to ASTM D994. Preformed joint fillers shall be termiteproofed, uniform, compressible and waterproof.

2. SELF-EXPANDING CORK: Preformed self-expanding cork joint filler shall consist of clean, granulated cork particles bound together by a synthetic resin of an insoluble nature and specially treated to enable them to expand in contact with moisture. Self-expanding cork joint filler shall conform to ASTM D1752, Type III.

3. RESIN-BONDED CORK: Preformed resin-bonded cork joint filler shall consist of clean, granulated cork particles bound together by a synthetic resin which will not tint water. Resin-bonded cork joint filler shall conform to ASTM D1752, Type II.

B. POLYETHYLENE ROD:

Polyethylene rod shall be Ethafoam as manufactured by the Dow Chemical Co., Haskon as manufactured by the Hercules Co., or equal.

C. EXPANDING JOINT SEALER:

Expanding joint sealer shall be polymethene foam impregnated with asphaltic bitumen similar to Compriband as manufactured by Secoa, Inc., Rodofoam PR as manufactured by Grace Construction Products, or equal.

2.02 SEALERS

A. MASTIC SEALANT:

Mastic joint sealant shall consist of a blend of refined asphalts, resins and plasticizing compounds, reinforced with long-fiber asbestos. Primer shall consist of gilsonite and petroleum asphalts and resinous plasticizers and shall be supplied by manufacturer of mastic sealant.

The mastic shall not lose more than 1 percent of its original weight when a 1/4-inch thick sample is maintained at a temperature of 200 degrees F for 4 hours. It shall not become fluid at temperatures of less than 300 degrees F or brittle at temperatures above minus 10 degrees F. The mastic shall not sag in a vertical concrete joint 1/2 inch wide, 1 inch deep, and at least 6 inches long at a temperature of 180 degrees F for a 24-hour period. It shall not rupture or lose bond when it is installed between two concrete blocks and, at a temperature of 50 degrees F, is extended to 150 percent of its original length at a rate up to 0.15 inch per hour. Sealant shall be compatible with fillers. Mastic sealant shall be pressure grade, unless otherwise approved by the Construction Manager.

2.02 B.

B. RUBBER SEALANT:

Rubber sealant shall be polysulfide thiokol base calking compound conforming to ASA A116.1 and shall contain a minimum of 40 percent by weight of polysulfide thiokol rubber. Unless otherwise indicated, sealant shall be Class A (self-leveling), or Class B (nonsag), Type I or Type II as hereinafter specified for intended use.

Sealant used in joints not subjected to traffic shall be Type I and cured to a Shore "A" hardness of 25 to 35. Sealant in joints subjected to traffic shall be Type II and cured to a Shore "A" hardness of 35 to 45.

Sealant shall be supplied premixed in cartridges, or in two compounds which shall be mechanically mixed and loaded into cartridges just prior to use. Color shall be as selected by the Construction Manager. Sealant primer shall be supplied by the manufacturer of the rubber sealant.

Sealant shall be based on LP liquid polysulfide polymer, manufactured by Thiokol Chemical Corporation, and bearing Thiokol Chemical Corporation's tested and approved seal.

2.03 CALKING

A. CALKING COMPOUND:

Calking compound shall be polysulfide (Thiokol) base calking compound. The two parts of the compound shall be accurately and thoroughly mixed and loaded into cartridges just prior to use. Unless otherwise specified, the compound shall be light grey in color and shall be cured to a Shore "A" hardness of 30 to 40.

B. CALKING PRIMER:

Calking primer shall be supplied by the manufacturer of the calking compound.

PART 3 - EXECUTION

3.01 JOINTS AND SPACES

Joints and spaces to be sealed shall be clean, dry, free of dust, loose mortar, loose concrete or loose plaster. Surfaces which are moist from absorbed water, or are of concrete not adequately cured (and not less than 60 days from pour) shall not be sealed until fully dry. All oils, grease, wax, asphalt, curing agents, bond breakers or other foreign materials shall be removed. Porcelain enamel glaze shall be removed by fine sandpaper. Protective coatings shall be removed from all aluminum surfaces

3.01

against which sealant is to be placed (except anodized surface need not be removed). Masking tape shall be used where necessary to protect surrounding surfaces which will be exposed in the finished work. Clean white wiping rags shall be used for drying and wiping. Rags shall be discarded frequently, as near surgical cleanliness is required. Cleaning solvent shall not be contaminated with dirty rags.

3.02 DIMENSIONS

Joints and spaces which are to receive sealant shall, in no case, be less than 1/4 inch deep over rod stock, nor less than 1/4 inch wide, nor more than 1 inch wide. Where these requirements are not met, no sealant shall be applied without written approval from the Construction Manager, except that these requirements may be superseded by other dimensions and/or tolerances shown in the detail drawings. Rod stock shall lie 3/8 inch back of surface of materials forming joint, except that joint depth shall not exceed joint width, and joints 1/2 to 3/4 inch wide shall have sealant 1/2 inch deep.

3.03 PRIMING

The joint surface, except metal or glass surfaces, shall be primed before application of the sealant material. Extremely rough or porous surfaces, and surfaces so required by the Construction Manager because of roughness or porosity, shall be given two coats of primer. The primer shall be applied only to the surfaces that will be covered by the sealant and shall be dry to the touch before sealant is applied.

3.04 WEATHERING STEEL PREPARATION

Immediately prior to the application of sealant to weathering steel, the steel surface shall be cleaned to bare metal, followed by solvent cleaning. No oxidation shall be permitted to remain, as this will destroy the sealant bond.

****END OF SECTION****

DIVISION 8
DOORS AND WINDOWS

<u>Section</u>	<u>Title</u>
08115	HOLLOW METAL DOORS AND PRESSED STEEL FRAMES
08200	WOOD DOORS
08331	ROLL-UP DOORS
08520	ALUMINUM WINDOWS
08700	FINISH HARDWARE
08800	GLASS AND GLAZING

SECTION 08115

HOLLOW METAL DOORS AND PRESSED STEEL FRAMES

PART 1 - GENERAL

1.01 DESCRIPTION

This section provides specifications for hollow metal doors and pressed steel frames.

1.02 QUALITY ASSURANCE

The doors and frames shall meet the performance test requirements of ANSI A151.1, and be prepared for hardware in accordance with the requirements of the applicable ANSI Standards of the A115 Series.

1.03 SUBMITTALS

Submittals shall comply with applicable paragraphs of Section 01300. The Contractor shall submit to the Construction Manager shop drawings showing cross sections and installation details.

PART 2 - PRODUCTS

2.01 DOORS

A. MATERIALS AND FABRICATION:

The doors shall be fabricated from two formed sheets of commercial quality 18-gage roller leveled carbon steel. The inside shall be reinforced with 20-gage, minimum, vertical channels running full height of the door at approximately 6 inches on center and spot welded at 4 inches on center. The top and bottom shall be closed and reinforced with 18-gage channel members for the full width of the door. All door edges shall be spot-welded at two centers for the full height of the door or reinforced with channels. To eliminate metallic ring, and provide insulation, only rock mineral wool, cellular asbestos fire retardant insulation, or equivalent materials that are standard with the manufacturer, shall be used as fill in the doors. There shall be no exposed seams on the edge or faces of the doors.

B. HARDWARE REINFORCEMENT:

The doors shall be mortised and reinforced in accordance with templates furnished by the hardware supplier. The doors shall be drilled and tapped for mortise hardware. Suitable reinforcement

2.01 B.

for surface applied hardware shall be provided. Drilling and tapping for surface applied hardware will be done in the field. Reinforcement for hinges shall be 9-gage flat bar, drilled and tapped. Reinforcement for surface applied items shall be 14 gage.

C. CLEARANCES:.

The lock edges shall be beveled 1/8 inch in 2 inches. At lock and hinge stiles and at top rails, clearances shall be 1/8 inch. Floor and threshold clearances shall be 1/4 inch unless otherwise indicated.

2.02 MATERIALS AND FABRICATION

A. FRAMES:

All frames shall be of 16-gage cold or hot rolled prime carbon steel sheet, free of defects impairing strength, durability or appearance. The corners shall be mitered and welded, with exposed joints ground smooth to true plane, and flush with surface of base metal. All surfaces shall be free of warp, wave, buckle or other defects. All edges, angles and corners shall be square, clean and sharp.

B. REINFORCEMENT:

The frames shall be mortised and reinforced to receive all hardware, drilled and tapped in accordance with templates furnished by the hardware supplier, and punched to receive rubber silencers. Plaster guards of 3/16-gage steel shall be spot welded over hardware reinforcing plates at mortise hardware locations. A hinge reinforcement using a 2-inch flat steel bar shall be welded to frames at each hinge cutout and drilled and tapped. Reinforcing plates of 12-gage steel shall be spot welded to frames at lock, latch and other hardware locations, including closers and brackets. Surface applied hardware locations shall be reinforced with 14-gage steel material. Where door openings exceed 42 inches in width, head members shall be reinforced with 12-gage steel channel for the full width of the head frame.

C. ANCHORS:

The anchors shall be of 14-gage steel, spot welded to inside of the frames, fixed or adjustable as required by wall conditions. Spacing shall not exceed 24 inches on center at jambs and head. The floor clips of 14-gage steel shall be spot welded to each jamb and punched for anchorage to the floor. A steel spreader at bottom of all frames shall be provided.

2.03

2.03 DOOR LOUVERS

Stationary louvers shall be of the inverted "Y" design, 1 inch thick, of 20-gage steel, with metal molding on both sides, and shall be as manufactured by Airolite, Panelouvre, Custom Architectural Products, or equal.

2.04 PROVISIONS FOR GLAZING

Where glazing is required, flush integral stops on one side and screw-on stops on the opposite side shall be provided.

2.05 FINISH

After assembly, all door edges shall be ground smooth and filled flush with mineral filler to conceal seams. The doors and frames shall be thoroughly cleaned, rinsed, and phosphate coated on all exposed surfaces. The doors and frames shall be given one shop coat of baked-on rust-inhibitive metal primer not less than 1 mil dry film thickness.

2.06 LABELED OPENINGS

Where labeled openings are scheduled or required, doors and frames shall be constructed in strict accordance with the requirements of Underwriters Laboratories, with attached labels for the required classification.

PART 3 - EXECUTION

3.01 INSTALLATION

A. STUD WALLS:

The frames shall be attached to the studs with "Z" type clips or strap anchors. Particular care shall be exercised to insure that frames are installed symmetrically with respect to the studs.

3.02 CALKING

Where drawings require frames to be installed with calking, weathertight and watertight construction shall be provided. Both materials and workmanship shall conform to the requirements of Section 07900 of these specifications.

****END OF SECTION****

SECTION 08200

WOOD DOORS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section provides specifications for all wood doors.

B. TYPE:

All wood doors shall be flush slab type, hollow or solid core as specified or shown.

1.02 QUALITY ASSURANCE

Materials and workmanship shall conform to the WWIC "Manual of Millwork," Section 20 for Custom Grade Doors. A grade stamp of "Certified Compliance" shall be provided on every door. Doors shall be as manufactured by General Veneer Co., Weyerhaeuser, Curtis Door Division of Georgia-Pacific, or equivalent.

1.03 SUBMITTALS

Submittals shall comply with applicable paragraphs of Section 01300. Within 60 days after award of contract, the Contractor shall send submittals to the Construction Manager for review.

In addition to the requirements of Section 01300, the Contractor shall submit to the Construction Manager for review the wood door manufacturer's written warranty against defects in materials and workmanship. The warranty shall cover a time period of two years after the date of final acceptance of the project. The following items shall be covered specifically:

1. Delamination in any degree.
2. Warp or twist of 1/4 inch or more.
3. Telegraphing of core unit through face veneer to cause surface variation of 1/100 inch in any 3-inch span.
4. Any defect which may affect performance or appearance.

2.01 A.

PART 2 - PRODUCTS

2.01 SOLID CORE DOORS

A. CORES:

Cores shall consist of kiln-dried, low-density, 2-1/2 inch wide, random length wood blocks, edge-glued with joints well staggered.

B. CROSS BANDS:

Cross bands shall be 1/16 inch kiln-dried hardwood, full width of door, with grain perpendicular to face grain.

C. EDGE BANDS:

Edge bands shall be kiln-dried hardwood not less than 5/8 inch thick after trimming; stile bands shall be same species as face veneer.

D. FACE VENEERS:

Face veneers shall be 1/28 inch thick kiln-dried "sound" grade beech or birch, unselected for color where opaque finish is indicated.

E. GLUE:

Glue shall be CS 35 Type II for bonding core blocks. Type I (fully waterproof) shall be used for all other work.

2.02 HOLLOW CORE DOORS

A. CORES:

"Cellular" cores complying with CS 171 requirements for mesh cores are acceptable. Core parts shall be securely bonded to face panels, using CS 35 Type II water resistant adhesive.

B. STILES AND RAILS:

Stiles shall have 1-1/8 inch minimum width after trimming. Rails shall have 2-1/2 inch minimum width after trimming. Stiles and rails shall be solid stock or glued-up blocks with joints staggered, provided outer edge-band is solid for full length of stiles and rails. Stiles shall be edge-banded with species to match face veneer. Two lock blocks, each at least 2-7/8 inch wide by 20 inch long, per door shall be provided.

2.02 C.

C. FACE VENEERS:

Face veneers shall be CS 35 "sound" grade or "paint" grade hardwood for opaque finish, unless otherwise indicated. Face veneers shall have standard commercial thickness not less than 1/32 inch before sanding. Face skin shall be two or three ply, having total minimum thickness of 1/8 inch before sanding. In lieu of "paint" grade hardwood veneer construction, hardboard faces complying with CS 171 are acceptable.

2.03 CUTOUTS

Openings for glass and louvers, where indicated, shall be fully framed in core prior to applying face veneers. Cutouts shall be located as indicated, but not closer than 5 inches from any edge. Stops and moldings shall match faces as closely as possible and shall be permanently attached to one side only.

2.04 LOUVERS

Where required, louvers shall be Airolite No. 601C with Type "C" metal molding, Panelouvre No. 67-C with Type "C" metal molding, or equivalent. Louvers shall be fabricated of 20-gage cold rolled steel and shall have a factory applied rust-inhibitive prime coat finish.

PART 3 - EXECUTION

Doors intended for opaque finish may be shipped in properly protected bundles with heavy separators between doors.

END OF SECTION

SECTION 08331

ROLL-UP DOORS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section provides specifications for all steel roll-up doors.

B. EQUIPMENT:

<u>Item</u>	<u>Equipment No.</u>
Electric roll-up door	MME570
Motor	M570

1.02 QUALITY ASSURANCE

A. GENERAL:

Specifications data are from the catalog of Southwestern Steel Rolling Door Company. Products of Kinnear, Cookson, Cornell, Pacific Rolling Door, or equal, will be acceptable.

B. DESIGN REQUIREMENTS:

All doors shall have manual operators, and shall also have electric motor operators.

Manual operators shall consist of reduction gears and heavily galvanized steel hand chain provided with chain lock brackets.

Electric motor operators shall be heavy-duty units consisting of 460 volt, 3 phase, 60 Hz, totally enclosed motors directly connected to a speed reducer; solenoid activated disc brake; and limit switches. Motor operators shall be sized by the door manufacturers for high torque starting and smooth operation at approximately 2/3 ft/sec speed. All electrical equipment shall meet NEMA standards and the complete prewired unit shall be UL listed.

Each unit shall be provided with a magnetic across-the-line heavy-duty reversing starter having thermal overload protection, and, unless otherwise specified, shall be equipped with momentary pushbutton marked "Open," "Close," which requires continuous contact for operation. The pushbutton station enclosure shall be NEMA 4X. Each unit shall be provided with electric interlock so the motor cannot be started when door is being operated by hand, and shall be constructed so manual operation may be effected even when motor is disconnected from the unit.

1.03 SUBMITTALS

Submittals shall comply with Section 01300 and shall include shop drawings of equipment specified.

PART 2 - PRODUCTS

2.01 CURTAIN

Curtain shall be made of interlocking, roll formed slats fabricated of galvanized steel of a gage suitable to resist the design wind loading. Malleable endlocks shall be fastened to each end of all slats with a minimum of two rivets. The bottom of the curtain shall be equipped with a foot piece consisting of two galvanized steel angles for reinforcement and a rubber loop astragal for sill contact. Curtain shall be flat slat type. Slats shall be of sufficiently large sections to give curtain strength to safely resist a wind load of 20 pounds per square foot.

2.02 HOOD

The hood shall be constructed of 24-gage galvanized steel sheet, formed to fit contour brackets, and reinforced at top and bottom edges.

2.03 GUIDES

Door guides shall be fabricated of steel angles bolted together to form channel guide for the curtain. Guides shall have sufficient slot depth to retain the curtain against a wind pressure of 20 pounds per square foot.

2.04 BRACKETS

Brackets shall be constructed of steel plates of sufficient thickness to support the weight of the curtain and barrel assembly and designed to form an end closure support for the hood. The drive bracket shall be equipped with permanently lubricated sealed ball bearings.

2.05 BARREL ASSEMBLY

Barrel shall be of steel pipe and shall be adequate to carry door weight with deflection not to exceed 0.04 inch per foot of door width. The door shall be counterbalanced with oil-tempered helical torsion springs. Spring tension shall be adjustable by a wheel that is accessible without removing the hood.

2.06 GEARS

All gears shall be of high grade cast iron made from machine-cut patterns.

2.07

2.07 FINISH

Curtain and hood shall have a baked grey acrylic primer. All other exposed surfaces shall be given one coat of rust-inhibiting paint.

PART 3 - EXECUTION

Installation shall be under the supervision of manufacturer-approved personnel. On completion of the installation the doors shall operate smoothly without interruptions during the opening and closing cycles.

END OF SECTION

SECTION 08520
ALUMINUM WINDOWS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section provides specifications for all fixed and operable aluminum windows.

B. TYPE:

Operable windows shall be sliding type.

1.02 QUALITY ASSURANCE

Aluminum windows shall be Fentron Series 3000 or the products of Hope, Lupton, or other equal manufacturers which, in the Construction Manager's opinion, meet all dimensional, structural, functional and aesthetic requirements of the project.

1.03 SUBMITTALS

Submittals shall comply with applicable paragraphs of Section 01300. The Contractor shall submit to the Construction Manager samples of all materials specified herein.

PART 2 - PRODUCTS

2.01 MATERIALS

A. FRAME AND SASH:

Frame and sash members shall be 6063-T5 aluminum extrusions. The frame and ventilator sections shall each be not less than 1-1/2 inch deep. Thickness of the basic members shall be at least 1/8 inch.

B. SCREENS:

Screens shall be provided for all operable vents. Screens shall be manufacturer's standard design with 16 x 18 mesh aluminum screen cloth.

C. HARDWARE:

Manufacturer's standard hardware shall be provided for operable sash.

2.01 D.

D. WEATHERSTRIPPING:

Weatherstripping shall be installed in retaining grooves designed as an integral part of the ventilator section, using high grade vinyl or neoprene formulated for this purpose.

E. GLASS AND GLAZING:

Windows shall be factory glazed with 1/4-inch thick clear polished plate or float glass, tempered where indicated, as manufactured by PPG, L-O-F or ASG. Provide double glazing at all exterior windows.

F. FINISH:

Finish on all aluminum shall be AA-M12C22A42 Dark Bronze Anodized Architectural Class I coating.

2.02 EQUIPMENT

Corners of window frames shall be mitered and of full bead welded construction providing rigid and secure connection. All windows shall be provided with rectangular metal beads for inside glazing.

PART 3 - EXECUTION

3.01 INSTALLATION

All windows shall be set plumb, square, and securely attached to surrounding construction. Installation shall be done by designated representative of the manufacturer.

Positive separation of aluminum from adjacent materials shall be provided by painting abutting aluminum surfaces with a heavy coat of bituminous paint or by the use of standard tape or gaskets manufactured for this purpose.

3.02 CALKING

At juncture between frames and adjacent materials, the entire perimeter of the frame shall be sealed on both sides, using materials and methods specified under the Calking and Sealants section.

3.03 FINAL CLEANING

Final cleaning of aluminum surfaces shall be done in strict accordance with the manufacturer's instructions. No abrasives shall be used.

****END OF SECTION****

SECTION 08700
FINISH HARDWARE

PART 1 - GENERAL

1.01 DESCRIPTION

This section provides specifications for furnishing of all finish hardware, including trim, attachments, and fastenings specified or required for proper and complete installation.

1.02 SUBMITTALS

Submittals shall comply with applicable paragraphs of Section 01300. Hardware schedules and catalog cuts shall be submitted.

A. HARDWARE LIST:

Within 90 days after Notice to Proceed, the Contractor shall submit to the Construction Manager a hardware list, identifying each hardware item by manufacturer, manufacturer's catalog number, catalog cuts, and exact location in the work. The hardware list shall be in suitable form to facilitate ready checking and approval by the Construction Manager. Approval of the hardware schedule by the Construction Manager does not relieve the hardware supplier from the responsibility of furnishing the job complete.

B. TEMPLATES:

In order to insure proper placement and fit, all hardware in connections with metal doors or metal frames shall be made with a template. Templates or physical hardware items shall be furnished to manufacturers concerned and shall be supplied sufficiently in advance to avoid delay in the work.

PART 2 - PRODUCTS

2.01 FINISH OF HARDWARE

The finish of hardware shall be as hereinafter specified. Special care shall be taken to coordinate the finish of the various manufacturers to insure an acceptable uniform finish.

2.02 LOCK UNIFORMITY

Except where otherwise specified, all locksets, latches, padlocks, cylinders, and component parts as specified hereinafter, shall be by one manufacturer.

2.03

2.03 LOCK STRIKES

All lock strikes shall be boxed and shall have a curved lip of sufficient length to protect the trim and jamb.

2.04 KEYING AND MASTERKEYING

All locksets, padlocks, and cylinders shall be keyed the same with Schlage keyways at the factory.

All locksets, padlocks, and cylinders shall be construction keyed. Contractor and hardware supplier shall be held responsible for permanent keys until all are delivered to the Owner or otherwise cleared to the Owner's complete satisfaction.

The Contractor shall furnish five additional construction keys.

2.05 DOOR CLOSERS

All door closers attached to mineral core or particle filled doors shall be installed with hex bolts.

2.06 DOOR BUTTS

Hinges shall be full mortise, template type, unless half mortise hinges are required. Hinges shall have nonrising loose pins, ball or oiltight bearings and flat button tips, except when otherwise specified. Where necessary to keep door leaf clear of walls, casings, jambs, or reveals in door openings, wide throw hinges of an approved type shall be furnished. Exterior door butts shall be steel, sheridized. For outswinging doors, hinges shall have a screw in the barrel to prevent removal of pin when door is closed.

2.07 MAINTENANCE RELATED ITEM

The Contractor shall provide one set of installation and adjusting tools and one set of maintenance manuals for locksets and door closers.

2.08 SCHEDULE OF HARDWARE

This schedule is a guide only. All finish hardware required for the project shall be furnished. Hardware required for any particular location, but not scheduled, shall be the same as that scheduled for similar locations. Hardware shall be as hereinafter specified and scheduled on the drawings.

BUTTS--INTERIOR DOORS: Stanley, McKinney, or equal 4-inch by 4-inch medium weight steel, 130-gage, polished and dull chrome-plated, BB for doors with closers.

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BUTTS--EXTERIOR DOORS: Stanley, McKinney, or equal, 4-1/2-inch by 4-1/2-inch heavy solid brass, 180 gage with nonremovable stainless steel pins and two permanently lubricated ball races.

LOCKSETS--Schlage, Sargent, or equal heavy-duty cylindrical lock with stainless steel mechanism with 6-pin cylinder and 3-3/4-inch backset. Lockset shall be complete with wrought aluminum ball type knob and 2-9/16-inch wrought aluminum rose.

LATCHSETS--INTERIOR DOORS: To match locksets.

CLOSERS--INTERIOR AND EXTERIOR DOORS: LCN Smoothee, Sargent "Powerglide," or equal, size and type to suit the particular door.

KICKPLATES--10 inches high, 16 gage, satin aluminum, bevelled edges, secured with countersunk screws.

THRESHOLDS--Extruded aluminum, 4-inch wide with fluted surface.

STOPS--INTERIOR DOORS: Wall bumper, circular rubber cushion in circular metal flange, where wall bumper not possible half-dome floor stop with rubber bumper.

WEATHERSTRIPPING--Pemko 430AS, ZERO 361, or equal, surface mounted, heavy-duty automatic door bottom.

--Pemko 315AR, ZERO 139, or equal, surface mounted at head and jambs.

2.09 HARDWARE GROUPS

A. MANUFACTURER:

Numbers and references in Hardware Groups below establish quality to be furnished and installed. Suitable types, having similar quality and operation as finish hardware specified, may be furnished when approved by the Construction Manager.

<u>Item</u>	<u>Manufacturer</u>
Butts, hinges	Stanley
Locksets, latches, cylinders	Schlage-Orbit design
Closers	LCN
Silencers, stops and holders	Brookline
Thresholds, weatherstripping	Pemko
Miscellaneous hardware	Stanley

2.09 B.

B. HARDWARE GROUPS:

Group #1

Each door to have:

1-1/2 pair butts	FBB199
1 lockset	D53PD
1 door closer	4016
1 door stop	1326
1 threshold	170A
Weatherstripping	430AS/315AR

Group #2

Each door to have:

2 pair butts	FBB199
1 lockset	D53PD
1 door stop	1329
1 threshold	170A
Weatherstripping	430AS/315AR

Group #3

Each door to have:

1-1/2 pair butts	FBB179
1 latchset	D10S
1 door stop	1330

Group #4

Each door to have:

1-1/2 pair butts	FBB179
1 lockset	D40S
1 door closer	4033
1 door stop	1326
1 kickplate	per specifications

Group #5

Each pair of doors to have:

3 pair butts	F179
1 latchset	D10S
1 dummy trim	D170
1 surface foot bolt	1056
2 kickplates	per specifications

Group #6

Each pair of doors to have:

3 pair butts	F179
1 latchset	D10S
1 dummy trim	D170
1 surface bolt	Sc 1078, 3" length

3.01

PART 3 - EXECUTION

3.01 PACKING, MARKING AND DELIVERY

Each unit of hardware shall be individually packaged, complete with proper fastenings and all appurtenances. Each package shall be clearly marked on the outside to show the contents and specific location in the work. Except where otherwise specified, all hardware shall be delivered to the job site.

END OF SECTION

SECTION 08800
GLASS AND GLAZING

PART 1 - GENERAL

1.01 DESCRIPTION

The section provides specifications for all glass and glazing in hollow metal frames, steel frames, and metal doors.

1.02 QUALITY ASSURANCE

Glass shall be as manufactured by PPG, L-O-F, or equal.

PART 2 - PRODUCTS

A. FLOAT GLASS:

Float glass shall be clear, 1/4 inch thick, ordinary glazing quality.

PART 3 - EXECUTION

Glass shall be accurately cut and installed on setting blocks in accordance with manufacturer's instructions, using standard glazing methods, with glazing tape for face and heel beads. Mirrors shall be securely installed where indicated on the drawings.

END OF SECTION

DIVISION 9

FINISHES

<u>Section</u>	<u>Title</u>
09250	GYPSUM WALLBOARD
09300	TILEWORK
09650	RESILIENT FLOORING
09900	COATING SYSTEMS
09901	FINISHES AND COLORS

SECTION 09250

GYPSUM WALLBOARD

PART 1 - GENERAL

1.01 DESCRIPTION

This section provides specifications for all gypsum wallboard work.

1.02 QUALITY ASSURANCE

Except as may be modified by these specifications and by applicable laws and ordinances at the place of building, all work shall be installed to conform to the requirements of "Standard Specifications for Gypsum Wallboard Interior Finishes," ANSI A97.1.

1.03 DELIVERY AND STORAGE

All materials shall be delivered in unbroken packages bearing the manufacturer's brand and designation.

PART 2 - PRODUCTS

2.01 GYPSUM WALLBOARD

Gypsum wallboard shall be tapered edge sheets, conforming to ASTM C36, of thicknesses as shown. Waterproof type shall be used in shower and toilet areas.

Approved manufacturers are U.S. Gypsum Co., Blue Diamond Co., National Gypsum Co., or Kaiser Gypsum Co. Inc.

2.02 JOINT REINFORCING TAPE, ADHESIVE AND METAL CORNER REINFORCEMENT

The tape, adhesive and reinforcement shall be standard products recommended by the manufacturer of the gypsum wallboard used in the work.

PART 3 - EXECUTION

3.01 WALLBOARD APPLICATION

A. CUTTING AND INSTALLING:

Gypsum wallboard shall be cut by scoring and breaking or by sawing, working from the face side. Edges and ends shall be hand cut where necessary to obtain neat joining when wallboard is

3.01 A.

erected. Wallboard shall be neatly scribed to meet projecting surfaces. Joints shall be staggered, with abutting ends occurring over a support. To minimize end joints, wallboard sheets of maximum practical lengths shall be used. Wallboard shall be applied with long dimension across supports.

B. FASTENERS:

Fasteners shall be spaced 12 inches on center in the field and 8 inches on center staggered along abutting edges and at 12 inches on center for ceilings. While fasteners are being driven, the wallboard shall be held in firm contact with the underlying support. Fastening shall proceed from the central portion of the wallboard toward the ends and edges. Fasteners shall be driven home, with heads in a dimple slightly below the wallboard surface. Care shall be taken to avoid breaking the paper face. Fasteners shall be placed no closer than 3/8 inch from ends or edges of wallboard.

3.02 JOINT TREATMENT

A. FIELD JOINTS:

A 3-inch wide uniform coating of adhesive shall be applied centered over the joint. Tape shall then be centered over the joint and embedded into the adhesive. When dry, the joint shall be sanded smooth. Two coats of adhesive shall be applied over the tape, extending each coat slightly beyond the preceding one. Each coat shall be allowed to dry and be sanded smooth. Nail dimples shall be treated in a like manner.

B. INSIDE ANGLES:

Inside corners and angles shall be treated as for field joints, except the tape shall be folded in the middle to provide a clean sharp corner, fully embedded.

C. OUTSIDE ANGLES:

Metal corner beads and accessories standard with the wallboard manufacturer shall be set in and finished with adhesive as for joints.

D. INTERSECTIONS WITH OTHER MATERIALS:

Where gypsum board abuts concrete and other materials or where the board edge would otherwise be exposed, U.S.G. No. 400 Series, Kaiser No. 102, or equal by Blue Diamond or National Gypsum, metal trim shall be provided.

****END OF SECTION****

SECTION 09300

TILEWORK

PART 1 - GENERAL

1.01 DESCRIPTION

This section provides specifications for all ceramic tile work.

1.02 QUALITY ASSURANCE

A. DESIGN REQUIREMENTS:

In addition to complying with all pertinent codes and regulations, all tile shall be installed in accordance with the recommendations contained in the "1979 Handbook for Ceramic Tile Installation" of the Tile Council of America, Inc.

B. STANDARDS:

Portland cement shall conform to ASTM C150, Type I or Type II.

Unless otherwise indicated or specified, all materials and workmanship shall be provided in accordance with the applicable requirements of the following ANSI specifications:

"Glazed Wall Tile, Ceramic Mosaic Tile, Quarry Tile and Paver Tile Installed with Portland Cement Mortar," A108.1 and A108.3.

"Ceramic Tile installed with organic adhesive" A108.4.

"Recommended Standard Specifications for Ceramic Tile," current edition by the Tile Council of America.

1.03 SUBMITTALS

Submittals shall comply with applicable paragraphs of Section 01300. The Contractor shall submit to the Construction Manager samples of all materials specified herein.

1.04 DELIVERY AND STORAGE

All materials shall be delivered in their original containers with seals unbroken and manufacturer's name and product identification clearly legible on each package.

2.01

PART 2 - PRODUCTS

2.01 CERAMIC WALL TILE

Ceramic wall tile shall be machine-made, dust-pressed, white-bodied, satin matte-glazed tile as manufactured by American Oleon, Interpace, or equal. Tile shall be 4-1/4-inch by 4-1/4-inch units. Colors shall be as selected by the Construction Manager from the manufacturer's standard range.

2.02 TRIMMERS FOR WALL TILE

Trimmers shall be shapes matching wall tiles. Bullnose shapes shall be provided for external corners, cove shapes for internal corners and base. Matching special shapes shall be provided as necessary for the work.

2.03 CERAMIC FLOOR TILE

Ceramic floor tile shall be machine-made, dust-pressed, natural clay or porcelain type, 2-inch by 2-inch, unglazed tile as manufactured by American Oleon, Interpace, or equal. Colors and patterns shall be as selected by the Construction Manager from the manufacturer's standard range.

2.04 ORGANIC ADHESIVE

Organic adhesive shall be CTA II mastic as manufactured by 3M Co., or equal, complying with ANSI A136.1.

2.05 GROUT FOR WALL TILE

Grout shall be a commercial preparation similar and equal to Tile Seal, Snowite or Tilemate, color shall be white.

2.06 GROUT FOR FLOOR TILE

Grout shall be white cement tinted to the colors selected by the Construction Manger.

2.07 CURING PAPER

Curing paper shall be nonstaining reinforced draft paper.

2.08 SAND

Sand shall be clean, washed, sharp, durable, natural particles, free from soluble salts and organic impurities. Sand for grouting shall be screened to pass a 30-mesh sieve with not more than 5 percent passing a 100-mesh screen.

2.09 WATER

Water used shall be clean and from a source intended for domestic consumption.

PART 3 - EXECUTION

3.01 INSTALLATION

A. SETTING:

All tile shall be installed in strict accordance with the reference specifications.

Ceramic floor tile shall be installed by the thick bed method, i.e., Portland cement, sand and water in the proportions of 1:6 with the underbed carefully sloped to drains. The tile shall be set in a bond coat of neat cement over the underbed.

Ceramic wall tile shall be installed in compliance with TCA specification for organic adhesives on solid backing and ANSI A108.4. Generally adhesive shall be spread with a notched trowel except in shower areas where the adhesive shall be a full bed.

B. GROUTING:

As much grout as possible shall be forced into the joints. Grout shall be wiped out to be flush with face of all-purpose edge tile. All excess grout shall be removed with clean burlap. Before grout sets, all skips and gaps shall be filled.

C. CURING:

Curing paper shall be applied with perimeter and all laps sealed. Paper shall be maintained in perfect conditions for a minimum of 5 days.

3.02 CLEANING TILE

Tile shall be cleaned promptly during progress of work so as to minimize final cleaning. Mortar scum shall not be left to dry on tile faces.

3.03 EXTRA MATERIAL

Two percent of each tile color and pattern shall be delivered to the Owner prior to final acceptance of the work.

END OF SECTION

SECTION 09650

RESILIENT FLOORING

PART 1 - GENERAL

1.01 DESCRIPTION

This section provides specifications for resilient floor tile, sheet vinyl, and wall base.

1.02 QUALITY ASSURANCE

Resilient flooring shall have a flame spread rating not greater than 75 when tested in accordance with ASTM E84.

1.03 SUBMITTALS

Submittals shall comply with applicable paragraphs of Section 01300. The Contractor shall submit to the Construction Manager samples of all materials specified herein.

PART 2 - PRODUCTS

2.01 MATERIALS

A. VINYL COMPOSITION TILE:

FS SS-T-312, Type IV, 12 inches by 12 inches, 1/8 inch thick. Colors and patterns shall be as selected by the Construction Manager from the manufacturer's standard range.

B. VINYL SHEET WITH BACKING:

Provide vinyl sheet with filled vinyl plastic wear layer and fibrous backing complying with FS L-F-475, Type II, and with RFCI SV-1, Type I, Material I wear layer, Group III backing suitable for Use Category I, with a recommended static load limit of 100 psi, 72-inch minimum sheet width, Grade A (0.050-inch thick wear layer).

D. PRIMERS, FILLERS, ADHESIVES AND CLEANERS:

All primers, fillers, adhesives and cleaners shall be as supplied by or approved by the flooring manufacturer.

E. FINISH:

The finish shall be of the slip resistant type such as Hillyard's "Poly-Kote," Columbia "Star," or equal, as recommended by the flooring manufacturer.

PART 3 - EXECUTION

3.01 PRELIMINARY INSPECTION

Subflooring shall be thoroughly dry, broom-clean, free of grease, oil, paint, and other foreign matter which would impair adhesion or show through the flooring.

3.02 APPLICATION OF FLOORING

A. GENERAL:

Prior to installation of flooring, all cracks and other pits and depressions shall be filled with crack filler.

Install flooring using method indicated in strict compliance with manufacturer's recommendations. Extend flooring into toe spaces, door reveals, and into closets and similar openings.

Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.

Tightly cement flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll flooring at perimeter of each covered area to assure adhesion.

B. TILE FLOORS:

Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.

Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable.

Lay tile in "checkerboard" fashion with grain reversed in adjacent tiles.

Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer's directions.

3.02 C.

C. SHEET FLOORING:

Lay sheet flooring to provide as few seams as possible with economical use of materials. Match edges for color shading and pattern at seams in compliance with manufacturer's recommendations.

Adhere sheet flooring to substrates using method approved by flooring manufacturer for type of sheet flooring and substrate condition indicated.

Use conventional full spread adhesive method unless otherwise indicated.

Use conventional perimeter bonding adhesive procedures where recommended by flooring manufacturer.

Prepare seams in vinyl sheet flooring in accordance with manufacturer's instructions for most inconspicuous appearance, sealing continuously with fluid-applied sealant or adhesive as standard with manufacturer.

Provide integral flash cove base where shown on the drawings, including cove support strip and metal top edge strip. Construct coved base in accordance with manufacturer's instructions.

D. ACCESSORIES:

Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

Apply butt type tapered brass edge strips where resilient floor edges would otherwise be exposed and prior to resilient flooring. Secure units to substrate with countersunk stainless steel anchors, complying with manufacturer's recommendations.

3.03 CLEANING AND PROTECTION

Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by the flooring manufacturer. Protect installed flooring with heavy Kraft paper or other covering.

Finishing: After completion of project and just prior to final inspection of work, thoroughly clean floors and accessories. After cleaning, three thin coats of finish shall be applied to flooring. Each coat shall be thoroughly dry and be machine buffed prior to application of the succeeding coat.

3.04 EXTRA MATERIAL

Two percent of each tile color and pattern shall be delivered to the Owner prior to final acceptance of the work.

****END OF SECTION****

SECTION 09900

COATING SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies paint coatings and their surface preparation.

B. DEFINITIONS:

Coating systems include surface description, surface preparation, required dry film thickness, and the number and application procedure of the prime and finish coatings as specified in Part 3.04, Coating System Specification Sheets (COATSPEC).

Field coating is the application or the completion of application of the coating system after installation of the surface at the site of the work.

1.02 QUALITY ASSURANCE

A. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Steel Structures Painting Council Specifications (SSPC), 1973.

B. STANDARDIZATION:

Materials, supplies, and articles provided shall be the standard products of manufacturers. Paints in a particular coating system shall be the products of a single manufacturer.

The standard products of manufacturers other than those specified will be accepted when it is demonstrated to the Construction Manager that they are equal in composition, durability, usefulness, and convenience for the purpose intended. Requests for substitutions will be considered, provided the following minimum conditions are met:

1. The proposed coating system shall use an equal or greater number of separate coats to achieve the required dry film thickness.

1.02 B.

2. The proposed coating system shall use coatings of the same generic type.
3. Requests for substitution shall have directions for application and descriptive literature which includes generic type, nonvolatile content by volume, and information confirming that the substitution is equal to the specified coating system.
4. The Contractor shall provide certified laboratory data sheets showing the results of complete spectrographic and durability tests performed on the proposed substitute. Tests shall be performed by a laboratory which conforms to the provisions of ASTM E329 and which shall be a member of the American Council of Independent Laboratories. Costs incurred in the testing program shall be borne by the Contractor.

1.03 INFORMATION TO BE PROVIDED

The following information shall be provided.

A list of materials proposed to be used under this section shall be provided before materials are delivered to the job site.

For each primer and finish coating, the Contractor shall provide the manufacturer's application instructions which shall include the following:

1. Surface preparation recommendations.
2. Primer type, where required.
3. Maximum dry and wet mil thickness per coat.
4. Minimum and maximum curing time between coats, including atmospheric conditions for each.
5. Curing time before submergence in liquid.
6. Thinner to be used with each paint.
7. Ventilation requirements.
8. Minimum atmospheric conditions during which the paint shall be applied.
9. Allowable application methods.
10. Maximum allowable moisture content.
11. Maximum storage life.

1.04 DELIVERY AND STORAGE

Materials shall be delivered to the job site in their original, unopened containers. Each container shall bear the manufacturer's name brand, batch number, date of manufacture, storage life, and special directions.

Paints shall be stored in enclosed structures and shall be protected from weather and excessive heat or cold. Flammable materials shall be stored in accordance with state and local codes. Materials exceeding storage life recommended by the manufacturer shall be removed from the site.

1.05 SPARE SUPPLIES

The Contractor shall provide one unbroken gallon container of each color and type of coating and each type of solvent and thinner required in the specification. These spare paint supplies shall be stored as directed by the Construction Manager.

PART 2 - PRODUCTS

2.01 MATERIALS

A. GENERAL:

Coating materials shall not be used until the Construction Manager has inspected the materials.

B. COATING SYSTEMS:

Unless otherwise specified, prime coatings may be shop or field applied. Shop applied primer shall be compatible with the specified system. Field coating signifies that coating is applied in place, after installation of the surface. If the shop coating meets the requirements of this section, the field coating may consist of touching up the shop prime coat to achieve the film thickness, continuity and coating specified in the COATSPEC. Damaged and poorly applied shop coatings that do not meet the requirements of this section shall be removed and the surfaces recoated in accordance with the COATSPEC.

Surface preparation shall be as specified in each system and in Part 3. Number of coats specified in each system shall be the minimum number of coats applied to provide the required dry film thickness.

3.01 A.

PART 3 - EXECUTION

3.01 PREPARATION

A. GENERAL:

Surfaces to be coated shall be clean. Before applying coating or surface treatments, oil, grease, dirt, rust, loose mill scale, old weathered coatings, and other foreign substances shall be removed except as specified. Oil and grease shall be removed before mechanical cleaning is started. Where mechanical cleaning is accomplished by blast cleaning, the abrasive used shall be washed, graded and free of contaminants which might interfere with the adhesion of the coatings.

Clean cloths and clean fluids shall be used in solvent cleaning. Cleaning and painting shall be scheduled so that dust and spray from the cleaning process will not fall on wet, newly painted surfaces. Hardware, electrical fixtures and similar accessories shall be removed or masked during preparation and painting operations, or shall otherwise be satisfactorily protected. Equipment adjacent to walls shall be disconnected and moved to permit cleaning and painting of equipment and walls and, following painting, shall be replaced and reconnected.

Contractor shall demonstrate that field coating is compatible with factory coating by applying small test patches of specified coating over shop coating.

B. METALLIC SURFACES:

Metallic surfaces shall be prepared in accordance with applicable portions of surface preparation specifications of the Steel Structures Painting Council (SSPC). Specific applicable standards are specified in each coating system. The solvent in solvent cleaning operations shall be as recommended by the manufacturer.

Preparation of metallic surfaces shall be based upon comparison with SSPC-Vis-1-67T (ASTM D220), and as described herein. To facilitate inspection, the Contractor shall, on the first day of sandblasting operations, sandblast metal panels to the standards specified. Plates shall measure a minimum of 8-1/2 inches by 11 inches. Panels meeting the requirements of the specifications shall be initialed by the Contractor and the Construction Manager and coated with a clear nonyellowing finish. One of these panels shall be prepared for each type of sandblasting and shall be used as the comparison standard throughout the project.

Surface preparation for galvanized metal, aluminum, copper, and brass shall be in accordance with SSPC SP-1 (solvent cleaning) and passivated in accordance with the coating manufacturer's written instructions.

3.01 C.

C. PREPARATION OF WOOD SURFACES:

Wood surfaces to be coated shall be cleaned of dirt, oil or other foreign substances with mineral spirits, scrapers, sandpaper or wire brush. Finished surfaces exposed to view shall be smoothed by planing or sandpapering. Millwork shall be sandpapered and given a coat of the specified exterior primer on all sides before installation. Built-in surfaces of window sills shall be double primed. Glazing rabbets and beads in exterior sash and doors shall be double primed. Small, dry, seasoned knots shall be surfaced scraped, sandpapered, and thoroughly cleaned and shall be given a thin coat of an acceptable knot sealer before application of the priming coat. Large, open, unseasoned knots, and beads or streaks of pitch shall be scraped off; however, if the pitch is still soft, it shall be removed with mineral spirits or turpentine, and the resinous area shall be coated with knot sealer. After priming, holes and imperfections shall be filled with putty or plastic wood, colored to match the finish coat, allowed to dry and sandpapered smooth.

D. PREPARATION OF CONCRETE, MASONRY AND PLASTER SURFACES:

Unless otherwise specified, surfaces which are to be coated shall be allowed to age for at least 28 days and allowed to dry to the moisture content recommended by the coating manufacturer. Moisture content may be tested by the Construction Manager with a Delmhorst Instrument Company moisture detector, or equal. The surfaces shall be brush treated with a 10 percent muriatic acid solution and thoroughly flushed with water after 10 minutes. (A 10 percent acid solution is made by diluting 30 percent commercial solution in the following proportions: 2 water to 1 acid.) Loose concrete and laitance shall be removed by sandblasting and chipping, and voids and cracks shall be repaired as specified in Section 03300.

Plaster surfaces shall be dry and clean and free from grit, loose plaster, and surface irregularities. Cracks and holes shall be repaired with acceptable patching materials, keyed to existing surfaces, and sandpapered smooth. Surfaces to be coated with oil or varnish base paints shall be tested for the presence of alkali. If present, the alkali shall be neutralized with acid solution as above.

Surfaces shall be cleaned with clear water by washing and scrubbing to remove foreign and deleterious substances.

Steam cleaning shall be used to clean wall surfaces of existing process channels and tanks to be coated. Surfaces to be coated, or recoated, shall be repaired, cleaned, and finished to the standards as specified herein, and in Section 03300 for new concrete.

3.01 E.

E. PREPARATION OF PLASTIC SURFACES:

Plastic shall be cleaned with solvent compatible with the specified primer.

3.02 APPLICATION

A. WORKMANSHIP:

Coated surfaces shall be free from runs, drops, ridges, waves, laps, and brush marks. Coats shall be applied so as to produce an even film of uniform thickness completely coating corners and crevices. Painting shall be done in accordance with the requirements of SSPC Paint Application Guide.

The Contractor's coating and painting equipment shall be designed for application of the materials specified. Compressors shall have suitable traps and filters to remove water and oils from the air. Spray equipment shall be equipped with mechanical agitators, pressure gages, and pressure regulators, and spray nozzles of the proper sizes.

Each coat of paint shall be applied evenly and sharply cut to line. Care shall be exercised to avoid overspraying or spattering paint on surfaces not to be coated. Glass, hardware, floors, roofs, and other adjacent areas and installations shall be protected by taping, drop cloths, or other suitable measures.

B. PAINT PROPERTIES, MIXING AND THINNING:

Paint, when applied, shall provide a satisfactory film and smooth even surface, and glossy undercoats shall be lightly sanded to provide a surface suitable for the proper application and adhesion of subsequent coats. Paints shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings consisting of two or more components shall be mixed in accordance with the manufacturer's instructions. Where necessary to suit the conditions of the surface, temperature, weather and method of application, the paint may be thinned immediately prior to use by the addition of not more than one pint per gallon of the proper thinner. Unless otherwise specified, paint shall not be reduced more than necessary to obtain the proper application characteristics. Thinner shall be as recommended by the coating manufacturer.

C. ATMOSPHERIC CONDITIONS:

Unless otherwise specified, or required for certain water-thinned paints, paints shall be applied only to surfaces that are dry, and only under such combination of humidity and temperatures of the atmosphere and surfaces to be painted as will cause evaporation rather than condensation. Paint shall not be applied during rainy,

misty weather, or to surfaces upon which there is frost or moisture condensation. During damp weather, when the temperature of the surface to be coated is within 10 degrees F of the dew point, the surfaces shall be heated to prevent moisture condensation thereon. Bare metal surfaces, except those which may be warped by heat, may be dehydrated by flame-heating devices immediately prior to paint application. During painting, and for a period of at least 8 hours after the paint has been applied, the temperature of the surfaces to be painted, the painted surfaces, and the atmosphere in contact shall be maintained at or above 40 degrees F and 10 degrees F above the dew point. Paint, when applied, shall be approximately the same temperature as that of the surface on which it is applied. Fans or heaters shall be used inside enclosed areas where conditions causing condensation are severe.

D. PROTECTION OF COATED SURFACES:

Where protection is provided for coated surfaces, such protection shall be preserved in place until the paint film has properly dried and the removal of the protection is authorized. Items which have been coated shall not be handled, worked on, or otherwise disturbed, until the paint coat is completely dry and hard. After delivery at the site of permanent erection or installation, shop-coated metalwork shall be repainted or retouched with specified paint when it is necessary to maintain the integrity of the film.

E. METHOD OF PAINT APPLICATION:

Where two or more coats are required, and if required by the Construction Manager, alternate coats shall contain sufficient compatible color additive to act as indicator of coverage, or the alternate coats shall be of contrasting colors. Color additives shall not contain lead, or any lead compound which may be destroyed or affected by hydrogen sulfide or any gas likely to be found in wastewater treatment plants.

Electrical and mechanical equipment, on which the manufacturer's coating is acceptable, shall be touch-up primed and painted with two coats of the specified coating system to match the color scheduled. This does not apply to electrical and instrumentation equipment specified in Division 16.

Paint shall not be applied to a surface until it has been prepared as specified. Unless otherwise specified, the primer or first coat shall be applied by brush to ferrous surfaces, except subsequent coats for blast-cleaned ferrous surfaces, which may be either brush or spray applied. Unless otherwise specified, prime and finish coats shall be applied at the rate recommended by the manufacturer for the service involved. After the prime coat is dry, suction spots shall be touched up before succeeding coats are applied. Unless otherwise specified, coats for concrete and masonry shall be brushed or rolled.

3.02 E.

Unless otherwise specified, finish coats shall not be applied until other work in the area is complete, and until the prime and intermediate coats have been inspected.

F. FILM THICKNESS AND CONTINUITY:

Coating system thickness is the total thickness of primer and finish coats and does not include passivators or sealers.

The surface area covered per gallon of paint for various types of surfaces shall not exceed those recommended by the manufacturer. The first coat on metal surfaces refers to the first full paint coat and not to conditioning or other pretreatment applications. Coatings shall be applied to the thickness specified, and in accordance with these specifications. Unless otherwise specified, the average total thickness (dry) of any completed protective coating system on exposed metal surfaces shall be not less than 1.25 mils per coat. The minimum thickness at any point shall not deviate more than 25 percent from the required average. Unless otherwise specified, no less than two coats shall be applied.

In testing for continuity about welds, projections (such as bolts and nuts), and crevices, the Construction Manager will determine the minimum conductivity for smooth areas of like coating where the dry mil thickness has been acceptable. This conductivity shall then be taken as the minimum required for these rough irregular areas. Pinholes and holidays shall be repainted to the required coat coverage.

G. SPECIAL REQUIREMENTS:

Hangers and supports shall be coated, except for the final coat, prior to installation. Except for those to be filled with grout, the underside of ungalvanized equipment bases and supports shall be coated with at least two coats of rust inhibiting primer prior to setting the equipment in place. Bolt and bolt holes in flanges (such as those used with couplings or wafer type valves where holes and bolts as finally installed will be exposed to weather or moisture) shall be painted prior to assembly to prevent rusting of the unprotected metal.

3.03 CLEANUP

Upon completion of painting, the Contractor shall remove surplus materials, protective coverings, and accumulated rubbish, and thoroughly clean all surfaces and repair any overspray or other paint-related damage.

3.04 COATING SYSTEM SPECIFICATION SHEETS (COATSPEC)

In the following COATSPEC table, the coating system letter (A, B, C, . . .) denotes the generic type of coating; the first

3.04

number (-1, -2, -3, etc.) denotes the surface; the second number (-1-1, -1-2, etc.) denotes a special condition such as inside, outside, or different mil thickness.

Surfaces to be coated, coating systems to be used, and required finishes and colors are specified in Section 09901. The final coat shall be applied only after all other work, including punch list items, has been completed.

3.04

3.04 COATING SYSTEM SPECIFICATION SHEET--COATSPEC

Coating System: A-1
Coating Material: Coal tar epoxy
Surfaces: Metal
Surface Preparation: In accordance with SSPC SP-5 (White Blast Cleaning)
Application: Field
The drying time between coats shall not exceed 24 hours in any case.
System Thickness: 20 mils dry film
Coatings:

ALTERNATIVE 1

Primer: One coat of Engard 463 Epoxy Tar Coating, black.
Finish: One or more coats of Engard 463 Epoxy Tar Coating.

ALTERNATIVE 2

Primer: One coat of Koppers Bitumastic No. 300-M, black.
Finish: One or more coats of Koppers Bitumastic No. 300-M, black.

ALTERNATIVE 3

Primer: One coat of Porter Tarsset C200, black.
Finish: One or more coats of Porter Tarsset 7076 or Tarsset C200, black.

3.04

3.04 COATING SYSTEM SPECIFICATION SHEET--COATSPEC

Coating System: A-2

Coating Material: Coal tar epoxy

Surfaces: Concrete or masonry

Surface Preparation: Masonry surfaces shall be sealed with manufacturer's recommended sealer. Concrete surfaces shall be patched and lightly sandblasted.

Application: Field

Prime coat shall be thinned and applied as recommended by coating manufacturer.

Drying time between coatings shall not exceed 24 hours.

System Thickness: 20 mils dry film

Coatings:

ALTERNATIVE 1

Primer: One coat of Engard 463 Epoxy Tar Coating, black.

Finish: Two coats of Engard 463 Epoxy Tar Coating, black.

ALTERNATIVE 2

Primer: One coat of Koppers Bitumastic No. 300-M, black.

Finish: Two coats of Koppers Bitumastic No. 300-M, black.

ALTERNATIVE 3

Primer: One coat of Porter Tasset Concrete Primer, black.

Finish: Two coats of Porter Tasset C200, black.

3.04 COATING SYSTEM SPECIFICATION SHEET--COATSPEC

Coating System: B-1

Coating Material: Epoxy

Surfaces: Metal

Surface Preparation:

1. Ferrous metal surface shall be prepared in accordance with SSPC SP-5 (White Blast Cleaning).
2. Shop primed surfaces which are to be incorporated in the work shall be prepared in the field by cleaning all surfaces in accordance with SSPC SP-2 (Hand Tool Cleaning). Damaged shop coated areas shall be cleaned in accordance with SSPC SP-3 (Power Tool Cleaning) and recoated with the primer specified.
3. If smoothing of rough metalwork is necessary, a smoothing cement acceptable to the paint material manufacturer shall be used.

Application: Field

System Thickness: 15 mils dry film

Coatings:

ALTERNATIVE 1

Primer: One coat of Engard 460 Chemical Resistance Epoxy Steel Primer to a dry film thickness of 2 mils.

Finish: Two or more coats of Engard 460 Chemical Resistant Epoxy.

ALTERNATIVE 2

Primer: One coat of Koppers 654 Epoxy Primer to a dry film thickness of 1-1/2 mils.

Finish: Two or more intermediate coats of Koppers 200 HB Epoxy.

3.04

Coating System: B-1 (continued)

ALTERNATIVE 3

Primer: One coat of Porter 4836/4837 Tank Lining Epoxy to a dry film thickness of 5 mils.

Finish: Two or more coats of Porter 4836/4837 Tank Lining Epoxy to a dry film thickness of 10 mils.

3.04 COATING SYSTEM SPECIFICATION SHEET--COATSPEC

Coating System: B-2
Coating Material: Epoxy
Surfaces: Concrete
Surface Preparation: In accordance with Part 3.
Application: Field

Prime coat shall be thinned and applied as recommended by coating manufacturer.

Drying time between coats shall be as recommended by coating manufacturer.

System Thickness: 15 mils dry film

Coatings:

ALTERNATIVE 1

Primer: One coat of Engard 424 Epoxy Vinyl Primer.
Finish: Two coats of Engard 460 Chemical Resistant Epoxy.

ALTERNATIVE 2

Primer: One coat of Koppers 200 HB Epoxy.
Finish: Two coats of Koppers 200 HB Epoxy.

ALTERNATIVE 3

Primer: One coat of Porter 4836/4837 Tank Lining Epoxy.
Finish: Two coats of Porter 4836/4837 Tank Lining Epoxy.

3.04 COATING SYSTEM SPECIFICATION SHEET--COATSPEC

Coating System: C-1

Coating Material: Coal tar solution

Surfaces: Metal

Surface Preparation: In accordance with SSPC SP-7 (Brush-Off Blast Cleaning) or SP-1 (Solvent Cleaning).

Application: Field

System Thickness: 15 mils

Coatings:

ALTERNATIVE 1	Two or more coats of Engard 800 High Build Coal Tar Coating.
ALTERNATIVE 2	Two or more coats of Koppers Bitumastic Super Service Black.
ALTERNATIVE 3	Two or more coats of Porter 7100 Tarmastic 100.

3.04 COATING SYSTEM SPECIFICATION SHEET--COATSPEC

Coating System: C-2
Coating Material: Coal tar solution
Surfaces: Concrete
Surface Preparation: In accordance with Part 3.
Application: Field
System Thickness: 15 mils

Coatings:

- ALTERNATIVE 1 Two or more coats of Engard 800 High Build Coal Tar Coating.
- ALTERNATIVE 2 Two or more coats of Koppers Bitumastic Super Service Black.
- ALTERNATIVE 3 Two or more coats of Porter 7100 Tarmastic 100.

3.04 COATING SYSTEM SPECIFICATION SHEET--COATSPEC

Coating System: D-1

Coating Material: Grease

Surfaces: Metal

Surface Preparation: In accordance with SSPC SP-1 (Solvent Cleaning).

Application: Field

Coating shall be applied with stiff brush, hand swab, or airless spray gun.

System Thickness: 50 square feet per gallon

Coatings:

ALTERNATIVE 1 One coat of Engard 880 Grease Coating.

ALTERNATIVE 2 One coat of Koppers Inertol Grease Coating.

3.04

3.04 COATING SYSTEM SPECIFICATION SHEET--COATSPEC

Coating System: E-1 (8 mils dry film thickness)
E-1-1 (5 mils dry film thickness)

Coating Material: Chlorinated rubber

Surfaces: Metal

Surface Preparation:

1. Bare ferrous metal surfaces shall be prepared in accordance with SSPC SP-6 (Commercial Blast Cleaning).
2. Ferrous metal with bleeding surfaces shall be cleaned in accordance with SSPC SP-1 (Solvent Cleaning) and sealed with two coats of Engard 160 Barrier Coat, Koppers Inertol Tar Stop, Porter No. 64 Stain Killer, or as otherwise recommended by coating manufacturer, applied to a thickness of 1 mil per coat prior to application of the above coating system.
3. Shop primed surfaces which are to be incorporated in the work shall be prepared in the field by cleaning all surfaces in accordance with SSPC SP-2 (Hand Tool Cleaning).
4. Galvanized or nonferrous surfaces shall be treated with a passivator as recommended by the coating system manufacturer.
5. If smoothing of rough metalwork is necessary, a smoothing cement acceptable to the paint system material manufacturer shall be used.

Application: Field

System Thickness: E-1: 8 mils dry film
E-1-1: 5 mils dry film

Coatings:

ALTERNATIVE 1

Primer: Engard 123 Universal Primer to a dry film thickness of 3 mils for system E-1; 1-1/2 mils for system E-1-1.

3.04

Coating System: E-1 and E-1-1 (continued)

ALTERNATIVE 1 (continued)

Finish: Two or more coats of Engard 259 Chlorinated Rubber to a dry film thickness of 5 mils for system E-1; 3-1/2 mils for system E-1-1.

ALTERNATIVE 2

Primer: Koppers 820 Metal Primer to a dry film thickness of 3 mils for system E-1; 1-1/2 mils for system E-1-1.

Finish: Two or more coats of Koppers Torex 800 to a dry film thickness of 5 mils for system E-1; 3-1/2 mils for system E-1-1.

ALTERNATIVE 3

Primer: Porter HD-21 Chromate Primer to a dry film thickness of 3 mils for system E-1; 1-1/2 mils for system E-1-1.

Finish: Two or more coats of Porter CR HB-11 to a dry film thickness of 5 mils for system E-1; 3-1/2 mils for system E-1-1.

3.04 COATING SYSTEM SPECIFICATION SHEET--COATSPEC

Coating System: E-2

Coating Material: Chlorinated rubber

Surfaces: Concrete, concrete block, plaster, gypsum board.

Surface Preparation: In accordance with Part 3.

Application: Field

Seal coat on concrete block to dry for a minimum of 48 hours prior to primer application.

System Thickness: 5 mils dry film

Coatings:

ALTERNATIVE 1

Primer: Engard 172 Undercoater to a dry film thickness of 1-1/2 mils. Concrete block walls shall be sealed with Engard 132 Sealer prior to primer. Gypsum board to be primed per coating manufacturer's recommendation.

Finish: Two coats of Engard 259 Chlorinated Rubber to a dry film thickness of 3-1/2 mils.

ALTERNATIVE 2

Primer: Koppers 830 Undercoater to a dry film thickness of 1-1/2 mils. Concrete block walls shall be sealed with Koppers Block Sealer prior to primer. Gypsum board to be primed per coating manufacturer's recommendations.

Finish: Two coats of Koppers Torex 800 to a dry film thickness of 3-1/2 mils.

ALTERNATIVE 3

Primer: Porter CR-11 Seal Coat to a dry film thickness of 1-1/2 mils. Concrete block to be sealed with Porter 895 Unifill Sealer prior to primer. Gypsum board to be primed per coating manufacturer's recommendations.

3.04

Coating System: E-2 (continued)

ALTERNATIVE 3 (continued)

Finish: Two coats of Porter CR-11 to a dry film thickness of 3-1/2 mils.

3.04

3.04 COATING SYSTEM SPECIFICATION SHEET--COATSPEC

Coating System: E-3
Coating Material: Chlorinated rubber
Surfaces: Wood, canvas lagging
Surface Preparation: In accordance with Part 3.
Application: Field

Primer for lagged ductwork shall be as recommended by coating manufacturer.

System Thickness: 5 mils dry film

Coatings:

ALTERNATIVE 1

Primer: One coat of Engard 147 to a dry film thickness of 1-1/2 mils.
Finish: Two coats of Engard 259 Chlorinated Rubber to a dry film thickness of 3-1/2 mils.

ALTERNATIVE 2

Primer: One coat of Koppers 625 Undercoater to a dry film thickness of 1-1/2 mils.
Finish: Two coats of Koppers Torex 800 to a dry film thickness of 3-1/2 mils.

ALTERNATIVE 3

Primer: One coat of Porter 565 Wood Primer to a dry film thickness of 1-1/2 mils.
Finish: Two coats of Porter CR-11 to a dry film thickness of 3-1/2 mils.

3.04

3.04 COATING SYSTEM SPECIFICATION SHEET--COATSPEC

Coating System: E-4
Coating Material: Semigloss enamel, interior.
Surfaces: Plastic
Surface Preparation: In accordance with Part 3.
Application: Field
System Thickness: 3-1/2 mils dry film
Coatings:

ALTERNATIVE 1

Primer: One coat of Engard 351 T.C. Vinyl Primer to a dry film thickness of 1/2 mil.
Finish: Two coats of Engard 259 to a dry film thickness of 3 mils.

ALTERNATIVE 2

Primer: One coat of Koppers 25 Vinyl Primer to a dry film thickness of 1/2 mil.
Finish: Two coats of Koppers Torex 800 to a dry film thickness of 3 mils.

ALTERNATIVE 3

Primer: One coat of Porter VC-11 Vinyl Primer 1700 to a dry film thickness of 1/2 mil.
Finish: Two coats of Porter CR-11 to a dry film thickness of 3 mils.

3.04 COATING SYSTEM SPECIFICATION SHEET--COATSPEC

Coating System: F-1

Coating Material: High heat paint

Surfaces: Metal

Surface Preparation: In accordance with SSPC SP-10 (Near-white Blast Cleaning).

Application: Field

Curing as required by coating manufacturer.

System Thickness: 2-1/2 mils

Coatings:

ALTERNATIVE 1 Two coats of Engard 240 High Temperature Coating.

ALTERNATIVE 2 Two coats of Koppers High Heat Silicone Aluminum.

ALTERNATIVE 3

Primer: One coat of Porter 1500 very high heat coating to a dry thickness of 1-1/2 mils.

Finish: One coat of Porter 1501 very high heat coating to a dry thickness of 1 mil.

3.04

3.04 COATING SYSTEM SPECIFICATION SHEET--COATSPEC

Coating System: G-3

Coating Material: Clear polyurethane

Surfaces: Wood

Surface Preparation: In accordance with Part 3.

Application: Field

System Thickness: 2 mils

Coatings:

ALTERNATIVE 1 Two coats of Porter 1811 Polyurethane coating.

ALTERNATIVE 2 Two coats of Rustoleum 9300 Clear Polyurethane.

END OF SECTION

SECTION 09901
FINISHES AND COLORS

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies finishes and colors for rooms, piping, equipment and other items which are coated or have other architectural finishes. The materials are specified in other sections of the project manual.

1.02 REFERENCES

Wherever possible, Federal Standard colors are referenced. If a particular manufacturer's number or description (such as for vinyl or ceramic tile, terrazzo, etc.) is referenced, it is for indicating the required color or pattern.

1.03 SAMPLES

The Contractor shall submit his proposed coating or finish supplier's range of colors for selection by the Construction Manager at least 3 weeks prior to its use.

PART 2 - PRODUCTS

2.01 COATING SYSTEM SCHEDULE

In the following schedule, the coating system for each specified surface shall conform to those listed in COATSPEC, Section 09900. Dado shall be as specified and, unless noted otherwise, shall be to 7 feet above the finish floor surface.

Unless specified otherwise on the room color schedule, surface coatings shall be semigloss, except that ceilings shall be coated with flat coatings to match wall areas. Ceilings in areas exposed to moisture, explosion, or other hazards shall be coated with semigloss finishes.

<u>Surface</u>	<u>Coating System</u>	<u>Color</u>
A. GENERAL:		
1. METALWORK:		
a. Outside equipment, including metal base and guards; conduits; piping; appurtenances, electrical,	A-1, B-1, C-1, D-1, E-1, E-1-1	AH 79307 DuPont yellow

2.01 A.1.

<u>Surface</u>	<u>Coating System</u>	<u>Color</u>
pneumatic and instrumentation control panels and stations, including supports; anchors for precast concrete. Refer to equipment specifications for exceptions.		
b. Aluminum or galvanized grating and handrail.	Uncoated	
c. Iron or steel submerged where color not required (except galvanized, stainless and nonferrous). Collection equipment, weirs above water level but below tank walk level.	A-1	Black
d. Iron or steel submerged where color specified (except galvanized, stainless and nonferrous).	B-1	Fed Std. 23655
e. Iron and steel, including galvanized and nonferrous, except stainless, exposed to moisture or atmosphere. Includes elements above water surface in tanks and channels.	E-1	Fed. Std. 23655
f. Iron and steel, including galvanized and nonferrous, except stainless, interior.	E-1-1	To match surface
g. The following items mounted on or adjacent to colored surfaces: conduit, piping and appurtenances; electrical, instrumentation or similar junction box or control panels; all supports and stands.	E1, E-1-1	To match surface

2.01 A.1.

<u>Surface</u>	<u>Coating System</u>	<u>Color</u>
h. The following items mounted or adjacent to uncolored surfaces: conduit, piping and appurtenances; electrical, instrumentation or similar junction box or control panels; all supports and stands.	E1, E-1-1	Fed.Std. 27778
i. Roof mounted equipment items including ventilation equipment, louvers, pipes, stacks not otherwise specified, except aluminum. Includes all ferrous surfaces and motors inside ventilation equipment enclosures.	E-1	Fed.Std. 27778
j. Equipment or piping operable at over 200°F, such as compressor and engine exhausts, steam cleaning piping and equipment, etc.	F-1	Grey/ silver
k. Drive and collector chains, gears, sprockets and shafts, wearing surfaces of submerged rails.	D-1	Grease paint
k. Fire hydrants, fire alarm system panels.	E-1	Red
2. CONCRETE, GROUT, MASONRY AND PLASTER:		
a. Submerged or for corrosion protection, where specified.	A-2	Black
b. Submerged, color required.	B-2	Fed.Std.
c. Exterior or interior where color is specified, except precast, or colored masonry otherwise specified.	E-2	Fed.Std.
d. Equipment bases; pipe and conduit bases, except those in terrazzo or tiled floor areas which are specified to be finished as floor or wall.	E-2	Fed.Std. or match wall

2.01 A.3.

<u>Surface</u>	<u>Coating System</u>	<u>Color</u>
3. OTHER:		
a. Pipe, ductwork, equipment and appurtenances: fiberglass, plastic, rubber, including flexible hose and conduit, plastic coated tubing, piping and conduit; lagged ductwork in areas not exposed to view. (Metal hangers and supports are coated as specified in paragraph A.1.e above.)	Uncoated	
The above items are expected to be clean and free of construction debris and damage, markings (felt pen, etc.), excess adhesives and paint overspray or drippings. Otherwise, coating shall be required.		
b. Lagged ductwork exposed to view.	E-3	To match surface
c. Wood: inside cabinet drawers; benches and bench tops; exposed woodwork not otherwise specified.	G-3	Clear
d. Wood: color required	E-3	Fed.Std. 27778
e. Tanks mounted outside	E-2, E-3	Fed.Std.
f. Uncolored concrete walls and floors	Sealer; see 03300-2.08	Clear
g. Door frames, metal	E-2	Fed.Std. 27778
h. Door edges, wood, metal (four edges)	E-2, E-3	Fed.Std. 27778 unless otherwise specified

2.01 B.1.

<u>Surface</u>	<u>Coating System</u>	<u>Color</u>
B. STRUCTURES:		
1. OFFICE/WORKSHOP BUILDING:		
Interior: see Room Finish Schedules on drawings for details and locations.	As specified for Material(s) See COATSPEC	As specified for Material(s)

<u>Room No.</u>	<u>Surface(s)</u>	<u>Material(s)</u>	<u>Color</u>
1 Work Area	Walls	Gypsum board	Fed.Std. 37778
		Plywood wainscot	Fed.Std. 27778
	Ceiling	Gypsum board	Off-White Fed.Std. 37778
	Floor	Concrete	Seated
	Base	Wood	Fed.Std. 10115
	Doors	Metal, wood	Fed.Std. 27778
2 Shop	Walls	Gypsum board	Fed.Std. 37778
		Plywood wainscot	Fed.Std. 27778
	Ceiling	Gypsum board	Fed. Std. 37778
	Floor	Concrete	Sealed
	Base	Wood	Fed.Std. 10115
	Cabinet	Wood	Fed.Std. 10115
	Doors	Metal, wood	Fed.Std. 27778

2.01 B.1.

<u>Room No.</u>	<u>Surface(s)</u>	<u>Material(s)</u>	<u>Color</u>
	Trim	Wood	Fed.Std. 10115
3 Office	Walls	Gypsum board	Fed.Std. 37778
	Ceiling	Gypsum board	Fed.Std. 37778
	Floor	Vinyl tile	Armstrong 51841 Castle Greige
	Base	Wood	Fed.Std. 27778
	Door	Wood	Fed.Std. 27778
	Trim	Wood	Fed.Std. 10115
4 Hall	Walls	Gypsum board	Fed. Std. 27778
	Ceiling	Gypsum board plaster, gypsum board	Off-White 27778 Fed.Std.
	Floor/ base sheet	Vinyl	Armstrong 86372 Zinnia
	Doors	Wood	Fed.Std. 27778
	Trim	Wood	Fed.Std. 10115
5 Toilet	Walls	Gypsum board	Fed. Std. 17778 gloss
	Ceiling	Plaster, gypsum board	Fed. Std. 17778 gloss
	Floor/base sheet	Vinyl	Armstrong 86372 Zinnia
	Toilet partitions		American Sanitary #36- Lemon Yellow

2.01 B.1.

<u>Room No.</u>	<u>Surface(s)</u>	<u>Material(s)</u>	<u>Color</u>
	Doors	Wood	Fed. Std. 17778
	Trim	Wood	Fed. Std. 10115
6 Locker Room	Walls	Gypsum board Marlite	Fed.Std. 27778 9013 White Sarona
	Ceiling	Gypsum board	Fed.Std. 27778
	Floor/base	Sheet vinyl	Armstrong 86372 Zinnia
	Bench	Wood	Clear
	Lockers	Steel	Fed.Std. 10115
	Door	Wood	Fed.Std. 27778
	Trim	Wood	Fed.Std. 10115
7 Dressing	Walls	Gypsum board Marlite	Fed.Std. 27778 9013 White Sarona
	Ceiling	Gypsum board	Fed.Std. 27778
	Floor/base	Sheet vinyl	Armstrong 86372 Zinnia
	Bench	Wood	Clear
8 Shower	Walls	Gypsum board Ceramic tile	Fed. Std. 17778 American Olean #46 Buckwheat
	Ceiling	Gypsum board	Fed.Std. 17778

2.01 B.1.

<u>Room No.</u>	<u>Surface(s)</u>	<u>Material(s)</u>	<u>Color</u>
	Floor/base	Ceramic tile	American Olean #46 Buckwheat
9 MCC Room	Walls	Gypsum board	Fed.Std. 37778
	Ceiling	Gypsum board	Fed.Std. 37778
	Floor	Concrete	Sealed
	Base	Wood	Fed.Std. 10115
	Door	Metal	Fed.Std. 27778
	Trim	Wood	Fed.Std. 10115

2. BUILDING EXTERIOR:

	<u>Surface(s)</u>	<u>Material(s)</u>	<u>Color</u>
1. Roofing	Buildings	Metal	Curoco Chocolate Brown
	Walls	Plywood	Cuprinol Intermix 30-90 stain
	Soffit	Plywood	Cuprinol Intermix 30-90 stain
	Trim	Wood	Cuprinol Intermix 25-40 stain
	Doors	Metal	Fed.Std. 20059

END OF SECTION

DIVISION 10

SPECIALTIES

<u>Section</u>	<u>Title</u>
10001	BUILDING SPECIALTIES
10150	COMPARTMENTS AND CUBICLES
10200	WALL LOUVERS
10400	IDENTIFICATION SIGNS
10800	TOILET ROOM ACCESSORIES

SECTION 10001
BUILDING SPECIALTIES

PART 1 - GENERAL

1.01 DESCRIPTION

This section provides specifications for building specialty items, including shower doors.

1.02 SUBMITTALS

Submittals shall comply with applicable paragraphs of Section 01300. Within 60 days after award of contract, the Contractor shall submit to the Construction Manager for review samples of all materials.

PART 2 - PRODUCTS

2.01 SHOWER DOORS

Shower stall doors shall be Keystone Model 90, Detcham Model C, without grille, or Midland Style 200, chrome-plated brass frame and tempered obscure glass panel.

****END OF SECTION****

SECTION 10150

COMPARTMENTS AND CUBICLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section provides specifications for all metal toilet partitions.

B. TYPE:

Toilet partitions shall be acrylic coated ceiling hung units.

Urinal screens shall be wall hung, flush type.

1.02 QUALITY ASSURANCE

Approved manufacturers and types shall be as follows:

<u>Manufacturer</u>	<u>Compartment Types</u>
Sanymetal	Century
Mills	Series 600
Weis	Ceiling hung
Fiat	Aristo
Global	Imperial

1.03 SUBMITTALS

Submittals shall comply with applicable paragraphs of Sections 00710 and 01300. The Contractor shall submit to the Construction Manager samples of all finishes and hardware items.

PART 2 - PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

A. COMPARTMENT PANELS:

Panels shall consist of two sheets of stretcher-leveled galvanized-bonderized steel, assembled over, and cemented under pressure to, a 1-inch thick sound-deadening insulating core as

2.01 A.

standard with the manufacturer. Edges of sheets shall be formed to take a continuous oval-shaped crown locking molding on all four edges, with corners mitered, welded and ground smooth. Provide concealed reinforcement to support grab bars where indicated.

B. DOORS:

Door construction shall be the same as for compartment panels. In addition, the edges of sheets shall be welded at frequent intervals to insure rigidity. Doors shall be approximately 24 inches and 32 inches wide, swinging out from compartments, or as indicated on the drawings.

C. PILASTERS:

Pilaster construction shall be the same as for doors, except 1-1/4-inch thick pilasters shall be reinforced to receive partition connections. Moldings shall be installed on vertical and bottom edges. Mechanical fastening devices shall be vertically adjustable for anchorage to ceiling.

D. MATERIAL GAGES:

Minimum gages for facing materials shall be as follows:

Partitions and doors	22
Pilasters	18

E. HARDWARE AND FITTINGS:

Hardware and fittings shall be of a noncorrosive metal alloy with nickel-chrome-plated finish, or of stainless steel.

1. HINGES: Hinges shall be concealed gravity type, manufacturer's standard, adjusted to hold doors ajar 30 degrees. Hinges shall have self-lubricating moving parts, all concealed.

2. BRACKETS AND TRIM: Stirrups shall be provided for fastening partitions to walls and pilasters. Pilasters shall have 3-inch high ceiling trim.

3. COAT HOOK-BUMPER AND LATCH: On the inner side of each door, a combination coat hook with rubber-tipped bumper, and a latch with stop and keeper, shall be provided.

4. FASTENERS: All fasteners required for complete installation shall be provided, using materials to match hardware. One-way, theftproof, head type fasteners shall be used for attaching metal to metal.

2.01 F.

F. FINISH:

Metal partitions, doors and pilasters shall receive two coats of synthetic enamel, baked-on to a smooth lustrous finish. Colors shall be as selected by the Construction Manager from the manufacturer's standard range.

PART 3 - EXECUTION

3.01 INSTALLATION

Partitions shall be installed where shown on drawings in accordance with reviewed shop drawings and manufacturer's instructions. Partitions shall be attached to supporting construction rigidly secure, level and plumb. Hardware shall be adjusted to perfect working order. All evidence of cutting, drilling and rough fasteners shall be concealed.

3.02 CLEANING

All work shall be washed and polished to remove dirt, grease and other imperfections.

END OF SECTION

SECTION 10200

WALL LOUVERS

PART 1 GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies the stationary extruded aluminum wall louvers, with appurtenances.

B. TYPE:

Louvers shall be water baffle type with 45-degree blade angle.

1.02 QUALITY LEVEL

For purposes of dimensioning and establishing minimum quality level, data has been taken from Airolite. Products of Aamco, Airline Products, or equal, which meet the dimensional, structural, functional, and aesthetic requirements of this section are acceptable.

1.03 SUBMITTALS

Submittals shall comply with Section 01300. Within 60 days after award of contract, the Contractor shall submit shop drawings showing cross sections and installation details.

PART 2 - PRODUCTS

2.01 GENERAL

Louvers shall be Airolite Type K 638, or equal.

2.02 MATERIALS AND CONSTRUCTION

Frames and blades shall be alloy 6063-T52, 0.081-inch extruded aluminum. Louvers shall be completely assembled by welding. Corners shall be mitered.

2.03 SCREEN

Insect screen shall be 18 x 14 mesh aluminum, mounted in standard folded U-type frame, attached to interior face with sheet metal screws.

2.04

2.04 FINISH

Finish on louver blades and frames shall be Aluminum Assoc. M12C22A42, Dark Bronze, Architectural Class I, anodic coating.

2.05 FASTENINGS

Fastenings shall be aluminum or stainless steel.

PART 3 - EXECUTION

3.01 INSTALLATION

Louver assemblies shall be installed plumb, square, level, and in alignment with other work. There shall be no exposed frame attachment fasteners.

3.02 CALKING

Weathertight and watertight construction shall be provided. Both materials and workmanship shall meet the requirements of Section 07900.

****END OF SECTION****

SECTION 10400

IDENTIFICATION SIGNS

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes identification signs for interior doors and for exteriors of buildings.

1.02 QUALITY ASSURANCE

Interior door signs shall be unframed acrylic plaques mounted with foam tape.

Exterior building and address identification signs shall be unframed acrylic plaques mounted with foam tape.

1.02 SUBMITTALS

Submittals shall comply with applicable paragraphs of Section 01300. The Contractor shall submit samples of sign lettering, materials and finish to the Construction Manager.

PART 2 - PRODUCTS

2.01 DOOR PLAQUES

Door plaques shall be 0.125-inch thick satin matte finish opaque acrylic with integral color. Background color shall be black. Image color shall be white, hot stamp or silkscreen applied. Letter style shall be Optima Bold, 36 point. Image centered on plaque.

1. "Restroom"
2. "Shower"
3. "Garden Waste Processing"
4. "Danger - Authorized Personnel Only" (two each)

END OF SECTION

SECTION 10800

TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section provides specifications for all toilet room accessories.

B. TYPE:

Toilet room accessories shall be of the surface mounted type or semirecessed type, as specified for each item.

1.02 QUALITY ASSURANCE

Toilet accessories shall be as manufactured by Bobrick Washroom Equipment, Inc., or equivalent products by Charles Parker Co.

1.03 SUBMITTALS

Submittals shall comply with applicable paragraphs of Section 01300. The Contractor shall submit to the Construction Manager shop drawings showing the installation details.

PART 2 - PRODUCTS

Except for mirrors, all items shall be of type 304 stainless steel, with No. 4 finish as follows:

The towel dispenser/waste receptable shall be Bobrick 3944, semirecessed.

The mirror shall be Bobrick 290 Series, size as indicated, stainless steel frame, with 1/4-inch polished plate glass mirror guaranteed against silver spoilage for 15 years.

The soap dispenser shall be Bobrick 32 surface mounted.

The grab bars shall be Bobrick 603 Series, lengths as indicated.

The toilet paper holder shall be Bobrick B-288, surface mounted.

The robe hooks shall be Bobrick B-2116 Heavy Duty Robe Hook with concealed mounting.

END OF SECTION

DIVISION 11

EQUIPMENT

<u>Section</u>	<u>Title</u>
11000	GENERAL REQUIREMENTS FOR EQUIPMENT
11020	DYNAMIC PERFORMANCE REQUIREMENTS FOR EQUIPMENT
11030	NOISE REQUIREMENTS AND CONTROL
11060	ELECTRIC MOTORS
11090	EQUIPMENT CONTROL DEVICES
11322	WET PIT NONCLOG PUMP

SECTION 11000

GENERAL REQUIREMENTS FOR EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

Equipment under this division includes providing and testing the equipment described in the sections listed on the Division 11 fly sheet on the preceding page.

In addition, the equipment specified under the following sections but not found in this division are subject to the general requirements of this division:

<u>Section</u>	<u>Title</u>
14542	Garden Waste Shredder
14550	Belt Conveyors
14552	Drag Conveyors
15705	Air to Air Heat Pump
15803	Radiant Heater
15821	Filtered Air Wall Supply Fans
15822	Propeller Wall Exhaust Fans
15823	Sidewall Exhaust Fans

B. EQUIPMENT LISTS:

Equipment lists, presented in these specifications and shown on the drawings, are included for the convenience of the Construction Manager and Contractor and are not intended to represent a rigorous and precise listing of all equipment, devices and material to be provided under this contract. The Contractor agrees to rely upon his own material and equipment takeoff lists for this purpose.

1.02 QUALITY ASSURANCE

A. ARRANGEMENT:

The arrangement of equipment shown on the drawings is based upon information available to the Owner at the time of design and is not intended to show exact dimensions peculiar to a specific manufacturer. The drawings are, in part, diagrammatic, and some features of the illustrated equipment installation may require revision to meet actual equipment installation requirements. Structural supports, foundations, connected piping and valves shown may have to be altered to accommodate the equipment provided. No

1.02 A.

additional payment will be made for such revisions and alterations. Substantiating calculations and drawings shall be submitted prior to beginning the work.

B. MOTORS AND CONTROL DEVICES:

1. MOTORS: Motors and motor accessories shall be as specified in Section 11060 and the particular equipment section.

2. CONTROL DEVICES: Control devices, wiring, starters, and other electrical items provided with mechanical equipment shall be as specified in Section 11090 and the particular equipment section.

C. UNIT RESPONSIBILITY:

The Contractor and the Owner agree that components of systems specified in the following sections shall be supplied as a unit by the designated responsible manufacturer to enhance compatibility, ease of construction and efficient maintenance. Contractor agrees to be responsible in accordance with Section 00710 to the Owner for performance of such systems.

<u>Section</u>	<u>Responsible manufacturer</u>
14550	Belt conveyors
14552	Drag conveyors
15705	Air to air heat pump

D. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
AFBMA Std 9-78	Load Ratings and Fatigue Life for Ball Bearings
AFBMA Std 11-78	Load and Fatigue Life for Roller Bearings
ANSI B1.1-74	Unified Screw Threads
ANSI B2.1-68	Pipe Threads (Except Dupeal)
ANSI B16.1-75	Cast Iron Pipe Flanges and Flanged Fittings, Class 125

1.02 D.

<u>Reference</u> (cont'd)	<u>Title</u>
ANSI B18.2.1-72	Square and Hex Bolts and Screws, Including Askew Head Bolts, Hex Cap Screws, and Log Screws
ANSI B18.2.2-72	Square and Hex Nuts

1.03 SUBMITTALS

Submittals shall be made as specified for each equipment item or group of related equipment items. Submittals shall be in accordance with Section 01300 and shall identify the equipment by the number listed in the specification section, manufacturer and type designation.

1.04 INFORMATION TO BE PROVIDED

Information shall be provided for each item of equipment as specified under individual specification sections. This information shall be identified by the equipment number listed in the specifications and drawings.

1.05 PROTECTION DURING SHIPMENT

A. SHIPPING:

Equipment shall be shipped in sealed, weathertight, enclosed conveyances and protected against damaging stresses during transport.

Bearing housings shall be wrapped or otherwise sealed to prevent contamination by grit and dirt, and ventilation and other types of openings shall be taped closed.

Damage shall be corrected to conform to the requirements of the contract before the assembly is incorporated into the work. The Contractor shall bear the costs arising out of dismantling, inspection, repair and reassembly.

B. FACTORY APPLIED COATINGS:

Each item of equipment shall be shipped to the site of the work with either the manufacturer's shop applied prime coating or a chlorinated rubber prime coating. The prime coating shall be applied over clean dry surfaces in accordance with the paint manufacturer's recommendations. The prime coating will serve as a base for field-applied finish coats.

2.01

PART 2 - PRODUCTS

2.01 FLANGES AND PIPE THREADS

Flanges on equipment and appurtenances provided under this section shall conform in dimensions and drilling to ANSI B16.1, Class 125. Pipe threads shall conform in dimension and limits of size to ANSI B1.1, coarse thread series, Class 2 fit.

Threaded flanges shall have a standard taper pipe thread conforming to ANSI B2.1. Unless otherwise specified, flanges shall be flat faced.

Flange assembly bolts shall be heavy pattern, hexagonal head, carbon steel machine bolts with heavy pattern, hot pressed, hexagonal nuts conforming to ANSI B18.2.1 and B18.2.2. Threads shall be Unified Screw Threads, Standard Coarse Thread Series, Class 2A and 2B, ANSI B1.1.

2.02 BEARINGS

Unless otherwise specified, equipment bearings shall be oil or grease lubricated, ball or roller type, designed to withstand the stresses of the service specified. Each bearing shall be rated in accordance with the latest revisions of AFBMA Methods of Evaluating Load Ratings of Ball and Roller Bearings. Unless otherwise specified, equipment bearings shall have a minimum L-10 rating life of 50,000 hours. The rating life shall be determined using the maximum equipment operating speed.

Grease lubricated bearings, except those specified to be factory sealed and lubricated, shall be fitted with easily accessible grease supply, flush, drain and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be standard hydraulic alemite type.

Oil lubricated bearings shall be equipped with either a pressure lubricating system or a separate oil reservoir type system. Each oil lubrication system shall be of sufficient size to safely absorb the heat energy normally generated in the bearing under a maximum ambient temperature of 60 degrees C and shall be equipped with a filler pipe and an external level indicator gage.

2.03 V-BELT ASSEMBLIES

V-belt assemblies shall be Dodge Dyna-V belts with matching Dyna-V sheaves and Dodge Taper-lock bushings, Wood's Super V-belts with matching Sure-Grip sheaves and Wood's Sure-Grip bushings, or equal.

2.03

Sheaves and bushings shall be statically balanced. Additionally, sheaves and bushings which operate at a peripheral speed of more than 5500 feet per minute shall be dynamically balanced. Sheaves shall be separately mounted on their bushings by means of three pull-up grub or cap tightening screws. Bushings shall be key seated to the drive shaft.

Belts shall be selected for not less than 150 percent of rated driver horsepower and, where two sheaves sized are specified, shall be capable of operating with either set of sheaves. Belts shall be of the antistatic type where explosionproof equipment is specified.

2.04 SEALS

A. MECHANICAL:

Unless otherwise specified, rotating shafts shall be provided with mechanical seals and stuffing boxes tapped for flushing seal faces. Seals shall be factory installed. Seals shall be internal, single or double as specified, and unbalanced except balanced seals shall be provided when shaft speed is greater than 3600 rpm or when pressures are greater than shown in the following:

Limits for Unbalanced Seals

<u>Seal inside diameter, inches</u>	<u>Shaft speed, rpm</u>	<u>Sealing pressure, psig</u>
1/2 to 2	Up to 1800	100
	1801 to 3600	50
Over 2 to 4	Up to 1800	50
	1801 to 3600	25

Single unbalanced seals shall be Crane 8-1, Durametallic RO, or equal. Single balanced seals shall be Chesterton 880, Crane 8B-1, or equal. Double seals shall be Chesterton 241, Durametallic RO/RD, or equal.

To maintain the necessary minimum or maximum pressure across the seal faces, spring pressure shall be uniformly distributed to the sealing faces by a coil spring or multiple springs. The rotating seal element shall be clamped to the shaft and provided with an O-ring seal. The stationary seal element shall be sealed with O-ring or gasket material.

Seal faces shall be either tungsten carbide, carbon, silicon carbide or ceramic. Elastomeric materials shall be Viton. Metal parts shall be type 316 stainless steel.

2.04 B.

B. SHAFT PACKING:

Where shaft packing is specified, stuffing boxes shall be tapped to permit introduction of seal liquid and shall hold a minimum of five rows of packing and a bronze lantern ring. Packing shall be die-molded packing rings of material suitable for the intended service and as recommended by the manufacturer. Lantern rings shall be of two-piece construction and shall be provided with tapped holes to facilitate removal.

2.05 COUPLINGS

Unless otherwise specified in the particular equipment sections, equipment with a driver greater than 1/2 HP, and where the input shaft of a driven unit is directly connected to the output shaft of the driver, shall have its two shafts connected by a flexible coupling which can accommodate angular misalignment, parallel misalignment and end float, and which cushions shock loads and dampens torsional vibrations. The flexible member shall consist of a tire with synthetic tension members bonded together in rubber. The flexible member shall be attached to flanges by means of clamping rings and cap screws, and the flanges shall be attached to the stub shaft by means of taperlock bushings which shall give the equivalent of a shrunk-on fit. There shall be no metal-to-metal contact between the driver and the driven unit. Each coupling shall be sized and provided as recommended by the coupling manufacturer for the specific application, considering horsepower, speed of rotation, and type of service.

Where torque or horsepower capacities of couplings of the foregoing type is exceeded, Thomas-Rex, Falk Steel Flex, or equal, couplings will be acceptable provided they are sized in accordance with the equipment manufacturer's recommendations and sizing data are submitted. They shall be installed in conformance to the coupling manufacturer's instructions.

2.06 GUARDS

Exposed moving parts shall be provided with guards which meet the requirements of CAL/OSHA. Guards shall be fabricated of 14-gage steel, 1/2-13-15 expanded metal screen to provide visual inspection of moving parts without removal of the guard. Guards shall be galvanized after fabrication and shall be designed to be readily removable to facilitate maintenance of moving parts. Reinforced holes shall be provided. Provisions shall be made to extend lube fittings through guards.

2.07 CAUTION SIGNS

Equipment with guarded moving parts which operates automatically or by remote control shall be identified by signs reading "CAUTION - AUTOMATIC EQUIPMENT MAY START AT ANY TIME". Signs

2.07

shall be constructed of corrosionproof material with a heavy-duty porcelain enamel finish. Letters shall be white on a red background. The sign size and pattern shall be as shown on the drawings. Signs shall be installed near guarded moving parts.

2.08 PRESSURE TAPS, TEST PLUGS AND GAGES

Pressure taps shall be provided on the suction and discharge sides of pumps, blowers and compressors. Pressure and vacuum test plugs and gages shall be provided where specified. Test plugs and gages shall be as specified in Division 15.

2.09 NAMEPLATES

Nameplates shall be provided on each item of equipment and shall contain the specified equipment name or abbreviation and equipment number. Equipment nameplates shall be engraved or stamped on corrosion resistant material and fastened to the equipment in an accessible location with No. 4 or larger oval head stainless steel screws or drive pins.

2.10 LUBRICANTS

The Contractor shall provide for each item of mechanical equipment a supply of the lubricant required for the commissioning period. Lubricants shall be of the type recommended by the equipment manufacturer and shall be products of the Owner's current lubricant supplier. The Contractor shall limit the various types of lubricants by consolidating them, with the equipment manufacturer's approval, into the least number of different types. Not less than 90 days before the date shown in his construction schedule for starting, testing and adjusting equipment, the Contractor shall provide the Owner with three copies of a list showing the required lubricants, after consolidation, for each item of mechanical equipment. The list shall show estimated quantity of lubricant needed for a full year's operation, assuming the equipment will be operating continuously.

PART 3 - EXECUTION

3.01 GENERAL

Equipment shall be provided and tested within the tolerances recommended by the equipment manufacturer. In addition, equipment provided under the specification sections listed below shall be installed and tested under the direction of installers who have been trained by the equipment manufacturer. This requirement, however, shall not be construed as relieving the Contractor of his

3.01

overall responsibility for this portion of the work. Forms 11000-A and 11000-B specified in Section 01999 shall be completed and provided to the Construction Manager.

<u>Section</u>	<u>Title</u>
14542	Garden Waste Shredder
15705	Air to Air Heat Pump

3.02 TESTING

Items of equipment specified in this division shall be tested as required in each section and in accordance with Division 1.

****END OF SECTION****

SECTION 11020

DYNAMIC PERFORMANCE REQUIREMENTS FOR EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

This section specifies dynamic performance requirements for rotating mechanical equipment.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
API 610-71	Centrifugal Pumps for General Refinery Service
API 611-69	General-Purpose Steam Turbines for Refinery Service
API 617-79	Centrifugal Compressors for General Refinery Service
HI-75	Hydraulic Institute Standards, 13th Edition, 1975

1.03 SUBMITTALS

The following information shall be submitted in accordance with Section 01300:

1. Location for mounting temporary vibration probe on general equipment as specified in paragraph 2.01 B.

1.04 INFORMATION TO BE PROVIDED

The following information shall be provided:

1. Manufacturer's certified values of first and second critical speeds for equipment specified in paragraphs 1.05 B and C.
2. Results of tests specified in paragraph 2.01 B.

1.05 A.

1.05 DYNAMIC PERFORMANCE REQUIREMENTS FOR EQUIPMENT

A. GENERAL EQUIPMENT:

Unless otherwise specified, rotating mechanical equipment greater than 10 horsepower shall not exhibit unfiltered RMS readings for vibration in excess of the following amplitudes:

<u>Speed range</u>	<u>Antifriction bearing^a</u>	<u>Sleeve bearing^b</u>
Below 900 rpm	3.0	3.5
900-1800 rpm	2.0	3.0
1801-3000 rpm	1.3	2.5
3001-4500 rpm	1.0	2.0
Above 4500	0.5	1.6

^aMeasured on bearing housing in vertical, axial and lateral direction.

^bMeasured radially on the shaft.

Axial shaft vibration displacements (relative to casings) shall not exceed 50 percent of the maximum lateral shaft vibration displacements (relative to casing) existing at any point along the shaft.

The vibration limitations are to include the frequency range from 5.0 Hz to 5000 Hz. The measurements shall be obtained with the mechanical equipment operating at any capacity within the specified operating range. In addition to these maximum unfiltered readings, no narrow band spectral acceleration component, whether subrotational, higher harmonic or asynchronous multiple of running speed, shall exceed 40 percent of the synchronous displacement amplitude component.

At the trip speed of the driver and at the critical speeds of the mass elastic system, the vibration shall not exceed the specified value plus 0.5 mils.

B. PUMPS:

Centrifugal, axial and mixed flow pumps specified in this project manual shall conform to the dynamic requirements for vibration limits, critical speed and balance as specified in API 610.

C. ELECTRIC MOTORS:

1. GENERAL: Electric motors specified in Section 11060 shall conform to the following dynamic requirements.

1.05 C.2.

2. VIBRATION LIMITS: Limits for shaft shall be as specified in paragraph 1.05 A. Limits for vibration of the bearing housings shall be 60 percent of those specified in paragraph 1.05 A.

3. CRITICAL SPEED: First critical speed shall be at least 20 percent above maximum operating speed.

PART 2 - PRODUCTS

(NOT IN CONTRACT)

PART 3 - EXECUTION

3.01 FIELD TESTING

A. GENERAL:

The Contractor shall test equipment to verify performance within specified vibration limits. Results of tests shall be provided to the Construction Manager.

B. FIELD TEST METHODS:

1. METHOD FOR GENERAL EQUIPMENT: Test method for general equipment consisting of equipment 10 horsepower and greater without permanently mounted vibration transducers is as follows:

- a. Submit locations for mounting temporary vibration transducers on equipment. Equipment with sleeve bearings shall be monitored for displacement on the shaft at each bearing in the x-y planes and for acceleration on each casing in the x-y-z planes. Equipment with antifriction bearings shall be monitored for acceleration on each casing in the x-y-z planes.
- b. Notify Construction Manager at least 2 weeks prior to testing.
- c. Acquire vibration data relating displacement vs. machine speed by operating each equipment train throughout its normal operating range, while subject to normal process load variations. The equipment shall then be continuously operated for a minimum of 2 hours at the dominated (maximum amplitude) resonant mode of each major component of the drive train with prerun and postrun vibration data documented.

3.01 B.1.

If vibration measurements are not within the specified limits, the Contractor agrees to investigate and perform work required to enable equipment to comply with the specifications at no additional cost to the Owner.

****END OF SECTION****

SECTION 11030

NOISE REQUIREMENTS AND CONTROL

1.0 GENERAL

Unless otherwise specified, the maximum permissible noise level for a complete piece of mechanical equipment located within or outside a structure shall not exceed 85 dbA at 3 feet. A complete piece of equipment includes the driver and driven equipment plus any intermediate couplings, gears and auxiliaries. All equipment specified shall be field and factory tested, as specified herein, for noise generation at the Contractor's expense.

Maximum permissible noise (sound pressure) levels are in decibels as read on the "A" weighting network of a standard sound level meter (dbA); all measurements are made in relation to a reference pressure of 0.0002 microbar. Measurements of emitted noise levels shall be made on a sound level meter meeting at least the Type II requirements as set forth in ANSI S1.4-1971 Specification for General Purpose Sound Level Meters, or any later revision thereof. The sound level meter shall be set on the "A" scale and to slow response. Unless changed in the specific section relating to a particular piece of equipment, the point of measurement of sound level shall be made at the specified distance from any major surface along the entire perimeter and at midheight of the piece of equipment or at the specified distance from an outer major surface encompassing the sound source including inlets or outlets.

2.0 FACTORY TESTS

The Contractor shall furnish for each piece of equipment, prior to shipment to the job site, a certified factory noise test report on the actual equipment to be provided or an unconditional guarantee that the equipment, when operating under design conditions, will not produce noise exceeding the permissible levels specified. Noise levels in excess of that specified shall be cause for rejection of the equipment. Standard noise data is not acceptable.

Noise measurements shall be accomplished preferably at the factory; in any event, these measurements shall be accomplished prior to shipment of any equipment to the job site. The measurements shall take place in a reverberant or semireverberant condition, with equipment sitting on a hard reflective surface. Alternative permitted conditions are those which duplicate the circumstances under which the equipment will operate this project. Tests shall be made at 1/2, 3/4, and full load where applicable.

2.0.

The manufacturer shall certify the maximum noise levels emanating from the equipment, its operating conditions, the environment in which tested, a list of the acoustical instruments used, and the points at which the measurements were made. The description shall be sufficiently detailed to permit the test to be repeated, and it shall include a sketch of the item being measured which shows the points of measurement and the point of maximum encountered noise level on the measurement line. Three copies of certified test results shall be submitted to the Construction Manager prior to shipment.

Final acceptance of any equipment is dependent upon satisfactory noise level performance after installation.

3.0 FIELD TESTS

The Contractor shall perform for each piece of equipment a field noise test that the equipment, when operating under new design conditions, will not produce noise exceeding the permissible levels specified. Tests shall be made at 1/2, 3/4, and full load where applicable. All readings shall be taken with only that equipment operating or allowances shall be made for any background level within 50 dbA of the equipment being measured. All measurements shall be witnessed by the Construction Manager. The Construction Manager shall be notified at least 5 working days prior to any field noise test.

In the event that the noise tests show levels in excess of the allowable limits, appropriate field noise reduction measures shall be undertaken to reduce the noise levels at the measurement location(s) to the allowable limits. All field noise reduction measures shall be at the Contractor's expense and shall be approved by the Construction Manager prior to installation. Methods to be employed may be in the form of sound reduction enclosure, acoustical equipment mountings, acoustical wall or ceiling panels, or acoustical insulation on the equipment. Cleaning of acoustical materials shall be accomplished by hosing down with water. Rated capacities, operation and normal maintenance procedures of the equipment shall not be affected by the noise reduction measures.

****END OF SECTION****

SECTION 11060
ELECTRIC MOTORS

PART 1 - GENERAL

1.01 SCOPE

This section specifies constant speed alternating current induction motors less than 250 horsepower to be provided with the driven equipment. This section refers to motors by the enclosure type as defined in NEMA MG1, except submersible motors. Valve operator motors are specified in Division 15.

1.02 QUALITY ASSURANCE

A. GENERAL:

Motors shall be built in accordance with UL 674, UL 1004, NEMA Standard MG1, and to the requirements specified herein.

B. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
IEEE 85-1973	Test Procedure for Airborne Sound Measurements on Rotating Machinery
NEMA ICS 6-1978	Enclosures for Industrial Controls and Systems
NEMA MG1-1978	Motors and Generators
UL 674-1978	Motors and Generators, Electric, For Use in Hazardous Locations, Class I, Groups C and D, Class II, Groups E, F, and G
UL 1004-1977	Motors, Electric

1.03 SUBMITTAL DATA

A completed "Motor Data Submittal" form, specified in Section 01999, shall be submitted for each item of equipment driven by a motor 200 horsepower or over. In addition, a heating curve shall be provided for motors 100 horsepower and over or where acceleration time is specified.

1.04

1.04 INFORMATION TO BE PROVIDED

The following information shall be provided:

1. For each item of equipment driven by a motor less than 200 horsepower, a completed "Motor Data Submittal" form, specified in Section 01999.
2. Operating and maintenance information specified in Section 01730, items 1, 2, 3, 5, and 9. Provide item 7, Overhaul Instructions, for each motor 5 horsepower and over.

Where the motor is specified in a separate section from the driven equipment, the operation and maintenance information shall be transmitted separately from the equipment operation and maintenance information under the procedure of Section 01730.

1.05 SERVICE CONDITIONS

A. ENVIRONMENTAL CONDITIONS:

Motors shall be as specified in NEMA MG1 for usual environmental conditions except motors shall be totally enclosed unless otherwise specified.

B. OPERATING CONDITIONS:

Motors shall be selected for the operating conditions of the driven equipment in accordance with NEMA MG1. Motors shall be subject to the vibration performance limits specified in Section 11020.

PART 2 - PRODUCTS

2.01 NAMEPLATES

Motors shall have manufacturer's engraved or stamped nameplates on nonferrous metal which shall indicate clearly the items of information enumerated in NEMA Standard MG1-10.37, MG1-10.38, or MG1-20.60. Nameplates shall be fastened to the motor frame with cadmium-plated screws or drive pins.

In addition, nameplates for motors 1/2 through 250 horsepower shall indicate the AFBMA B-10 rated operating life for motor bearings in accordance with paragraph 2.03 G.

The nameplates shall be positioned to be readily visible for inspection in the complete machine.

2.02 A.

2.02 MOTORS LESS THAN 1/2 HORSEPOWER

A. GENERAL:

Unless otherwise specified, motors less than 1/2 horsepower shall be squirrel cage, single phase, capacitor start induction run. Small fan motors may be split-phase or shaded pole type. Wound rotor or commutator type single phase motors are acceptable where their specific characteristics are necessary for the application. Winding conductors and rotor bars shall be copper.

B. RATING:

Motors shall be rated for operation at 115 volts, single phase, 60 Hz, and shall be continuous-time rated in conformance with NEMA Standard MG1-10.35. Dual voltage rated motors are acceptable if all leads are brought out to the conduit box.

Locked rotor current shall not be greater than specified in NEMA Standard MG1-10.36, Design "N."

C. ENCLOSURES:

Unless otherwise specified, motors shall be totally enclosed.

Where specified, explosionproof motors shall bear the UL label for Class I, Division 1, Group C hazardous locations, and the drain holes shall be provided with breather/drain devices for hazardous locations. UL-approved devices shall be provided to detect and automatically deenergize the motor if there is any increase in surface temperature above 180 degrees C, as identified by the marking number "T3A" from NEC Table 500-2(b).

D. BEARINGS:

Motors shall be provided with sleeve-type or sealed ball bearings lubricated for 5 years normal use.

E. INSULATION:

Single phase motor insulation systems shall be as Class F.

2.03 MOTORS 1/2 HORSEPOWER THROUGH 250 HORSEPOWER

A. GENERAL:

Motors 1/2 horsepower through 250 horsepower shall be 3 phase, squirrel cage, induction motors designed and connected for 460 volt, 60 Hz operation. Dual voltage (230/460) rated motors are acceptable if all leads are brought out to the conduit box.

2.03 A.

Totally enclosed and explosionproof motors shall be Westinghouse Mill and Chemical, Reliance Model SXT-XT, General Electric 700SD Severe Duty, or equal. Windings and rotor bars shall be copper.

B. HORSEPOWER:

The electrical system has been designed for the maximum rated horsepower specified in each motor-driven equipment section.

Motors shall be required to deliver no more than 87 percent of the rated horsepower at the specified operating condition and no more than the rated horsepower at any condition throughout the driven machine's range of full speed operating characteristics.

C. RATING:

1. SERVICE FACTOR: Motors shall be continuous time rated. Unless otherwise specified, motors shall have a 1.15 service factor.

2. INSULATION: Insulation system shall be NEMA Class F, with Class B insulation temperature rise maximum; shall be nonhygroscopic; and shall be suitable for use in moisture-laden atmospheres and atmospheres containing acid or alkali vapor.

D. TORQUE:

Unless otherwise specified, motors shall be design letter B as described in NEMA MG1-1.16. Motors shall develop ample torque for starting, accelerating, and full rated load running conditions under the voltage and frequency variations specified in NEMA MG1-12.43A and B.

E. CURRENT BALANCE:

Current unbalance on polyphase motors shall not exceed the values tabulated below when motor is operating at any load within its service factor rating and is fed by a balanced voltage system:

Under 5 horsepower	25 percent
5 horsepower and above	10 percent

F. ENCLOSURES:

1. GENERAL: Unless otherwise specified, motors shall be totally enclosed. Enclosures shall be as specified in NEMA MG1 with the following additional features.

2. DRIPPROOF MOTORS: Dripproof motors with frames, size 280 and larger, shall have cast iron frames, end shields, and conduit boxes. Aluminum end shields shall be provided with steel inserts for bearing support.

2.03 F.3.

3. **TOTALLY ENCLOSED MOTORS:** Totally enclosed motors shall be either ventilated or nonventilated as the manufacturer requires to meet the service factor. Each enclosure shall be provided with drilled and tapped holes to drain cavities within the motor. Frames, size 286 and smaller, shall have plastic plugs in the drain holes. Frames, larger than size 286, shall have automatic breather/drain devices in the drain holes.

Frames, size 180 and larger, shall have cast iron frames, end shields, and conduit boxes. Fan covers shall be metal or high impact plastic.

4. **EXPLOSIONPROOF MOTORS:** Explosionproof motors shall bear the UL label for Class I, Division 1, Group C hazardous locations, and the drain holes shall be provided with breather/drain devices for hazardous locations. UL-approved overtemperature protection devices shall be provided to detect and automatically de-energize the motor if there is any increase in surface temperature above 180 degrees C, as identified by the marking number "T3A" from NEC Table 500-2(b). The device shall be furnished with a relay with a normally closed contact for external wiring to the motor control circuit. The contact shall have a NEMA ICS Class 150 rating at 120 volts. Auxiliary equipment shall be of the type UL-approved for installation in Class I, Division 1, Group C hazardous locations.

5. **SUBMERSIBLE MOTORS:** Submersible motors shall be UL-approved for explosionproof atmospheres in accordance with paragraph 2.02 C or 2.03 F.4. In addition, submersible motors shall have two mechanical seals--the lower one outside the motor and protecting the upper one which is in an oil filled chamber. Moisture detector probes in the oil filled seal chamber shall be provided to indicate the presence of moisture in the seal chamber. A normally closed NEMA Class B150 contact from the moisture detector shall open to deactivate the motor control circuit in the event of moisture detection.

Submersible motors shall be provided with a continuous flexible nonwicking submersible electrical cable of the correct ampacity and of sufficient length to reach the junction box. Cables containing fillers shall not be acceptable.

6. **DUST-IGNITIONPROOF MOTORS:** Dust-ignitionproof motors shall be suitable for use in carbon dust areas and shall bear the UL label for Class II, Division 1, Group F hazardous locations.

7. **WEATHER PROTECTED MOTORS:** Weather protected NEMA Type II (WP-II) motors shall be provided with screens to prevent objects larger than 1/2 inch from entering the enclosure.

2.03 G.

G. BEARINGS:

Motor bearings shall be designed for an AFBMA B-10 operating life of 40,000 hours which shall be indicated on the motor nameplate. Antifriction motor bearings shall be regreasable and initially shall be filled with grease suitable for the ambient temperature specified. If a higher ambient temperature is specified for motor insulation rating purposes, bearings shall be sized and designed for the higher ambient.

H. CONDUIT BOXES:

Conduit boxes shall be cast iron provided with threaded hubs. Dripproof and totally enclosed motors shall be furnished with gaskets at the base of the conduit box and between the halves of the conduit box. The conduit box shall be provided with a means of mounting which allows for 360 degrees of rotation and for bonding a ground conductor using a stud or ground pad inside the box.

I. LIFTING EYES:

Motors weighing more than 50 pounds shall be provided with at least one lifting eye.

2.04 OVERTEMPERATURE PROTECTION

A. GENERAL:

Overtemperature protection devices shall provide a normally closed contact rated NEMA ICS Class B150. Relays or solid state contacts which are required shall be provided in an enclosure on or near the motor. Relay enclosures shall be in accordance with NEMA ICS-6 and shall be NEMA 4 for all motors except explosionproof which shall be 7C or 9F as specified.

B. REQUIREMENTS:

Explosionproof motors shall be protected as specified in paragraphs 2.02 C and 2.03 F.4.

Motors rated 200 horsepower or more and, where specified, motors over 100 horsepower shall be NEMA MG1-12.53, Type 1.

Overtemperature protection where specified for motors rated less than 100 horsepower shall be NEMA MG1-12.53, Type 2.

2.05 SPECIAL FEATURES

A. HIGH EFFICIENCY:

Motors rated 1/2 HP or larger to be high efficiency and shall have efficiencies equal to or better than those listed in Schedule 11060-1. High efficiency motors shall be Westinghouse MAC II,

2.05 A.

Louis Allis Spartan, Reliance Duty Master XE, General Electric Energy Saver, or Gould E-plus motors. Motor efficiency shall be tested in accordance with IEEE-112, Test Method B.

B. HEATERS:

Where specified, heaters shall be provided to prevent moisture condensation after shutdown. Heaters shall be cartridge type or flexible wraparound type installed adjacent to core iron. Heaters shall be rated 120 volts, single phase. Rating in watts and volts shall be noted on motor nameplate or on a second nameplate. The space heater terminals shall be brought to a separate terminal block or pigtails in the conduit box.

C. LOW NOISE:

Low noise motors shall have sound pressure levels less than those shown in Schedule 11060-1 when measured with no load in accordance with IEEE 85.

PART 3 - EXECUTION

3.01 TESTING

Resistance testing shall be as specified in Section 16000.

SCHEDULE 11060-1

Low Noise Sound Level
Requirements for Totally
Enclosed and
Explosionproof Motors

Motor		High Efficiency Requirements			Explosionproof Motors	
HP	Synch. speed, rpm	NEMA Eff. Index	Nom. Eff.	Min. Eff.	Sound Pressure at 3 ft dBA	Sound Power, dBA
1	1800	L	81.5	78.5	59	65
	1200	L	81.5	78.5	54	65
1 1/2	3600	L	81.5	78.5	76	78
	1800	L	81.5	78.5	59	65
	1200	K	84.0	81.5	64	67
2	3600	L	81.5	78.5	76	78
	1800	K	84.0	81.5	59	65
	1200	K	84.0	81.5	64	67
3	3600	K	84.0	81.5	75	83
	1800	K	84.0	81.5	63	69
	1200	K	84.0	81.5	59	69
5	3600	K	84.0	81.5	75	83
	1800	H	86.5	84.0	63	69
	1200	H	86.5	84.0	59	69
7 1/2	3600	H	86.5	84.0	74	81
	1800	H	86.5	84.0	68	73
	1200	H	86.5	84.0	62	69
10	3600	H	86.5	84.0	74	81
	1800	G	88.5	86.5	68	73
	1200	H	86.5	84.0	62	69
15	3600	G	88.5	86.5	74	80
	1800	G	88.5	86.5	71	78
	1200	G	88.5	86.5	66	74
20	3600	G	88.5	86.5	74	80
	1800	G	88.5	86.5	71	78
	1200	F	90.2	88.5	66	74
25	3600	G	88.5	86.5	80	84
	1800	F	90.2	88.5	69	78
	1200	F	90.2	88.5	63	72
30	3600	F	90.2	88.5	78	84
	1800	F	90.2	88.5	69	78
	1200	F	90.2	88.5	63	72
40	3600	F	90.2	88.5	81	88
	1800	E	91.7	90.2	70	79
	1200	F	90.2	88.5	67	76
50	3600	E	91.7	90.2	81	88
	1800	E	91.7	90.2	70	79
	1200	E	91.7	90.2	67	82
60	3600	E	91.7	90.2	77	86
	1800	E	91.7	90.2	73	82
	1200	E	91.7	90.2	71	80
75	3600	E	91.7	90.2	77	86
	1800	D	93.0	91.7	73	82
	1200	E	91.7	90.2	71	80
100	3600	D	93.0	91.7	78	90
	1800	D	93.0	91.7	78	86
	1200	E	91.7	90.2	72	84
125	3600	D	93.0	91.7	80	89
	1800	D	93.0	91.7	80	91
	1200	D	93.0	91.7	72	84
150	3600	C	94.1	93.0	80	89
	1800	D	93.0	91.7	80	91
200	1800	C	94.1	93.0	80	91

SECTION 11090

EQUIPMENT CONTROL DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies electrical and instrumentation devices specified as part of equipment systems.

1.02 QUALITY ASSURANCE

A. GENERAL:

Control devices shall be listed by Underwriters Laboratories Inc., Factory Mutual, or Canadian Standards Associations for their intended purpose where such listing has been applied to similar products.

B. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

JIC EMP-1-1967, Electrical Standards for Mass Production Equipment.

NEMA ICS Series, as revised to 1978, Industrial Control and Systems (NEMA-ICS).

National Electrical Code, 1978.

1.03 INFORMATION TO BE PROVIDED

The following shall be provided:

1. Sufficient data for materials and components to demonstrate compliance with the specifications.
2. Location of ancillary devices, conduit, junction boxes, safety and control devices, and conduit entries for feeding or controlling the equipment.
3. Electrical elementary diagrams, internal connection diagrams, and external interconnection diagrams, drawn in accordance with JIC and/or ICS standards. Connection

diagrams shall be the conventional type with lines showing point-to-point wiring and must show terminals and devices as viewed by the electrician; wireless or wire schedule types are not acceptable.

4. Process flow diagrams and process and instrumentation diagrams (P&IDs) using ISA symbols for equipment which interfaces with the instrumentation system or has internal control loops.
5. Range and setting of indicators, instruments, timers, and devices.

PART 2 - PRODUCTS

2.01 POWER RATINGS

Control devices shall be suitable for the voltage and current on the electrical and instrumentation drawings or as specified.

Where more than one piece of equipment (each having its own power source) have a common control power system, provision shall be made for transferring the control power system to an active source should the main source of control power fail.

2.02 PILOT DEVICES

Electrical pilot devices including switches, relays, and contacts shall be heavy-duty industrial quality devices. Contacts which provide alarm, malfunction or control to external systems shall be rated NEMA A600 (10 amps continuous at 600 volts AC), except that pressure switches and temperature switches shall be rated NEMA B600 (5 amps continuous at 600 volts AC). Range of switches shall be that recommended by the mechanical equipment manufacturer.

2.03 ALARM AND MALFUNCTION DETECTION

Devices which are used to directly signal alarm or malfunction conditions shall be externally manually reset. The devices shall have a minimum of one contact which shall open on malfunction or alarm condition, as scheduled. Other output relays and devices shall have a minimum of one normally open and one normally closed contact which may be a NEMA Form C contact. If the contact of the device is required for internal equipment control as well as to signal alarm or malfunction conditions, then the manufacturer may make the reset function a part of his equipment's master shutdown system. However, each source of shutdown shall be shown by local trouble lights or flags which are manually reset at the equipment control panel. Trouble output contacts shall open and remain

2.03

open until manually reset when equipment is shut down due to a malfunction. Trouble contacts shall not indicate abnormal conditions when the equipment has been manually shut down. Alarm and malfunction signals shall be initiated by a contact opening.

2.04 CABLE

Rubber covered multiconductor cable shall not be used on stationary equipment for any voltage exceeding 250 volts AC, nor shall it be used for connections to any motor rated 1/4 horsepower or larger. For these purposes, JIC EMP-1-1967 E12.4.4 through E12.4.8 and E13.3 shall apply.

2.05 LIQUIDTIGHT CONDUIT

Flexible conduit shall be liquidtight flexible metal conduit, formed from spirally wound galvanized steel strip with successive convolutions securely interlocked, jacketed with liquidtight plastic cover. Minimum size shall be 1/2 inch. Fittings for liquidtight conduit shall have cadmium-plated malleable iron body and gland nut, brass grounding ferrule threaded to engage conduit spiral and O-ring seals around the conduit and box connection and isolated throat. Forty-five and 90-degree fittings shall be used where applicable. Maximum length of flexible conduit shall be 36 inches.

2.06 INDICATING LIGHTS

Indicating lights shall be oiltight transformer type with 6.3 voltage lamps and push-to-test features and shall be equipped with colored lenses in accordance with the following schedule:

<u>Color</u>	<u>Typical Function</u>	<u>Example</u>
Red	Danger, abnormal condition, fault condition	Voltage applied; cycle in automatic; faults in air, water, lubricating or filtering systems; ground detector circuits.
Amber (yellow)	Attention	Motors running; machine in cycle; unit or head in forward position.
Green	Safe condition (security)	End of cycle; unit or head returned; motors stopped; motion stopped; contactors open.
White or clear	Normal condition	Normal pressure of air, water, lubrication.

2.07 GROUNDING

A separate ground conductor shall be run in each power conduit. The conductor shall be sized in accordance with NEC Table 250-95. The conductor shall be bonded to the inside of the device junction box.

Freestanding control panels shall be equipped with a 1/4-inch by 1-inch copper ground bus running the length of the panel, with the steel structure connected to the bus so as to effectively ground the entire structure. A compression fitting shall be provided at each end of the ground bus for accepting plant ground connections.

2.08 DEVICES WITH MOTOR STARTERS AND CONTACTORS

Equipment which is provided with control devices having motor starters or contactors shall also comply with the following.

A. DISCONNECT SWITCHES:

Equipment shall be provided with a disconnect switch. If the disconnect switch is not located within sight of the drive, it shall be provided with a padlock hasp. The disconnect shall be a horsepower rated disconnect switch or molded case circuit breaker, except that a manual motor starter may be used for drives less than 2 kVA. Horsepower rated disconnect switches for equipment 2 kVA or greater shall be provided with UL Class RK1 fuses. Circuit breaker interrupting ratings shall be 10,000 symmetrical amperes for service at 240 volts or below and shall be 22,000 symmetrical amperes for service above 240 volts unless otherwise noted. When the disconnecting device is not a circuit breaker or fused disconnect, the circuit feeding the disconnecting device shall have adequate overcurrent and short circuit protection.

B. OVERLOAD PROTECTION:

Protection shall be provided for full motor running overload in ungrounded conductors for motors.

C. OVERLOAD RELAY CONTACTS:

Overload relay contacts shall not be connected in the line having provision for grounding. Grounding connections shall be provided in the unfused side of control circuits and shall be connected.

D. POWER:

Power will be supplied at one voltage as shown or specified. Additional voltage requirements, such as 120 volt control power,

2.08 D.

shall be derived from transformers provided internal to the control device as required. Each control power transformer shall be rated at least 150 percent of the calculated maximum load it serves.

PART 3 - EXECUTION

3.01 INSTALLATION

Control devices, when installed, shall comply with the requirements of the NEC and the ESO. Where these differ, the more stringent shall take precedence.

All panels (electrical), controllers, and all other appurtenances which require periodic adjustment shall be installed at a readily accessible location.

3.02 FIELD WIRING

Conduit, wiring, or mounting of devices not shown on the electrical or instrumentation drawings but required for a complete and operable system shall be provided under this section.

****END OF SECTION****

SECTION 11322

WET PIT NONCLOG PUMPS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies wet pit nonclog pumps for pumping wastewater and low pressure sludge gas condensate.

B. TYPE:

Wet pit nonclog pumps shall be of the heavy-duty, vertical, nonclog, wet pit type. The motor and thrust bearings shall be mounted on a pedestal supported by a plate which spans the sump top, and with the pump's volute suspended in the sump from a section of tubing which encloses the shaft and radial bearing. Pump shall be Weil manufacture or equal.

C. EQUIPMENT LIST:

<u>Item</u>	<u>Equipment No.</u>
Sump pump	P620

1.02 QUALITY ASSURANCE

A. GENERAL:

Sump pumps shall be designed and selected for continuous operation, pumping water and wood waste particles. Sump pumps shall be suitable for pH ranging from 5 to 8. The pumps shall be capable of passing a 1-inch diameter sphere, minimum. The pumps shall be furnished without inlet strainers.

B. OPERATING REQUIREMENTS:

	<u>P620</u>
Maximum pump speed, rpm	1750
Discharge pipe size, inches, minimum	2
Motor, horsepower, maximum	1/2
Rated conditions	
Capacity, gpm	50
Total head, ft	20

1.03

1.03 ENVIRONMENTAL CONDITIONS

Equipment furnished under this section will be located at Sacramento, California, and will be outdoors in a weather-exposed location. Temperature is expected to range from 20 to 120 degrees F and relative humidity from 10 to 90 percent. Equipment will be subject to corrosion from rainwater and will be in a dusty environment.

1.04 SUBMITTALS

Submittals shall comply with Section 01300 and paragraph 11000-1.03.

1.05 STANDBY COMPONENTS

The following spare parts shall be furnished for each pump size:

- 1 - set thrust bearings
- 1 - lower bearing assembly
- 1 - complete set of seals, gaskets and packing
- 1 - lantern ring

PART 2 - PRODUCTS

2.01 MATERIALS

<u>Component</u>	<u>Material</u>
Motor support and casing	Cast iron, ASTM A48
Baseplate	Steel
Support pipe shaft enclosure	Steel
Shaft	Stainless steel
Impeller	Cast iron, ASTM A48
Bearings	Bronze
Float and rod	--

2.02 EQUIPMENT

A. GENERAL:

Pumps shall be suspended from the baseplate by a heavy steel tube which shall be designed to enclose the pump drive shaft and its guide bearings. Impellers shall be statically and dynamically balanced, fitted with an external adjusting device located above the baseplate. Shafts shall be turned, ground and polished. Guide bearings shall be the renewable, grease lubricated, bronze-sleeve type. Guide bearings shall be provided at the pump unit and at

2.02 A.

each joint in the shaft tube. Thrust bearings shall be the heavy-duty, grease-lubricated ball thrust type located for convenient maintenance. Thrust bearings shall be protected by a gastight stuffing box with split gland and lantern ring. Tongue-and-groove registers shall be provided at each hanger tube joint, at the pump, at the floor plate, and at the motor and bearing pedestal to ensure accurate and permanent alignment.

B. PUMPS:

Sump pumps shall be suitable for single installation in a 3-foot deep sump. Shafts shall have a minimum diameter of 1-7/16 inches.

C. LEVEL CONTROL:

Pump shall be fitted with its own float switch complete with float, float rod, and float buttons. Level at which pump operates shall be adjustable.

D. BASEPLATE:

Baseplate shall be circular, 14 inches in diameter and shall be fitted with an adjustable clamp to permit height adjustment of motor and pump depth.

E. DRIVE UNIT:

The pumps shall be direct driven by continuous duty, vertical, solid shaft, high thrust electric motors. Motors shall be 110 volt, 60 cycle and operate at 1750 rpm. Sump pumps shall be driven by TEFC motors. Motors shall comply with the requirements set forth in Section 11060.

PART 3 - EXECUTION

3.01 INSTALLATION

Pumps shall be installed as shown and according to manufacturer's recommendations.

3.02 TESTING

Pumps shall be completely field tested to prove compliance with the requirements specified.

END OF SECTION

DIVISION 12

FURNISHINGS

Section

Title

12640

WORK BENCHES

SECTION 12640

WORK BENCHES

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section provides specifications for all work benches.

1.02 SUBMITTALS

Submittals shall comply with applicable paragraphs of Sections 01300 and 11000. Sixty days after award of contract, the Contractor shall submit to the Construction Manager shop drawings showing cross sections and the installation details.

PART 2 - PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

Work benches shall have leg supports similar to Hallowell Part No. 6005 modified to include one steel drawer near each end and one duplex electrical outlet at each leg and to provide wood back stringer and lower shelf.

The top shall be made up of 2-inch square strips of wood laminated together and covered with 3/16-inch steel plate returned over front, ends and splash. All exposed edges shall be ground smooth and corners shall be ground to a 1/4-inch radius.

All metal shall be bonderized and given a 1.5 mil thickness of synthetic industrial enamel in color selected by the Construction Manager.

All exposed wood shall be sealed with a penetrating sealer and then given two coats of semigloss urethane varnish.

END OF SECTION

DIVISION 13
SPECIAL CONSTRUCTION

(NOT IN CONTRACT)

DIVISION 14
CONVEYING SYSTEMS

<u>Section</u>	<u>Title</u>
14542	GARDEN WASTE SHREDDER
14550	BELT CONVEYORS
14552	DRAG CONVEYORS
14562	BULK MATERIAL HOPPER

SECTION 14542

GARDEN WASTE SHREDDER

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies shredders for grinding garden waste. It also specifies the associated hydraulic drive system.

B. TYPE:

Shredders shall be low speed, rotary shear cutting type with hydraulic drive system. Shredder shall be Saturn Model 62-40, or equal.

<u>Item</u>	<u>Equipment No.</u>
Shredder	MME607

1.02 QUALITY ASSURANCE

A. PERFORMANCE AND DESIGN REQUIREMENTS:

The unit shall be designed for continuous service. It will be required to shred municipal garden waste including bush and tree trimmings. Waste will be carried to the unit by a 5-foot wide chain conveyor and removed by a 2-foot wide belt conveyor. Incoming material will be a maximum size of branch 4 feet long and 4 inches in diameter. Shredded product shall be maximum size 1-inch cube.

B. OPERATING REQUIREMENTS:

Output capacity (minimum), tons/hr	15
Hopper capacity (minimum), cu ft	1000
Incoming waste conveyor width, ft	5
Shredded waste conveyor width, ft	2
Drive unit power, horsepower	200
Cutter diameter, inches	21
Cutter speed	
Fast shaft, rpm	36
Slow shaft, rpm	20

1.03

1.03 ENVIRONMENTAL CONDITIONS

Equipment furnished under this section will be located at Sacramento, California, and will be outdoors in a weather-exposed location. Temperature is expected to range from 20 to 120 degrees F and relative humidity from 10 to 90 percent. Equipment will be subject to corrosion from rainwater and will be in a dusty environment.

1.04 SUBMITTALS

Submittals shall be in accordance with Section 01300 and paragraph 11000-1.03. The following information shall be submitted:

1. Motor data required in Section 11060.
2. Scale drawings of shredder showing intake hopper, discharge structure, and structural supports of the unit.

1.05 INFORMATION TO BE PROVIDED

Operation and maintenance information items 1 through 9 shall be provided as listed in Section 01730.

PART 2 - PRODUCTS

2.01 MATERIALS

Cutters, hoppers, frame and support structure shall all be carbon steel. The cutters shall have a hardness of 50 on the Rockwell scale. All exposed carbon steel parts shall be painted in accordance with Section 09900.

2.02 CONSTRUCTION

A. EQUIPMENT:

Shredder shall be equipped with a separate hydraulic drive unit mounted on a pad or ground as shown on the drawings. Shredder head shall consist of two cutter shafts rotating in opposite directions at different speeds. The cutters shall be 1-1/2 inches thick, 21 inches in diameter, and be keyed to the main shaft. Shredder hopper and discharge structure shall be sized to be compatible with the feed and discharge conveyors. Bearings shall be continuously lubricated and have a rating of M3 as specified in Section 11000.

B. MOTOR DRIVE:

Drive units shall consist of two 100 horsepower motors. Motors shall be open dripproof, 1750 rpm, 460 volt, 3 phase units as specified in Section 11060.

2.02 C.

C. HYDRAULIC SYSTEM:

Each cutter shaft shall be driven by a 3000 psi, 62.2 rpm hydraulic motor. Hydraulic motors shall be radial piston design with 525 cubic inch displacement and delivering 19,520 ft-lbs of torque. Each hydraulic motor shall be driven by a 141 gpm pump connected by magnalay flexible hose covered with sheet metal safety cover. Hydraulic system shall have a low level hydraulic fluid safety switch and high temperature switch to provide system shutdown if level drops below operating limits or fluid exceeds design temperature.

D. CONTROLS:

Controls shall be the manufacturer's prepackaged unit with a NEMA 4 control box and shall include the following functions:

1. Start/stop of each hydraulic/electric motor
2. Start/stop of shredder drive
3. Oil heater on/off indicator light
4. Low level indicator light
5. Overheat indicator light
6. Jog/reverse function

Shredder controls shall be interlocked with feed and discharge conveyors such that when the shredder stops, the feed conveyor stops, and when the discharge conveyor stops, the shredder stops. Control box shall be mounted adjacent to hydraulic unit on concrete pad.

PART 3 - EXECUTION

3.01 INSTALLATION

The shredder shall be installed as shown with proper alignment of incomings and discharge conveyors. Installation shall be according to manufacturer's written instructions.

3.02 TESTING

The shredder shall be field tested after installation. Testing shall be carried out in the presence of the Construction Manager and a manufacturer's representative. Material to be shredded in the test shall be actual garden waste typical of the wastes expected over the life of the equipment.

****END OF SECTION****

SECTION 14550

BELT CONVEYORS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies belt conveyors for transporting solids.

B. TYPE:

Belt conveyors shall be the heavy duty, troughing idler type with motor drive unit mounted on the conveyor frame.

C. EQUIPMENT LIST:

<u>Item</u>	<u>Equipment No.</u>
Shredder removal belt conveyor	CON609
Safety pull cord	HS609
Tracking switch	ZS609
Speed switch	SS609
Distribution belt conveyor	CON611
Safety pull cord	HS611
Tracking switch 1	ZS611A
Tracking switch 2	ZS611B
Tracking switch 3	ZS611C
Tracking switch 4	ZS611D
Speed switch	SS611
Tripper plow	MME613
Tripper limit switch 1	ZS613A
Tripper limit switch 2	ZS613B

1.02 QUALITY ASSURANCE

A. GENERAL:

Belt conveyors shall be designed and selected for continuous duty while conveying solids derived from garden waste shredding processes at a municipal collection site.

Conveyors shall be designed to convey shredded waste material up to 1 inch in size.

Conveyor manufacturer shall provide all structural steel supports, walkways, and access stairs as shown on the drawings.

1.02 B.

B. OPERATING REQUIREMENTS:

Specific operating requirements for the equipment to be furnished under this section are as follows:

	<u>CON609</u>	<u>CON611</u>
Peak loading rate, tons/hr	15	15
Conveyor belt		
Max speed, fpm	110	120
Width, inches	24	24
Approx length, ft ^a	52	132
Angle of rise, degrees	25	0
Min length of take-up device, ft	1.5	1.5
Motor		
Type	TEFC	TEFC
Horsepower, max	7-1/2	7-1/2
Voltage	460	460

^aActual length shall be verified in the field and shall be sufficient to accommodate the equipment furnished.

Brush chips are expected to have a density of 20 pounds per cubic foot and a 35-degree surcharge angle.

1.03 ENVIRONMENTAL CONDITIONS

Equipment furnished under this section will be located at Sacramento, California, and will be outdoors in a weather-exposed location. Temperature is expected to range from 20 to 120 degrees F and relative humidity from 10 to 90 percent. Equipment will be subject to corrosion from rainwater and will be in a dusty environment.

1.04 SUBMITTALS

Submittals shall comply with Section 01300 and paragraph 11000-1.02.

1.05 STANDBY COMPONENTS

These parts shall be provided for each conveyor size as follows:

- 1 - set conveyor bearings
- 1 - gross shear pins
- 1 - set pulleys

- 2 - belt scraper blades
- 1 - set V-belts
- 1 - bearing puller for roller bearings in the idlers
- 1 - set plow scraper elements

PART 2 - PRODUCTS

2.01 MATERIALS

<u>Component</u>	<u>Material</u>
Belts	Nylon, 2 ply
Wiper blades	Tungsten carbide
Idlers	Steel
Frame and supports	Steel, painted
Walkway	Steel, painted

All painting shall be in accordance with Section 09900.

2.02 EQUIPMENT

A. BELTS:

Belts shall be of a 2-ply multiwarp nylon construction with cord filling placed alternately above and below the main cord warp. Belts shall be Rubber Manufacturers Associate Grade 2 and shall have 1/8-inch neoprene rubber top cover and 1/16-inch neoprene rubber bottom cover and shall have an allowable working tension of 150 pound/inch of width. All belt splices shall be field vulcanized with overlapping cuts, and all splices shall be as strong as the uncut belt. All splices shall be free of pockets or discontinuities which might trap particles and shall have a smooth surface to permit the belt cleaners to operate most efficiently. Belt stretch shall be limited to a maximum of 2.5 percent of total length.

B. IDLERS AND BEARINGS:

All idlers shall be rated CEMA Series C.

Conveyor idlers shall have ball bearings with shielded triple-labyrinth type seals prelubricated for life and for operation in a pressure washdown environment.

Belt carrying idlers shall be not less than 4 inches in diameter, 20-degree troughing idlers and shall be spaced at not more than 2 feet, 6 inches on center at loading areas, nor more than 4 feet, 6 inches on center on run. Belt carrying idlers shall be of the 3 equal roll type and shall be of adequate width for the conveyor belt installed. Return belt idlers shall be not less than 4 inches in diameter, rubber disc idlers and shall be spaced at not greater than 10 feet on center.

2.02 B.

Bearings shall be sealed-for-life, antifriction self-aligning ball bearings designed for continuous duty and moderate loads. Tail shafts and head shafts shall be provided with two-bolt split-housing roller bearing pillow blocks. One training idler shall be provided on the carrying run and two shall be provided on the return run. All bearings shall be rated for Class B-10 (60,000 hours) life at the loads imposed.

C. PULLEYS AND SHAFTS:

Head and tail shaft pulleys shall be crown faced one-piece pulleys, and all pulleys shall be provided with all necessary shafting and bearings. Head and tail shaft pulleys shall be at least 16 inch diameter. Pulleys shall be of welded steel construction and shall be at least 4 inches wider than the belt. Shafts shall be a minimum 1-15/16-inch diameter steel.

Lagging shall be provided on all head and tail pulleys. Head pulleys shall be covered over their full width with vulcanized plain solid neoprene rubber lagging a minimum of 1/2 inch thick. Tail pulleys shall have solid neoprene rubber lagging over the full width of the face of the pulleys.

D. TAKE-UP DEVICE:

A manual adjustable screw type take-up device shall be provided with roller bearing take-up blocks. It shall be located at the end of the conveyor opposite the drive end.

E. BELT SCRAPERS:

All conveyors shall be furnished with multiple-bladed, adjustable-tension, finger-type scrapers. To maintain a uniform tension across the belt, each blade shall also have an independent tension adjustment system. The blades shall be constructed from tungsten carbide. All conveyors shall be furnished with a belt scraper at the head pulley to enable material cleared off the belt to fall into the discharge chute.

F. BELT TRIPPERS:

Trippers shall be independently powered, capable of traveling the length of storage belts and positioning at any point of travel. Tripper shall divert to both sides of storage belt with chuting to 6 inches below return run of storage belt.

Tripper shall be "V" plow type. "V" plow shall be capable of manual positioning to allow either diverting or through travel for delivery to head pulley. Plow shall be minimum, 5/16-inch steel with 1/2-inch rubber skirts adjustable in height. "V" shall be maximum 60 degrees. Flat belt plate under plow shall have flat nosing rolls (4 inches in diameter) at each end of plate, lifting belt off of troughing idlers. Plate shall be 3/8 inch cold

2.02 F.

finished or polished on faying surface. Chuting shall be minimum 1/4-inch plate with length parallel to travel to allow for "bunching" of wet material ahead of plow without spilling outside chute walls. All fixing nuts and bolts shall be stainless steel AISI 304.

Tripper shall travel on rails with a minimum 8 inches diameter, flanged wheels, or "V" groove wheels. Bearings shall be sealed, frictionless bearings with 1-7/16 minimum diameter shafting. Tripper shall travel freely on well-aligned rails without binding. Travel shall be positive in each direction with either chain or cable. Power unit shall be located on tripper (walking on chain). Control shall be manual pushbutton located at operator's station. Travel shall be normally "off" with movement only when button is depressed. Travel speed shall be approximately 30 fpm and shall be capable of plowing against the belt travel. Tripper shall not creep from any set location. Wiring to motor shall be by cable reel and shall be provided by tripper unit manufacturer. Cable reel shall be Appleton RL405 or equal with 4/C #12 AWG rubber-covered cable. Minimum cable length is 80 feet. Reel shall be mounted on a swivel base, and base shall be supported above tripper fixed to conveyor frame. Conductor bars and collector shoes are not acceptable. Tripper travel motor shall be minimum 1 HP, 3 phase with 1.15 service factor. Tripper shall be provided with a nonfusible disconnect switch by manufacturer. Tripper shall be provided with a striker plate to actuate limit switches which shall be provided by tripper manufacturer. Limit switches shall be Cutter Hammer 14977 H11, or equal.

G. FRAMES AND SUPPORTS:

The conveyor assembly shall be supported on not less than 6-inch deep steel channel stringers with adequate stiffeners between the two runs of the belt. Rigid leg supports of 6-inch channel shall be provided as needed to the conveyor walkway supports as shown on the drawings. Supports shall be capable of transmitting all vertical and lateral loads to the equipment anchors. All supports shall be fabricated of not less than 1/4-inch thick steel and shall be adequately braced with 3-inch angle and reinforced. All shop connections shall be welded unless shown otherwise on the drawings. Welding shall be in accordance with AWS Structural Welding Code D1.1. Traper on support leg shall be 1-1/2 in 12.

H. DRIVE UNIT:

The conveyor drive unit shall be mounted with the drive motor located above the head pulley. Motors shall be connected by a V-belt drive to their respective head pulleys through a shaft mounted speed reducer. Motors shall be of sufficient size to operate under continuous duty without overloading at any point on the system operating curve. The drive unit shall be mounted on an adjustable base, and extra V-belts and pulleys shall be provided

2.02 H.

to obtain belt speeds equal to 67 percent and 150 percent of design speed. Motors shall comply with the requirements set forth in Section 11060.

I. FEED CHUTES:

Feed chutes shall be provided at all conveyor junctions and shall be fabricated of 1/4-inch thick steel plate.

J. SKIRTBOARDS:

Skirtboards shall be designed to preclude entrapment of material lumps between the moving belt and any parts of skirtboard or loading hopper. Skirtboards shall be equipped with replaceable abrasion resistant liners, as specified in accompanying drawings. Skirtboard sealing strips shall be gum rubber, 55 to 60 Durometer, 1/2 inch thick. Skirtboard sealing strips shall meet the belt at 45-degree angle to reduce wear on the belt.

K. SPEED SWITCH:

All conveyors shall be fitted with a low speed switch which will shut down conveyor drive when conveyor belt is stopped. Switch shall be fitted on the first return, nonpowered idler pulley, at the head end of the conveyor. Switch shall be encased in a NEMA 4 enclosure. Switch shall be Allen Bradley 808 or equal. Switch shall trip at 80 percent of normal running speed.

L. TRACKING SWITCH:

Tracking switches shall be installed on conveyors as indicated on the drawings. Switches shall be encased in a NEMA 4 enclosure. Switches shall be Cutler Hammer 14977 H11 or equal.

M. TRIP WIRE SAFETY SWITCH:

Both transport conveyors shall be furnished with a trip wire operated safety switch and actuating cable extending the full length of the conveyor on both sides where shown. The safety switch shall be designed to stop the conveyor's drive motor at a net cable pull (total actuation force required minus weight of unsupported cable) of not more than 20 pounds. Trip switches shall be mounted on the conveyor's frame at the drive motor and shall be encased in a NEMA 4 enclosure. Trip switches shall have a visible flag alarm to indicate a tripped condition when actuated. Trip switches shall be DPDT rated 20 amps at 120V AC and shall have a positive manual safety lock to prevent accidental reset. Trip wire shall be 1/8-inch aircraft cable encased in nylon coating. Switches shall be Kraus and Naimer or equal.

2.02 N.

N. HOLDBACKS:

Elevating conveyors shall be provided with holdbacks to prevent reversal of conveyor when stopped under design load. Selection of holdback shall be based on stalled torque rating of drive motor.

O. WALKWAYS:

All conveyor walkways, unless otherwise indicated on the drawings, shall be 2 feet wide. At distribution conveyor CON611 walkway shall be 1 foot 6 inches clear of conveyor to allow material to be ploughed off the conveyor. Walkways shall be fitted with handrails as specified in Section 05520. Toeplates shall extend continuously around edges of all platform landings except at stair or ladder access. Walkways shall otherwise be as specified in Section 05530.

PART 3 - EXECUTION

3.01 INSTALLATION

Each conveyor shall be installed as shown on the contract drawings and in accordance with manufacturer's recommendations.

3.02 TESTING

After completion of installation, each conveyor shall be completely tested to verify compliance with this specification.

END OF SECTION

SECTION 14552

DRAG CONVEYORS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies drag conveyors for transporting solids. This section also specifies all conveyor accessories including supports and walkways.

B. TYPE:

Drag conveyors shall be the heavy duty, chain and bar flight type with motor drive unit mounted on the conveyor frame.

C. EQUIPMENT LIST:

<u>Item</u>	<u>Equipment No.</u>
Receiving hopper drag conveyor	CON603
Safety pull cord	HS603
Speed switch	SS603
Elevating drag conveyor	CON605
Safety pull cord	HS605
Speed switch	SS605

1.02 QUALITY ASSURANCE

A. GENERAL:

Drag conveyors shall be designed and selected for continuous duty while conveying garden waste solids at a municipal collection site.

Conveyors shall be designed to convey garden waste material including tree branches up to 4 inches in diameter and 4 feet in length, leaves, grass cuttings, and general garden waste.

Conveyor manufacturer shall provide all structural steel supports, walkways, and access stairs as shown on the drawings.

B. OPERATING REQUIREMENTS:

Specific operating requirements for the equipment to be furnished under this section are as follows:

	<u>CON603</u>	<u>CON605</u>
Peak loading rate, tons/hr	15	15

1.02 B.

	<u>CON603</u>	<u>CON605</u>
Conveyor belt		
Max speed, fpm	35	40
Width, inches	60	60
Approx length, ft ^a	32	52
Angle of rise, degrees	0	35
Min length of take-up device, ft	1.5	1.5
Motor		
Type	TEFC	TEFC
Horsepower, max	7-1/2	15
Voltage	460	460

^aActual length shall be verified in the field and shall be sufficient to accommodate the equipment furnished.

1.03 ENVIRONMENTAL CONDITIONS

Equipment furnished under this section will be located at Sacramento, California, and will be outdoors in a weather-exposed location. Temperature is expected to range from 20 to 120 degrees F and relative humidity from 10 to 90 percent. Equipment will be subject to corrosion from rainwater and will be in a dusty environment.

1.04 SUBMITTALS

Submittals shall comply with Section 01300 and paragraph 11000-1.02.

1.05 STANDBY COMPONENTS

These parts shall be provided for each conveyor size as follows:

- 1 - set conveyor bearings
- 1 - gross shear pins
- 1 - set sprockets

PART 2 - PRODUCTS

2.01 MATERIALS

<u>Component</u>	<u>Material</u>
Chain and flights	Carbon steel
Frame and supports	Steel, painted
Walkway	Steel, painted

All painting shall be in accordance with Section 09900.

2.02 EQUIPMENT

A. CHAINS:

Chains shall be flat bed welded steel type flight chains. Chains shall be Jeffrey Class 700.5, or equal. Flight bars shall be minimum 6-inch channel at 5-foot spacing and attached to chain with a Jeffrey F22-6 attachment, or equal.

B. SPROCKETS:

Sprockets shall have minimum 19 teeth and shall have hardened teeth.

C. FRAMES AND SUPPORTS:

The conveyor assembly shall be supported on not less than 6-inch deep steel channel legs with 3-inch angle braces between the two legs. Rigid leg supports shall be provided as needed to the conveyor walkway supports as shown on the drawings. Supports shall be capable of transmitting all vertical and lateral loads to the equipment anchors. All supports shall be fabricated of not less than 1/4-inch thick steel and shall be adequately braced and reinforced. All shop connections shall be welded unless shown otherwise on the drawings. Welding shall be in accordance with AWS Structural Welding Code D1.1.

D. DRIVE UNIT:

The conveyor drive unit shall be mounted with the drive motor located above the head pulley. Motors shall be connected by a V-belt drive to their respective head pulleys through a shaft mounted speed reducer. Motors shall be of sufficient size to operate under continuous duty without overloading at any point on the system operating curve. The drive unit shall be mounted on an adjustable base, and extra V-belts and pulleys shall be provided to obtain belt speeds equal to 67 percent and 150 percent of design speed. Motors shall comply with the requirements set forth in Section 11060.

E. FEED CHUTES:

Feed chutes shall be provided at all conveyor junctions and shall be fabricated of 1/4-inch thick steel plate.

F. SKIRTBOARDS:

Skirtboards shall be designed to preclude entrapment of material lumps between the moving belt and any parts of skirtboard or loading hopper. Skirtboards shall be equipped with replaceable abrasion resistant liners, as specified on accompanying drawings.

2.02 F.

Skirtboard sealing strips shall be gum rubber, 55 to 60 Durometer, 1/2 inch thick. Skirtboard sealing strips shall meet the belt at 45-degree angle to reduce wear on the belt.

G. SPEED SWITCH:

All conveyors shall be fitted with a low speed switch which will shut down conveyor drive when conveyor belt is stopped. Switch shall be fitted on the first return, nonpowered idler pulley, at the head end of the conveyor. Switch shall be encased in a NEMA 4 enclosure. Switch shall be Allen Bradley 808, or equal. Switch shall trip at 80 percent of normal running speed.

H. TRIP WIRE SAFETY SWITCH:

Both transport conveyors shall be furnished with a trip wire operated safety switch and actuating cable extending the full length of the conveyor on both sides where shown. The safety switch shall be designed to stop the conveyor's drive motor at a net cable pull (total actuation force required minus weight of unsupported cable) of not more than 20 pounds. Trip switches shall be mounted on the conveyor's frame at the drive motor and shall be encased in a NEMA 4 enclosure. Trip switches shall have a visible flag alarm to indicate a tripped condition when actuated. Trip switches shall be DPDT rated 20 amps at 120V AC and shall have a positive manual safety lock to prevent accidental reset. Trip wire shall be 1/8-inch aircraft cable encased in nylon coating. Switches shall be Kraus and Naimer, or equal.

I. HOLDBACKS:

Elevating conveyors shall be provided with holdbacks to prevent reversal of conveyor when stopped under design load. Selection of holdback shall be based on stalled torque rating of drive motor.

PART 3 - EXECUTION

3.01 INSTALLATION

Each conveyor shall be installed as shown on the contract drawings and in accordance with manufacturer's recommendations.

3.02 TESTING

After completion of installation, each conveyor shall be completely tested to verify compliance with this specification.

END OF SECTION

SECTION 14562

BULK MATERIAL HOPPER

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies hoppers and appurtenances for storage and controlled discharge of bulk solids.

B. TYPE:

Hoppers shall be rectangular in plan and shall have sloping sides to provide solids to a conveyor in the base of the hopper.

<u>Item</u>	<u>Equipment No.</u>
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Receiving hopper	MME601
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1.02 QUALITY ASSURANCE

A. PERFORMANCE AND DESIGN REQUIREMENTS:

Hoppers shall be designed for continuous duty at an outdoor location. Hopper will contain garden waste material including branches, leaves, grass, cuttings and general garden waste.

B. OPERATING REQUIREMENTS:

Hopper volume	2000 cu ft
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1.03 ENVIRONMENTAL CONDITIONS

Equipment furnished under this section will be located at Sacramento, California, and will be outdoors in a weather-exposed location. Temperature is expected to range from 20 to 120 degrees F and relative humidity from 10 to 90 percent. Equipment will be subject to corrosion from rainwater and will be in a dusty environment.

1.04 SUBMITTALS

Submittals shall comply with Section 01300 and paragraph 11000-1.02.

Submittals shall include drawings and material description of hopper components.

2.01

PART 2 - PRODUCTS

2.01 MATERIALS

<u>Component</u>	<u>Material</u>
Hopper	Steel, painted
Lining	Abrasion resistant steel

All painting shall be in accordance with Section 09900.

2.02 CONSTRUCTION

A. GENERAL:

Hopper shall be of welded reinforced steel construction of minimum thickness, 1/4 inch, with angle bracing where necessary. Reinforcement shall be sufficient to withstand full load of hopper containing garden waste material at weight up to 20 tons. Welding shall be in accordance with AWS Structural Welding Code D1.1.

Hopper shall have an abrasion resistant lining to withstand expected forces from dropping and friction of waste material.

Hopper shall be welded along top edges to steel angle embedded in edge of concrete pit. Hopper support shall be primarily a steel channel and angle support structure with base on floor of conveyor pit. At the discharge end of the hopper, a height adjustable plate the full width of the hopper shall be provided to set the material pile height on the conveyor CON603.

PART 3 - EXECUTION

3.01 INSTALLATION

Hopper and all appurtenances shall be installed as shown on contract drawings and in accordance with manufacturer's recommendations.

****END OF SECTION****

DIVISION 15

MECHANICAL

<u>Section</u>	<u>Title</u>
15050	PIPING SYSTEMS
15055	PIPING MATERIALS AND COMPONENTS
15061	STEEL PIPE
15064	PLASTIC PIPE
15075	JOINT GASKETS
15085	PIPING CONNECTIONS
15112	REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTERS
15186	FIRE HOSES AND CABINETS
15200	INSULATION FOR EXPOSED PIPING AND EQUIPMENT
15400	PLUMBING
15405	PLUMBING FIXTURES
15500	FIRE EXTINGUISHERS AND CABINETS
15705	AIR TO AIR HEAT PUMP
15800	HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS BALANCING
15803	RADIANT HEATER
15821	FILTERED AIR WALL SUPPLY FANS
15822	PROPELLER WALL EXHAUST FANS
15823	SIDEWALL EXHAUST FANS
15835	SMALL GAS BLOWER
15840	SHEET METAL DUCTWORK
15846	DUCTWORK THERMAL INSULATION
15860	DAMPERS

DIVISION 15 (cont'd)

MECHANICAL

<u>Section</u>	<u>Title</u>
15872	CEILING DIFFUSERS, GRILLES, REGISTERS AND EXTRACTORS
15879	LOUVERS
15880	VENTILATION AIR FILTERS
15920	HVAC CONTROL SYSTEMS
15921	HVAC INSTRUMENTS
15931	WALL MOUNTED THERMOSTATS
15932	REMOTE BULB THERMOSTATS

SECTION 15050

PIPING SYSTEMS

1.01 DESCRIPTION

A. SCOPE:

This section specifies systems of process piping. Detailed specifications for the components listed on the Piping System Specification Sheets are found in other sections of Division 15. General requirements for piping systems are specified in Section 15055.

B. DEFINITIONS:

Pressure terms used in Section 15050 and elsewhere in Division 15 are defined as follows:

1. WORK: The actual pressure at which the piping system works under normal conditions.
2. MAX: The greatest continuous pressure at which the piping system operates.
3. TEST: The hydrostatic pressure used to evaluate system acceptance.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
AASHO M36-74	Zinc Coated (Galvanized) Corrugated Iron or Steel Culverts and Underdrains
ANSI B16.22-73	Wrought Copper and Bronze Solder-Joint Pressure Fittings
ANSI B16.26-75	Cast Copper Alloy Fittings For Flared Copper Tubes
ANSI B16.3-77	Malleable-Iron Threaded Fittings
ANSI B16.9-78	Factory-Made Wrought Steel Butt-Welding Fittings

1.02

<u>Reference</u> (cont'd)	<u>Title</u>
ASTM A47-77	Malleable Iron Castings
ASTM A53-79	Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless
ASTM A74-75	Cast Iron Soil Pipe and Fittings
ASTM A120-79	Pipe, Steel, Black and Hot Dipped Zinc Coated (Galvanized) Welded and Seamless for Ordinary Uses
ASTM A234-79	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A312-79	Seamless and Welded Austenitic Stainless Steel Pipe
ASTM A403-79	Wrought Austenitic Stainless Steel Pipe Fittings
ASTM B88-78	Seamless Copper Water Tube
ASTM C76-79	Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
ASTM C296-78	Asbestos-Cement Pressure Pipe
ASTM C564-70	Rubber Gaskets for Cast-Iron Soil Pipe and Fittings
ASTM D2241-78	Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
ASTM D2513-80a	Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
ASTM D2611-73	Butt Fusion Polyethylene (PE) Plastic Pipe Fittings, Schedule 80
AWWA C106-80	Standard for Gray-Iron Pipe Centrifugally Cast in Metal Molds for Water or Other Liquids
AWWA C108-75	Standard for Cast-Iron Pipe Centrifugally Cast in Sand-Lined Molds for Water or Other Liquids
AWWA C110-77	Gray-Iron and Ductile-Iron Fittings 3 Inch Through 48 Inch for Water and Other Liquids

1.02

<u>Reference</u> (cont'd)	<u>Title</u>
AWWA C111-79	Standard for Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C151-76	Standard for Ductile-Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids
AWWA C200-75	Steel Water Pipe 6 Inches and Larger
AWWA C205-71	Standard for Cement-Mortar Protective Lining and Coating for Steel Water Pipe 4 Inches and Larger - Shop Applied
AWWA C208-59	Standard Dimensions for Steel Water Pipe
AWWA C210-78	Standard for Coal-Tar Epoxy Coating System for the Interior and Exterior of Steel Water Pipe
AWWA C900-75	Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches, for Water
CISPI 301-75	Specification Data for Hubless Cast Iron Sanitary System with No-Hub Pipe and Fittings
MIL-P-22245A	Pipe and Pipe Fittings, Glass Fiber Reinforced Plastic

1.03 PIPING SYSTEM SPECIFICATION SHEETS (PIPESPEC)

Each piping system is specified in the PIPESPEC which is alphabetically arranged by designated system abbreviations as shown in Table A:

Table A, Abbreviations for Piping Systems

<u>System Abbreviation</u>	<u>System</u>
D	Drain
HWS	Hot Water Supply
LG	Landfill Gas
SD	Sanitary Drain
V	Vent
1W	Potable Water (City water)

PIPING SYSTEM SPECIFICATIONS					
SERVICE Drain	BACKGROUND Green	LEGEND DRAIN	SYMBOL D		
GASKET Neoprene, C.I.		TEST MEDIUM: <input type="checkbox"/> AIR <input checked="" type="checkbox"/> WATER <input type="checkbox"/>		DURATION: * MIN	
PRESSURE-PSIG			TEMPERATURE F*		
WORK	-	MAX	3	TEST	* NORMAL 70
PIPE SIZE	EXPOSURE	PIPE		FITTINGS	
3" and smaller	EXPOSED	Steel, ASTM A120, galvanized.		150# galvanized malleable iron, ANSI B16.3, screwed and banded.	
	BURIED EMBEDDED ENCASED	Polyvinylchloride (PVC), ASTM D2241, SDR-26 pressure rating 160 psi. Solvent weld socket type joints.		PVC. Joint options same as for pipe.	
4"-12"	EXPOSED	Cast iron soil pipe (CISP), ASTM A74, service hub and spigot, compression type joint, with ASTM C564 rubber gasket, or hubless cast iron sanitary system per CISPI 301.		CISP, ASTM A74. Joint options same as for pipe.	
	BURIED EMBEDDED ENCASED	PVC, ASTM D3034, SDR-35, with gasketed joints.		PVC. Joint options same as for pipe.	
14" and larger	EXPOSED	Ductile iron, flanged, AWWA C151.		Ductile iron, flanged, AWWA C110.	
	BURIED EMBEDDED ENCASED	Reinforced concrete, or asbestos cement with compression type joint, or ductile iron, AWWA C151, mechanical joint per AWWA C111.		Asbestos cement compression type joint, or cast iron, AWWA C110, with mechanical joint per AWWA C111. Cast iron fittings shall be polyethylene encased.	
VALVES					
SIZE	EXPOSURE	TYPE	SPECIFICATION		
All	All	Check	Backwater valves where specified shall be as follows: Vertical: Smith Figure 7080, Josam Series 1000, or equal. Horizontal: Smith Figure 7012, Josam Series 1100, or equal.		
REMARKS: *In accordance with Section 318, Uniform Plumbing Code, latest edition. Mechanical pipe couplings and fittings may be substituted for flanged joints and fittings for exposed ductile or cast iron piping.					

PIPING SYSTEM SPECIFICATIONS					
SERVICE Potable Hot Water Supply		BACKGROUND Yellow	LEGEND POTABLE HOT WATER SUPPLY		SYMBOL HWS
GASKET			TEST MEDIUM: <input type="checkbox"/> AIR <input checked="" type="checkbox"/> WATER <input type="checkbox"/> _____		DURATION: 120 MIN
PRESSURE-PSIG			TEMPERATURE F°		
WORK	40	MAX	50	TEST	75
		NORMAL	140	MAX	200
PIPE SIZE	EXPOSURE	PIPE		FITTINGS	
2" and smaller	EXPOSED	Steel, ASTM A120, galvanized, Schedule 40, no lining, or copper tube, ASTM B88, Type L, drawn. Insulation.		150# galvanized malleable iron, ANSI B16.3, screwed and banded. Insulation.	
	BURIED EMBEDDED ENCASED	Same as exposed steel pipe, with machine applied thermoplastic coating.		Same as exposed. Coating to match pipe.	
2-1/2" and larger	EXPOSED	Steel, ASTM A120, black, Schedule 40, no lining, seamless. Insulation.		Steel, ASTM A234, seamless, Schedule 40, black, ANSI B16.9, butt weld. Insulation.	
	BURIED EMBEDDED ENCASED	Same as exposed, with machine applied thermoplastic coating. Insulation.		Same as exposed. Coating to match pipe. Insulation.	
	EXPOSED				
	BURIED EMBEDDED ENCASED				
VALVES					
SIZE	EXPOSURE	TYPE	SPECIFICATION		
2" and smaller	Exposed	Isolating	Ball: Jamesbury 211100TT, Worcester 4211T, Jenkins 32A, or equal.		
		Throttling	Globe: Crane 7 or 17; Jenkins 106A or 108A, or equal.		
		Check	Swing: Crane 141, Jenkins 352, or equal.		
2-1/2" and larger	Exposed	Isolating	Butterfly		
		Throttling	Butterfly: Adjustable memory stops.		
		Check	Double-disc: Mission Duo-Chek Fig. 12 HMP, Weco CY12C30BE, Gulf Valve Model MB, or equal.		
	Buried	Isolating	Gate: ANWA C500, NRS, double-disc, flanged joint, with extension stem and valve box.		
REMARKS: Insulation shall be in accordance with the specifications.					
SHEET <u>1</u> OF <u>1</u>					

PIPING SYSTEM SPECIFICATIONS

SERVICE Landfill Gas	BACKGROUND Red	LEGEND LANDFILL GAS	SYMBOL LG
GASKET Neoprene, C.I.		TEST MEDIUM: <input type="checkbox"/> AIR <input checked="" type="checkbox"/> WATER <input type="checkbox"/>	DURATION: <u>120</u> MIN

PRESSURE-PSIG		TEMPERATURE F°	
WORK <u>75</u>	MAX <u>100</u>	TEST <u>150</u>	NORMAL <u>70</u> MAX <u>85</u>

PIPE SIZE	EXPOSURE	PIPE	FITTINGS
4"-12"	EXPOSED	PVC, ASTM D2241, SDR-26 pressure rating 160 psi. Solvent weld socket type joints.	PVC. Joint options same as for pipe.
	BURIED EMBEDDED ENCASED	PVC, ASTM D2241, SDR-26 pressure rating 160 psi. Solvent weld socket type joints.	PVC. Joint options same as for pipe.
	EXPOSED		
	BURIED EMBEDDED ENCASED		
	EXPOSED		
	BURIED EMBEDDED ENCASED		

VALVES

SIZE	EXPOSURE	TYPE	SPECIFICATION
4" and larger	Buried	Isolating	Butterfly

REMARKS: Insulation shall be in accordance with specifications.

Plastic pipe and fittings which may be exposed to sunlight shall be manufactured from chlorinated polyvinylchloride, Type IV, Grade 1. Landfill gas piping shall be perforated as shown on the drawings.

PIPING SYSTEM SPECIFICATIONS					
SERVICE Sanitary Drain		BACKGROUND Green		LEGEND SANITARY DRAIN	
				SD	
GASKET Neoprene, C.I.		TEST MEDIUM: <input type="checkbox"/> AIR <input checked="" type="checkbox"/> WATER <input type="checkbox"/>		DURATION: * MIN	
PRESSURE-PSIG			TEMPERATURE F*		
WORK	-	MAX	3	TEST	*
				NORMAL	70
				MAX	
PIPE SIZE	EXPOSURE	PIPE		FITTINGS	
3" and smaller	EXPOSED	Steel, ASTM A120, galvanized.		150# galvanized malleable iron, ANSI B16.3, screwed and banded.	
	BURIED EMBEDDED ENCASED	Polyvinylchloride (PVC), ASTM D2241, SDR-26 pressure rating 160 psi. Solvent weld socket type joints.		PVC. Joint options same as for pipe.	
4"-12"	EXPOSED	Cast iron soil pipe (CISP), ASTM A74, service hub and spigot, compression type joint with ASTM C564 rubber gasket, or hubless cast iron sanitary system per CISPI 301.		CISP, ASTM A74. Joint options same as for pipe.	
	BURIED EMBEDDED ENCASED	PVC, ASTM D3034, SDR-35, with gasketed joints.		PVC. Joint options same as pipe.	
14"-24"	EXPOSED	Ductile iron, flanged, AWWA C151.		Ductile iron, flanged, AWWA C110.	
	BURIED EMBEDDED ENCASED	Reinforced concrete, or asbestos cement with compression type joint, or ductile iron, AWWA C151, mechanical joint per AWWA C111.		Asbestos cement compression type joint, or cast iron, AWWA C110, with mechanical joint per AWWA C111. Cast iron fittings shall be polyethylene encased.	
VALVES					
SIZE	EXPOSURE	TYPE	SPECIFICATION		
All	All	Check	Backwater valves where specified shall be as follows: Vertical: Smith Figure 7080, Josam Series 1000, or equal. Horizontal: Smith Figure 7012, Josam Series 1100, or equal.		
REMARKS: *In accordance with Section 318, Uniform Plumbing Code, latest edition. Mechanical pipe couplings and fittings may be substituted for flanged joints and fittings for exposed ductile or cast iron piping.					
SHEET <u> 1 </u> OF <u> 2 </u>					

PIPING SYSTEM SPECIFICATIONS

SERVICE Sanitary Drain	BACKGROUND Green	LEGEND SANITARY DRAIN	SYMBOL SD
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GASKET Neoprene, C.I. **TEST MEDIUM:** AIR WATER **DURATION:** * MIN

PRESSURE-PSIG	TEMPERATURE F°
WORK MAX 3 TEST *	NORMAL 70 MAX

PIPE SIZE	EXPOSURE	PIPE	FITTINGS
27" and larger	EXPOSED	Steel, AWWA C200, with mechanical pipe couplings. Pipe 27" and larger may be plain end butt weld or slip joint fillet weld.	Fabricated steel, AWWA C208. Thickness, lining and joint treatment to match pipe.
	BURIED EMBEDDED ENCASED	Reinforced concrete pipe.	Concrete mortar lined and coated steel.
	EXPOSED		
	BURIED EMBEDDED ENCASED		
	EXPOSED		
	BURIED EMBEDDED ENCASED		

VALVES

SIZE	EXPOSURE	TYPE	SPECIFICATION
			See Sheet 1 of 2.

REMARKS: *See Sheet 1 or 2.

PIPING SYSTEM SPECIFICATIONS				
SERVICE Vent	BACKGROUND Yellow	LEGEND VENT	SYMBOL V	
GASKET Neoprene, C.I.		TEST MEDIUM: <input type="checkbox"/> AIR <input checked="" type="checkbox"/> WATER <input type="checkbox"/>		DURATION: * MIN
PRESSURE-PSIG			TEMPERATURE F*	
WORK -	MAX 3	TEST *	NORMAL 70	MAX 100
PIPE SIZE	EXPOSURE	PIPE	FITTINGS	
3" and smaller	EXPOSED	Steel, ASTM A120, galvanized, or polyvinylchloride (PVC), Schedule 80, normal impact, socket type.	150# galvanized malleable iron, ANSI B16.3, screwed and banded, or PVC, Schedule 80, socket type, normal impact.	
	BURIED EMBEDDED ENCASED	Reinforced thermosetting resin pipe (RTRP), ASTM D2996, Type 11 AD.	Bell and spigot, solvent weld per manufacturers instructions. End connections for transition to exposed piping double thick flanges per MIL-P-22245A.	
4"-12"	EXPOSED	Cast iron soil pipe (CISP), ASTM A74, service hub and spigot, compression type joint with ASTM C564 rubber gasket, or hubless cast iron sanitary system per CISPI 301.	CISP, ASTM A74. Joint options same as for pipe.	
	BURIED EMBEDDED ENCASED	Same as exposed.	Same as exposed.	
	EXPOSED			
	BURIED EMBEDDED ENCASED			
VALVES				
SIZE	EXPOSURE	TYPE	SPECIFICATION	
REMARKS: *In accordance with Section 318, Uniform Plumbing Code, latest edition. Mechanical pipe couplings and fittings may be substituted for flanged joints and fittings for exposed cast iron piping.				
SHEET <u>1</u> OF <u>1</u>				

PIPING SYSTEM SPECIFICATIONS					
SERVICE Potable Water		BACKGROUND Red		LEGEND POTABLE WATER (CITY WATER)	
GASKET Neoprene, C.I.		TEST MEDIUM: <input type="checkbox"/> AIR <input checked="" type="checkbox"/> WATER <input type="checkbox"/>		DURATION: 120 MIN	
PRESSURE-PSIG			TEMPERATURE F°		
WORK	75	MAX	100	TEST	150
		NORMAL	70	MAX	85
PIPE SIZE	EXPOSURE	PIPE		FITTINGS	
3" and smaller	EXPOSED	Steel, ASTM A120, galvanized, no lining, or copper tube, ASTM B88, Type L, drawn.		150# galvanized malleable iron, ANSI B16.3, screwed and banded, or brass compression type.	
	BURIED EMBEDDED ENCASED	PVC, ASTM D2241, SDR-26 pressure rating 160 psi. Solvent weld socket type joints.		PVC. Joint options same as for pipe.	
4"-12"	EXPOSED	Steel, ASTM A120, no lining, with mechanical pipe couplings or flanged joints.		Steel, ASTM A234, or malleable iron, ASTM A47.	
	BURIED EMBEDDED ENCASED	Same as buried pipe, 3" and smaller. Gasketed joints.		PVC or cast iron (IPS). Joint options same as for pipe. Cast iron fittings shall be polyethylene encased.	
	EXPOSED				
	BURIED EMBEDDED ENCASED				
VALVES					
SIZE	EXPOSURE	TYPE	SPECIFICATION		
3" and smaller	Exposed	Isolating	Ball: Jamesbury 211100TT, Worcester 4211T or 5911T, Jenkins 32A, or equal.		
		Throttling	Globe: Crane 7 or 17, Jenkins 106A or 108A, or equal.		
		Check	Swing: Crane 141, Jenkins 352, or equal.		
	Buried	Isolating	Ball: PVC, true union, socket type, Celanese Chemtrol Series TU, Hayward Manufacturing, GF Plastics, or equal with extension stem and valve box.		
4" and larger	Exposed	Isolating	Butterfly		
		Throttling	Butterfly: With adjustable memory stops.		
		Check	Double-disc: Mission Duo-Chek Fig. 12 HMP, Weco CV12C30BE, Gulf Valve Model MB, or equal.		
	Buried	Isolating	Butterfly		
REMARKS: Insulation shall be in accordance with specifications.					
Plastic pipe and fittings which may be exposed to sunlight shall be manufactured from chlorinated polyvinylchloride, Type IV, Grade 1.					

SECTION 15055

GENERAL REQUIREMENTS FOR PIPING SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies general requirements for piping systems and shall be used in conjunction with the Piping System Specification Sheets (PIPESPEC), Section 15050, and other sections of Division 15 which specify piping components.

1.02 QUALITY ASSURANCE

A. REFERENCES:

This section references the following documents. They are a part of this section insofar as specified and modified herein. In case of conflict between the requirements of this section and the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ANSI A13.1-75	Piping and Piping Systems
ANSI B31.1-80	Power Piping
ASME (1977) :	Boiler and Pressure Vessel Code
AWWA C601-68	Standard for Disinfecting Water Mains
MIL-STD-810C (1975)	Environmental Test Methods
UPC (1979)	Uniform Plumbing Code

B. DESIGN REQUIREMENTS:

Unless otherwise specified, pipe wall thickness shall be designed using MAX pressure as specified in Section 15050.

1.03 SUBMITTALS

In accordance with Section 01300, submittals are not required unless the Contractor proposes a substitution for a particular specification or takes exception to the specifications. Otherwise, the Contractor agrees to provide piping materials in accordance with the specifications.

1.04

1.04 INFORMATION TO BE PROVIDED

Piping layout drawings shall be transmitted to the Construction Manager a minimum of 2 weeks prior to construction.

PART 2 - PRODUCTS

2.01 PIPING IDENTIFICATION

A. PLASTIC CODING MARKERS:

Plastic markers for coding pipe shall conform to ANSI A13.1 and shall be as manufactured by W. H. Brady Company, Seton Name Plate Corporation, or equal. Markers shall be the mechanically attached type that are easily removable; they shall not be the adhesive applied type. Markers shall consist of pressure sensitive legends applied to plastic backing which is strapped or otherwise mechanically attached to the pipe. Legend and backing shall be resistant to petroleum based oils and grease and shall meet criteria for humidity, solar radiation, rain, salt, fog and leakage fungus, as specified by MIL-STD-810C. Markers shall withstand a continuous operating temperature range of -40 degrees F to 180 degrees F. Plastic coding markers shall not be the individual letter type but shall be manufactured and applied in one continuous length of plastic.

Markers bearing the legends on the background colors specified in the PIPESPEC shall be provided in the following letter heights:

<u>Outside pipe diameter,^a inches</u>	<u>Letter height, inches</u>
Less than 1-1/2	1/2
1-1/2 through 3	1-1/8
Greater than 3	2-1/4

^aOutside pipe diameter shall include insulation and jacketing.

In addition, pipe markers shall include uni- and bidirectional arrows in the same sizes as the legend. Legends and arrows shall be white on blue or red backgrounds and black on yellow or green backgrounds.

B. TRACER TAPE:

Tracer tape shall be 6 inches wide, yellow and made of inert plastic material suitable for direct burial. Tape shall be capable of stretching to twice its original length.

2.01 B.

Two messages shall be printed on the tape. The first message shall read "CAUTION CAUTION CAUTION _____ PIPE BURIED BELOW" with bold letters approximately 2 inches high. The blank shall be filled with the particular system fluid such as chlorine, oxygen or sulfur dioxide. The second message shall read "CALL _____" with letters approximately 3/4 inch high. Both messages shall be printed at maximum intervals of 2 feet.

2.02 VALVES

Valves of the same size and service shall be provided by a single valve manufacturer. Actual length of valves shall be within 1/16 inch (plus or minus) of the manufacturer's length. Flanges shall meet the requirement of ANSI B16.5. Push-on and mechanical joints shall meet the requirements of ANSI A21.11. Wafer style valves, where allowed, shall be designed for installation between 125-pound flanges.

PART 3 - EXECUTION

3.01 GENERAL

A. LOCATION:

Piping shall be provided as specified except for adjustments to avoid architectural and structural features and shall be coordinated with electrical construction.

B. PIPING SIZES:

Where the size of piping is not specified, the Contractor shall provide piping of the sizes required by UPC. Unless specified otherwise, small piping (less than 1 inch in diameter) required for services not described by UPC shall be 1/2 inch.

C. PIPE SUPPORTS:

Piping shall be supported by anchor brackets, guides, saddles or hangers. Hangers for horizontal runs of pipe shall be spaced as specified. Supports shall be provided on each run at each change of direction. Pipe supports shall be hot-dip or mechanically galvanized. Unless otherwise specified, existing pipes and supports shall not be used to support new piping.

D. ANCHORAGE:

Bends and tees in pressure piping systems shall be anchored in accordance with the requirements of ANSI B31.1, unless specified otherwise.

3.01 E.

E. PIPE PENETRATIONS:

Pipe penetrations shall be as specified.

F. BEDDING AND BACKFILL:

Unless otherwise specified, bedding and backfill for buried pressure piping shall be in accordance with Table A of Section 02200.

3.02 PIPING IDENTIFICATION

A. PIPE CODING:

After application of the specified coating and insulation systems, exposed piping, interior and exterior, and piping in ceiling spaces, pipe trenches, pipe chases and valve boxes shall be identified with plastic markers as specified in paragraph 2.01 A. Legend markers and directional arrows shall be located at each side of walls, floors and ceilings, at one side of each piece of equipment, at piping intersections, and at 50-foot centers.

B. TRACER TAPE:

A single line of tape as specified in paragraph 2.01 B shall be provided 2.5 feet above the centerline of buried pipe where specified in Section 15050. Tape shall be spread flat with message side up before backfilling.

3.03 VALVE IDENTIFICATION

Stainless steel tags bearing the valve number stamped in 1/4-inch high letters shall be installed on valve flanges in a position visible from floor level. Flangeless valves 8 inches in diameter and larger shall have tags attached to the valve body by self-tapping stainless steel screws. Flangeless valves 6 inches in diameter and smaller shall have tags attached to the valve stem by stainless steel wire.

3.04 TESTING

A. GENERAL:

Upon completion of piping, but prior to application of insulation on exposed piping, the Contractor shall test the piping systems. Pressures, media and test durations shall be as specified in the PIPESPEC. Equipment which may be damaged by the specified test conditions shall be isolated. Testing shall be performed using calibrated test gages and calibrated volumetric measuring equipment to determine leakage rates. Each test gage shall be selected so that the specified test pressure falls within the upper half of the gage's range. The Contractor shall notify the Construction Manager 1 hour prior to each test.

3.04 B.

B. GAS, AIR AND VAPOR SYSTEMS:

Steam lines shall be tested hydrostatically in accordance with the ASME procedure for testing pressure piping.

Unless otherwise specified, gas, air and vapor systems shall be tested by pressure as follows:

<u>Pipeline size</u>	<u>Test pressure</u>	<u>Testing medium</u>
2 inch and smaller	75 psi or less	Air or water
2 inch and smaller	Greater than 75 psi	Water
Greater than 2 inch	3 psi or less	Air or water
Greater than 2 inch	Greater than 3 psi	Water

The allowable leakage rate for hazardous gas systems, insulated systems, and systems tested with water shall be zero at the specified test pressure throughout the specified test period. Hazardous gas systems shall include sulfur dioxide, chlorine, propane, sludge gas and natural gas systems.

The allowable leakage rate for other systems tested with air shall be based on a maximum pressure drop of 5 percent of the specified test pressure for the duration of the period. Prior to starting a test interval using air, the air shall be at ambient temperature and specified test pressure.

C. LIQUID SYSTEMS:

Leakage shall be zero at the specified test pressure throughout the specified duration for the following systems: exposed piping, buried insulated piping, and buried or exposed piping carrying liquid chemicals. Leakage from other buried liquid piping systems shall be less than 0.05 gallon per hour per inch diameter per 100 feet of buried piping.

D. DRAINS:

Drain systems, other than pumped drain systems, shall be tested in accordance with UPC.

3.05 CLEANING AND FLUSHING

A. GENERAL:

Piping systems shall be cleaned following completion of testing and prior to connection to operating, control, regulating or instrumentation equipment. The Contractor may, at his option, clean and test sections of buried or exposed piping systems. Use of this procedure, however, will not waive the requirement for a full pressure test of the completed system. Unless specified

3.05 A.

otherwise, piping 24 inches in diameter and smaller shall first be cleaned by pulling a tightly fitting cleaning ball or swab through the system. Piping larger than 24 inches in diameter may be cleaned manually or with a cleaning ball or swab.

B. TEMPORARY SCREENS:

Upon completion of the cleaning, the Contractor shall connect the piping systems to related process equipment. Temporary screens in accordance with the following table shall be inserted in pipelines at the suction of pumps and compressors:

<u>Equipment suction or piping size, inches</u>	<u>Maximum screen opening, inches</u>
0 - 1	1/16
1-1/4 - 3	1/4
3-1/2 - 6	1/2
Over 6	1

The Contractor shall maintain the screens during testing, initial start-up, and initial operating phases of the commissioning process. In special cases, screens may be removed as required for performance tests. The Contractor shall remove the temporary screens and make the final piping connections after the screens have remained clean for at least 24 consecutive hours of operation. Systems handling solids are exempted.

C. GAS AND AIR SYSTEMS:

Gas and air system piping 6 inches in diameter and smaller shall be blown out, using air or the testing medium specified. Piping larger than 6 inches shall be cleaned by having a swab or "pig" drawn through the separate reaches of pipe. After connection to the equipment, it shall then be blown out using the equipment. Upon completion of cleaning, the piping shall be drained and dried with an air stream; sludge gas, natural gas and propane systems shall be purged with nitrogen and maintained at 10 psi until put in service.

D. LIQUID SYSTEMS:

After completion of cleaning, liquid systems shall be flushed with clean water. With temporary screens in place, the liquid shall be circulated through the piping system using connected equipment for a minimum period of 15 minutes and until no debris is collected on the screens.

E. CHEMICAL SYSTEMS:

Liquid chlorine and sulfur dioxide systems shall be cleaned and dried using the solvent, steam cleaning and drying process recommended by Dowell, Bentz Entec, or equal. Final drying

3.05 E.

operations shall include a complete purge with dry nitrogen until all moisture is removed (dew point of -40 degrees F maximum) from the system and maintained at 30 psi until put in service.

F. HYDRAULIC AND LUBE OIL SYSTEMS:

Hydraulic and lube oil systems shall be pressure tested and cleaned with the same solvent used for cleaning chemical systems. After cleaning is completed, hydraulic and lube oil systems shall be flushed by circulating hydraulic oil through the piping, using a magnetic trap. The flushing process shall be continued for a period of not less than 8 hours at a velocity of not less than 10 feet per second in the largest pipe. The flushing liquid recirculated through the piping shall be continuously filtered by a 20 micron filter of the cleanable disc type. No cleansing or flushing liquid shall be circulated through control valves, cylinders or pumps that will be incorporated in the completed project.

G. POTABLE WATER SYSTEMS:

Potable water piping systems shall be flushed and disinfected in accordance with AWWA C601.

END OF SECTION

SECTION 15061

STEEL PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies steel pipe and fittings.

1.02 QUALITY ASSURANCE

A. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ASME (1977)	Boiler and Pressure Vessel Code
ASTM A120-79	Pipe, Steel, Black and Hot Dipped Zinc Coated (Galvanized) Welded and Seamless for Ordinary Uses
AWWA C200	Standard for Steel Water Pipe Six Inches and Larger
AWWA C600	Standard for Installation of Gray and Ductile Cast Iron Water Mains and Appurtenances

B. DESIGN REQUIREMENTS:

Steel pipe and fittings shall be designed in accordance with ASTM A120 or AWWA C200 in conjunction with AWWA M11 as specified in Section 15050, Piping Systems. Design pressures for the purpose of determining wall thicknesses shall be that listed for test pressures under Section 15050.

Unless otherwise specified, the minimum wall thickness for ASTM A120 pipe shall be Schedule 40.

The minimum design pressure for AWWA C200 pipe shall be 30 psig and the minimum wall thickness shall be 10 gage (U.S. Standard). Buried pipe and fittings shall be designed for a maximum deflection of 3 percent of the internal diameter for the trench conditions specified plus an imposed wheel load equal to H-20 truck loading.

1.02 B.

Under no circumstances shall any combination of loads required under this specification produce a tensile stress in excess of 50 percent of the material's minimum yield strength.

The diameter specified for pipe and fittings shall be the nominal inside diameter after lining.

C. JOINTS:

Joints shall conform to the requirements of AWWA C200 or ASTM A120, as specified. Where no jointing requirements have been specified, joints shall be welded in accordance with AWWA C206. Flanges, where specified, shall be steel plate flanges conforming to AWWA C207.

D. FITTINGS AND APPURTENANCES:

Malleable iron threaded fittings and appurtenances shall conform to the requirements of ASTM A47.

Steel fittings and appurtenances shall conform to the requirements of ASTM A234.

Fabricated steel fittings and appurtenances shall conform to AWWA C208 and shall be designed in accordance with AWWA M11.

E. TESTING:

Factory testing shall conform to the requirements of AWWA C200.

1.03 INFORMATION TO BE PROVIDED

Affidavits of Compliance with AWWA C200 or ASTM A120, as applicable, and Contractor's layout drawings shall be provided.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

Steel for AWWA C200 pipe shall conform to the requirements of ASTM A36, ASTM A572, Grade 42, or ASTM A283, Grade D.

2.02 PIPE MANUFACTURE

AWWA C200 pipe shall be straight or spiral seam.

2.03 PIPE LINING

Unless otherwise specified, pipe and fittings shall be lined with coal tar epoxy as specified in AWWA C210 to a minimum thickness of 20 mils in not less than two coats.

2.04 A.

2.04 PIPE COATING

A. COAL TAR EPOXY:

Unless otherwise specified, pipe and fittings for buried installation shall be coated with coal tar epoxy, shop applied in accordance with AWWA C210 to a minimum thickness of 20 mils in not less than two coats.

B. THERMOPLASTIC:

1. MACHINE APPLICATION: Where specified, machine-applied thermoplastic coating shall conform to FEDSPEC L-C-530B(1). The Contractor shall provide certified laboratory test data showing that the coating system to be provided has successfully passed the artificial weathering test specified in subparagraph 4.4.2.2.3 of the FEDSPEC. Pipe greater than 16 inches in diameter shall have a minimum coating thickness of 54 mils; coating thickness for smaller pipe shall be as specified in Table III of the FEDSPEC.

Heat shrinkable sleeves shall be fabricated from radiation cross-linked semirigid polyethylene, coated on the inside surfaces with thixotropic adhesive designed to flow and provide a complete seal when heated.

2. FIELD APPLICATION: Where specified, field-applied thermoplastic coating shall be Flangeseal by Raychem, or equal.

2.05 JOINT GASKETS

Joint gaskets shall be as specified in Section 15075 of this specifications manual.

PART 3 - EXECUTION

3.01 GENERAL

Pipe shall be provided in accordance with AWWA M11, Chapter 16. Welded joints shall be in accordance with AWWA C206.

Sleeve-type mechanical pipe couplings shall be provided in accordance with AWWA M11 and Section 15085 of these specifications.

Pipe lining and coatings at field joints shall be applied as specified in paragraphs 2.03 and 2.04.

3.02 THERMOPLASTIC COATING

Mechanical couplings, including those at valves, shall be provided with the coating specified in paragraph 2.04 B.2. The

3.02

application of the coating shall consist of an initial coat of mastic to exposed metal surfaces.

3.03 TESTING

Hydrostatic testing shall be in accordance with Section 4 of AWWA C600 except that test pressures shall be as listed in Section 15050. Unless otherwise specified, allowable leakage shall be 0.02 gallons per hour per inch diameter per 100 feet of pipeline.

END OF SECTION

SECTION 15064

PLASTIC PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies polyvinylchloride, chlorinated polyvinylchloride, polyethylene, and polypropylene pipe and fittings.

B. PIPE DESIGNATIONS:

For use in the Piping System Specification Sheets (PIPESPEC) in Section 15050 and in this section, the following plastic pipe designations are defined:

<u>Designation</u>	<u>Definition</u>
PVC	Polyvinylchloride
CPVC	Chlorinated polyvinylchloride
PE	Polyethylene
PP	Polypropylene

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ASTM D1248-78	Polyethylene Plastics Molding and Extrusion Materials
ASTM D1784-78	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D1785-76	Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2146-78	Propylene Plastic Molding and Extrusion Materials
ASTM D2241-78	Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)

1.02

<u>Reference (cont'd)</u>	<u>Title</u>
ASTM D2464-76	Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2466-78	Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2467-76	Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2564-79	Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
ASTM D2657-79	Heat Joining of Polyolefin Pipe and Fittings
ASTM D3034-78	Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM F402-80	Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings
ASTM F437-77	Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F438-77	Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40
ASTM F439-77	Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F441-77	Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
ASTM F477-76	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F493-80	Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings

1.03 INFORMATION TO BE PROVIDED

The following information shall be provided:

1. Manufacturer's certificates of compliance with the specified standards and Contractor's layout drawings.

PART 2 - PRODUCTS

2.01 GENERAL

The following designations, where applicable, are specified in the PIPESPEC: ASTM standard, standard dimension ratio (SDR), pressure rating, schedule, class, and type of joint.

2.02 PVC PIPE

A. PRESSURE PIPE:

PVC material for pipe and fittings shall conform to ASTM D1784, Class 12454-B. Pipe and fittings shall either be in accordance with ASTM D1785 or shall conform to ASTM D2241 for standard dimension ratios: 160 psi pipe--SDR 26; 200 psi pipe--SDR 21; 250 psi--SDR 17 as specified. Neoprene gaskets with push-on joints shall conform to ASTM F477.

Schedule 80 PVC socket type fittings shall conform to ASTM D2467. Schedule 40 PVC fittings shall conform to ASTM D2466. PVC solvent weld cement for socket connections shall meet the requirements of ASTM D2564. Schedule 80 PVC threaded fittings shall conform to ASTM D2464.

B. NONPRESSURE PIPE:

PVC material for pipe and fittings shall conform to Class 12454-B, as defined in ASTM D1784. Pipe and fittings shall meet the requirements of ASTM D3034 for SDR 35. Neoprene gaskets with push-on joints shall conform to ASTM F477.

2.03 CPVC PIPE

CPVC material for pipe and fittings shall conform to ASTM D1784, Class 23447-B. Pipe and fittings shall be in accordance with ASTM F441. Neoprene gaskets with push-on joints shall conform to ASTM F477.

Schedule 80 CPVC socket type fittings shall conform to ASTM F439. Schedule 40 CPVC socket type fittings shall conform to ASTM F438. CPVC solvent weld cement for socket connections shall meet the requirements of ASTM F493. Schedule 80 CPVC threaded type fittings shall conform to ASTM F437.

2.04

2.04 PE PIPE

PE pipe shall meet the requirements of ASTM D1248, Type III, Grade 3, Class C, 100 psi or higher rated. Fittings shall be of the same material, socket-fusion connection, 125 psi or higher rated.

2.05 PP PIPE

PP pipe and fittings shall be formulated of polypropylene conforming to ASTM D2146, Type I, Schedule 40. Mechanical joint couplings shall be of the same material as the pipe using gaskets of high molecular weight polyethylene. Heat fusion welding shall be in conformance with ASTM D2657.

PART 3 - EXECUTION

3.01 GENERAL

PVC pipe 3 inches in diameter and less shall be joined by means of socket fittings and solvent welding in conformance with ASTM F402 unless otherwise specified. PVC pipe 4 inches in diameter and greater shall be joined by means of gasketed push-on joints unless otherwise specified.

Connections to different types of pipe shall be by means of specified adapters or transition fittings. Foreign material shall be removed from the pipe interior prior to assembly.

3.02 TESTING

Testing of plastic piping shall be as specified in Section 15055.

****END OF SECTION****

SECTION 15075

JOINT GASKETS

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies rubber gaskets for push-on compression type joints used with fabricated steel pipe, steel pipe, reinforced concrete pipe, and concrete cylinder pipe.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ASTM D395-78	Standard Test Methods for Rubber Property, Compression Set
ASTM D412-75	Standard Test Methods for Rubber Properties in Tension
ASTM D471-79	Standard Test Method for Rubber Property, Effect of Liquids
ASTM D573-78	Standard Test Method for Rubber, Deterioration in an Air Oven
ASTM D1149-78a	Standard Test Method for Rubber Deterioration, Surface Ozone Cracking in a Chamber (Flat Specimen)
ASTM D2240-75	Standard Test Method for Rubber Property, Durometer Hardness

1.03 INFORMATION TO BE PROVIDED

The Contractor shall provide the copies of the laboratory test reports specified in paragraph 2.03 B of this section.

PART 2 - PRODUCTS

2.01 MATERIALS

Gasket stock shall be a synthetic rubber compound in which the elastomer is neoprene. The compound shall contain no less than 50 percent by volume neoprene and shall be free from factice, reclaimed rubber and other deleterious substances.

2.02 PHYSICAL REQUIREMENTS

The compound shall meet the following physical requirements when tested in accordance with the specified ASTM standards.

A. TENSILE (ASTM D412):

The tensile strength shall be 1500 psi minimum and the ultimate elongation shall be 425 percent minimum.

B. HARDNESS (ASTM D2240, TYPE A DUROMETER):

1. INITIAL TEST: The compound shall have a minimum hardness of 45 ± 5 for pipe diameters less than 90 inches and 55 ± 5 for pipe diameters greater than 90 inches.

2. SUBSEQUENT TEST: After conducting the initial test, the test specimen and the durometer shall be conditioned at -10 degrees C for 48 hours and then shall be tested. The increase in hardness over the initial test value shall not exceed 15 points.

C. COMPRESSION SET (ASTM D395):

The compression set shall not exceed 20 percent when compressed for 22 hours at 70 degrees C.

The test specimens shall be circular discs cut from the gaskets. Test specimens shall be $0.500 (+ 0.005 - 0.025)$ inches in height. The diameter of the test specimen shall be that of the gasket but not to exceed 1.129 ± 0.010 inches in diameter.

D. AGING (ASTM D573):

The test specimen deterioration shall be less than 20 percent reduction in tensile strength, 40 percent reduction in ultimate elongation, and 15 points increase in hardness.

E. EFFECT OF LIQUIDS (ASTM D471):

The maximum volume change in oil and in water shall be as follows:

1. Oil: 100 percent in ASTM Oil No. 3.
2. Water: 15 percent.

The test specimens shall have a thickness of $0.080 + 0.005$ inches and shall be circular discs cut from the gasket.

2.02 F.

F. OZONE CRACKING (ASTM D1149):

The test specimen shall be a gasket loop mounted to give at least 20 percent elongation. There shall be no cracking visible at two times magnification of the gasket after 100 hours exposure to 1 mg/l ozone at 40 degrees C.

2.03 TESTING

The Contractor shall furnish certified copies of test reports indicating that the gasket material has been tested and that the results of the tests comply with the requirements specified.

PART 3 - EXECUTION

3.01 GENERAL

The gaskets shall be installed in accordance with the manufacturer's recommendations.

END OF SECTION

SECTION 15085

PIPING CONNECTIONS

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies the following methods of connecting metallic piping: flanges, threading, mechanical couplings, dielectric unions, welding and soldering.

1.02 REFERENCES

This section references the following documents. They are a part of this section insofar as specified and modified herein. In case of conflict between the requirements of this section and the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ANSI B1.1-74	Unified Screw Threads
ANSI B2.1-68	Pipe Threads (Except Dry Seal)
ANSI B16.1-75	Cast Iron Pipe Flanges and Flanged Fittings
ANSI B16.5-77	Steel Pipe Flanges and Flanged Fittings
ANSI B18.2.1-72	Square and Hex Bolts and Screws
ANSI B18.2.2-72	Square and Hex Nuts
ANSI B31.1-80	Power Piping
API Std 1104-77	Standard for Welding Pipelines and Related Facilities
ASTM B32-76	Solder Metal
AWWA C207-78	Standard for Steel Pipe Flanges for Water Works Service - Size 4 Inches Through 144 Inches

PART 2 - PRODUCTS

2.01 FLANGE ASSEMBLIES

A. FLANGES:

Cast iron flanges shall be faced in accordance with ANSI B16.1. Where companion flanges are used, the flanges on pipe shall be

2.01 A.

refaced to be flush with the companion flange face. Class 150 and Class 300 forged steel flanges shall be raised face conforming to ANSI B16.5. Lightweight slip-on flanges shall be plain face conforming to AWWA C207, Class B and ANSI B16.5. Unless otherwise specified, steel flanges shall be ANSI Class 150 or AWWA Class D. Plain faced flanges shall not be bolted to raised face flanges.

B. GASKETS:

Gaskets for plain faced flanges shall be the full face type. Thickness shall be 1/16 inch for pipe 10 inches and less in diameter and 1/8 inch for pipe 12 inches and larger in diameter. Gaskets for raised face flanges shall match the raised face and shall be 1/16 inch thick for pipe 3-1/2 inches and less in diameter and 1/8 inch thick for pipe 4 inches and larger.

Gaskets as designated in the PIPESPEC are specified as follows:

1. Neoprene, C.I.: neoprene with cloth insert.
2. TFE: noncreeping tetrafluoroethylene (TFE) with insert filler.
3. Asbestos: white compressed asbestos with styrene butadiene rubber binder.

C. BOLTS:

Flange assembly bolts shall be ANSI B18.2.1 standard square or hexagon head carbon steel machine bolts with ANSI B18.2.2 standard hot pressed hexagon nuts. Threads shall be ANSI B1.1, standard coarse thread series; bolts shall be Class 2A, nuts shall be Class 2B. Bolt length shall conform to ANSI B16.5. Flange assembly bolts and nuts for submerged or buried service shall be alloyed with approximately 1/2 percent copper, 1/2 percent nickel, and 1 percent chromium regardless of any other protective coating.

2.02 MECHANICAL COUPLINGS

A. SLEEVE-TYPE COUPLINGS:

Unless otherwise specified, sleeve-type mechanical pipe couplings shall be Smith-Blair Type 411, Dresser Style 38, or equal, with the stop removed from the middle ring. Reducing couplings shall be Smith-Blair Type 413, Dresser Style 62, or equal. Sleeve-type flanged coupling adapters shall be Smith-Blair Type 913, Dresser Style 128, or equal. Insulating couplings shall be Smith-Blair Type 416, Dresser Style 39, or equal.

B. PLAIN END COUPLINGS:

Plain end pipe couplings shall be Gustin-Bacon 205, Victaulic Style 90, or equal.

2.02 C.

C. GROOVED END COUPLINGS:

Grooved end flexible-type couplings shall be Gustin-Bacon 100, Victallic 77, or equal. Grooved end flanged coupling adapters shall be either Gustin-Bacon 154, Victaulic Style 741, or equal. Snap-joint grooved end couplings shall be Gustin-Bacon 115, Victaulic Style 78, or equal.

2.03 THREAD

Pipe thread dimensions and size limits shall conform to ANSI B2.1.

2.04 DIELECTRIC UNIONS

Dielectric unions shall be EPCO, Capital, or equal.

PART 3 - EXECUTION

3.01 PIPE CUTTING, THREADING AND JOINTING

Pipe cutting, threading and jointing shall conform to the requirements of ANSI B31.1.

3.02 PIPE WELDING

Pipe shall be welded by ASME-certified welders using shielded metal arc, gas shielded arc or submerged arc welding methods. Each welder's certificate shall be provided to the Construction Manager prior to that welder working on the job. Welds shall be made as specified in accordance with the requirements of ASME Boiler Code (Class I) and API 1104.

3.03 TAKEDOWN COUPLINGS

Takedown couplings shall be screw unions, flanged or grooved end mechanical coupling type joints and shall be provided as specified. Flanged or grooved end joints shall be employed on pipelines 2-1/2 inches in diameter and larger. Where piping passes through walls, takedown couplings shall be provided within 3 feet of the wall, unless specified otherwise.

A union or flanged connection shall be provided within 2 feet of each threaded end valve unless the valve can be otherwise easily removed from the piping.

3.04 FLEXIBILITY

Unless otherwise specified, piping 2 inches in diameter and larger passing from concrete to earth shall be provided with pipe couplings or flexible joints as specified within 3 feet of the

3.04

structure. Steel and ductile iron pipe shall be provided with one such coupling or joint; other pipe shall be provided with two such couplings or joints. Where required for resistance to pressure, mechanical couplings shall be restrained in accordance with AWWA M11, Figures 19.15 and 19.16, and Tables 19.7 and 19.8.

3.05 DIELECTRIC CONNECTIONS:

Where a copper pipe is connected to steel or cast iron pipe, an insulating section of rubber or plastic pipe shall be provided. The insulating section shall have a minimum length of 12 pipe diameters. Dielectric unions as specified in paragraph 2.04 may be used instead of the specified insulating sections. Where copper pipe is supported from hangers, it shall be insulated from the hangers, or copper-plated hangers shall be used.

3.06 SOLDER JOINTS

Solder to be used in copper piping shall be ASTM B32, Alloy 50 B.

****END OF SECTION****

SECTION 15112

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section provides specifications for backflow preventers suitable for use with potable water systems.

B. TYPE:

Backflow preventers furnished under this specification shall be of the reduced pressure principle type designed to provide atmospheric relief upon loss of adequate pressure differential.

C. EQUIPMENT LIST:

Backflow preventers shall be as follows:

<u>Equipment No.</u>	<u>Connection size, in.</u>	<u>Capacity, gpm</u>	<u>Max pressure loss, psi</u>
MME640	4	500	14
MME641	3/4	30	20

1.02 QUALITY ASSURANCE

A. PERFORMANCE AND SERVICE CONDITIONS:

Equipment and devices furnished under this specification shall be suitable for continuous operation with the fluids and pressures described in Section 15050, Piping System Specification Sheets.

B. DESIGN REQUIREMENTS:

Reduced pressure principle backflow preventers shall function to provide complete atmospheric relief of a zone between the device's inlet and outlet connections whenever the difference in pressure between the inlet and outlet connections falls to 2 psi or less or when the supply pressure is at or below atmospheric pressure. Reverse flow prevention devices shall seal both inlet and outlet connections and a relief valve shall vent the zone between the two connections to atmosphere.

C. TESTING:

Backflow preventers furnished under this specification shall have qualified, by actual test of the size furnished, under the

1.02 C.

provisions of AWWA C506. Testing shall be by the Foundation for Cross-Connection Control Research, University of Southern California and shall encompass the complete sequence of testing and evaluation required by the referenced standard.

1.03 SUBMITTALS

Submittal information to be furnished to the Engineer for review shall be in accordance with paragraph 1.03 of Section 11000 and shall include all but items 6, 7, 9 and 12 required by that paragraph. Submittals shall also include tools' price list from manufacturers.

1.04 INFORMATION TO BE PROVIDED

Information to be furnished to the Engineer shall include Certificates full or Approval under AWWA C506 from the Foundation for Cross-Connection Control Research, University of Southern California.

PART 2 - PRODUCTS

2.01 MATERIALS

Materials shall conform to the requirements of AWWA C506.

2.02 EQUIPMENT

The backflow preventer shall be comprised of five distinct mechanisms: isolating gate valves at the inlet and outlet of the device, two spring loaded independently operated check valves, and a spring assisted diaphragm operated relief valve interposed between the two check valves.

The design of the device shall include features which insure that an atmospheric separation is provided between the supply connection and any back leakage through the outlet check valve. Sensing systems shall be provided to open the relief valve whenever the pressure at the supply connection approaches outlet pressure or when supply pressure is at or below atmospheric pressure. Test cocks shall be provided to facilitate field testing.

2.03 SPECIAL TOOLS

All special tools and test kits shall be included for maintenance of equipment.

****END OF SECTION****

SECTION 15186
FIRE HOSES AND CABINETS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section includes specifications for fire hoses with nozzle, valve, hose rack and hose housing,

B. TYPE:

Hoses shall be suitable for water service, as shown.

1.02 QUALITY ASSURANCE

Hoses shall be pressure rated for a minimum working pressure of 300 psig.

PART 2 - PRODUCTS

2.01 MATERIALS

<u>Component</u>	<u>Material</u>
Angle valve, 1-1/2 inch	Cast brass
Escutcheon plate, 1-1/2-inch	Steel
Hose rack, 1-1/2 inch	Enamel steel
Rack nipple, 1-1/2 inch	Cast brass
Fog nozzle, 1-1/2 inch	Cast brass
Rack hose with couplings, 1-1/2 inch	Linen hose with cast brass coupling
Hose housing	Galvanized 16-gage steel

Hose rack units shall be Larsen Model No. 1.5-100 RSSF, or equal. Hose housing shall be Larsen Outside Hose House, Model 15-58 with 18-inch legs.

2.02 CONSTRUCTION

Hoses shall remain flexible under all conditions.

Hoses to be furnished include the following:

2 - 100-foot lengths 1-1/2-inch linen hose

2.02

Hose housing shall be galvanized. Doors shall be double reinforced with continuous hinges. Louvers for ventilation shall be provided at both ends.

PART 3 - EXECUTION

Hose units and housing shall be located as shown on the drawings. Unit located at building shall be anchored to the building. Housing shall be modified as required to accommodate the hose rack units specified above.

END OF SECTION

SECTION 15200

INSULATION FOR EXPOSED PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies insulation for exposed piping and equipment, which consists of insulating material, jackets, covers, and flashing. Surfaces to be insulated include piping and related equipment and appurtenances.

B. TEMPERATURE CLASSES:

Insulation for exposed piping and equipment is classified for the following temperature ranges: low, medium, and high.

Low temperature class insulation shall be suitable for an operating temperature range of minus 100 to plus 100 degrees F.

Medium temperature class insulation shall be suitable for an operating temperature range of 100 to 800 degrees F.

High temperature class insulation shall be suitable for an operating temperature range of 800 to 1200 degrees F.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ASTM B209-80	Aluminum-Alloy Sheet and Plate
ASTM C552-79	Cellular Glass Block and Pipe Thermal Insulation
ASTM D781-68	Puncture and Stiffness of Paperboard, and Corrugated and Solid Fiberboard
ASTM E96-80	Water Vapor Transmission of Materials
FEDSPEC HH-I-523C (1966)	Thermal Insulation Block and Pipe Covering

1.02

<u>Reference (cont'd)</u>	<u>Title</u>
FEDSPEC HH-I-558B Int. Amendment 2 (1973)	Thermal Insulation, Blocks, Boards, Blankets, Felts, Sleeving and Pipe Fitting Covering
FEDSPEC HH-I-573b (1968)	Thermal Insulation

1.03 INFORMATION TO BE PROVIDED

The following information shall be provided:

1. Manufacturer and manufacturer's type designation.
2. Samples, for each insulation material type, of typical jacket and closures for fittings, valves and appurtenances.
3. Descriptive literature and catalog data for materials to be used showing methods of installation.
4. Certification of ratings for water vapor transmission and puncture and stiffness.

PART 2 - PRODUCTS

2.01 GENERAL

Piping insulation shall be tubular. Equipment insulation shall be cut to fit the surface.

2.02 INSULATION

A. GENERAL:

Low temperature class insulation shall be of the unicellular elastomeric thermal, cellular glass, or fiberglass type.

Medium temperature class insulation shall be of the cellular glass or fiberglass type.

High temperature class insulation shall be of the calcium silicate type.

B. UNICELLULAR ELASTOMERIC THERMAL TYPE:

Unicellular elastomeric thermal type insulation shall conform to the requirements of FEDSPEC HH-I-573, Class T.

2.02 C.

C. CELLULAR GLASS TYPE:

Cellular glass type insulation shall conform to the requirements of ASTM C552, Type II.

D. FIBERGLASS TYPE:

Fiberglass type insulation shall conform to the requirements of FEDSPEC HH-I-558.

E. CALCIUM SILICATE TYPE:

Calcium silicate type insulation shall conform to the requirements of FEDSPEC HH-I-523, Type II, Class C.

2.03 PIPE AND EQUIPMENT JACKETS

A. LAMINATED JACKETS:

Laminated jackets shall consist of aluminum and white kraft paper. Jackets shall have a perm rating for water vapor transmission of not more than 0.02 in accordance with procedure A of ASTM E96. Jackets shall have a minimum puncture and stiffness rating of 50 beach puncture units as tested by ASTM D781.

B. ALUMINUM JACKETS:

Aluminum jackets shall be constructed of smooth finish aluminum sheet conforming to ASTM B209, alloy 5005, temper H16, with integral vapor barrier.

Jackets shall be 0.016 inch thick.

Sheet metal screws shall be aluminum or stainless steel.

Jackets shall be secured with 0.020 by 3/4 inch type 304 stainless steel expansion bands.

2.04 FITTING AND VALVE COVERS

A. RIGID COVERS:

Rigid covers shall be one piece, premolded covers of polyvinylchloride.

B. ALUMINUM COVERS:

Aluminum covers shall be constructed of smooth finish aluminum conforming to ASTM B209, alloy 5005, temper H16, with integral vapor barrier. Covers shall be 0.016 inch thick.

2.04 C.

C. SOFT COVERS:

Soft covers shall be of the reusable type with TFE-coated fiberglass covers and liner.

2.05 SHIELDS

Shields shall be 16-gage galvanized steel sheet, 9 inches long and formed into a half cylinder.

2.06 FLASHING

Flashing shall include aluminum caps, sealant and reinforcing. Aluminum caps shall be 20 gage thick and shall be cut to completely cover the insulation. Sealants shall be as recommended by the insulation manufacturer.

Reinforcement in flashing heated up to 370 degrees F shall be nylon fabric. Reinforcement in flashing for hotter surfaces shall be wire mesh or as recommended by the insulation manufacturer.

PART 3 - EXECUTION

3.01 GENERAL

A. APPLICATION:

Insulation shall be applied over clean, dry surfaces. Double layer insulation, where specified, shall be provided with staggered section joints.

B. PIPE SUPPORTS:

Hangers, anchors, pipe guides and other support elements shall interrupt jackets, covers, and insulation except for chilled water supply or return (CWS, CWR) piping.

3.02 PIPING INSULATION

A. GENERAL:

1. PIPE: Insulation shall be butted firmly together and jacket laps and joint strips provided with lap adhesive.

Pipe shall be provided with the laminated jackets specified in paragraph 2.03 A. Jackets shall be provided with their seams located on the underside of pipe.

2. FITTINGS AND VALVES: Insulation shall be secured in place with 20-gage wire and a coat of insulating cement.

3.02 A.2.

Fittings and valves shall be provided with the rigid covers specified in paragraph 2.04 A. Covers shall overlap the adjoining pipe insulation and jackets. Covers shall be provided with their seams located on the underside of fittings and valves.

B. LOW TEMPERATURE CLASS:

1. PIPE: Insulation shall have ends sealed off with a vapor barrier coating.

2. FITTINGS AND VALVES: Insulation shall have rigid covers sealed at edges with vapor barrier adhesive. The ends of covers shall be secured with vinyl tape. The tape shall overlap the jacket and the cover at least 1 inch. Vapor barrier shall not be penetrated.

C. MEDIUM- AND HIGH-TEMPERATURE CLASS:

1. PIPE: Insulation shall have ends sealed with end joint strips and held in place by waterproof adhesive.

2. FITTINGS AND VALVES: Insulation shall have rigid covers mechanically secured by stainless steel tacks pushed into the overlapping throat joint.

D. OUTDOOR PIPING:

1. PIPE: Insulation shall be provided with the aluminum jackets specified in paragraph 2.03 B.

2. FITTINGS AND VALVES: Insulation shall be provided with the aluminum covers specified in paragraph 2.04 B.

3.03 MECHANICAL EQUIPMENT INSULATION

A. GENERAL:

Insulation shall fit the contours of equipment and shall be provided with 1/2 by 0.015 inch galvanized steel bands. Weld pins or stick clips with washers may be used for flat surfaces and spaced a maximum 18 inches apart. Joints shall be staggered and voids filled with insulating cement. Insulation shall be provided with the laminated jackets specified in paragraph 2.03 A.

B. LOW TEMPERATURE CLASS:

Insulation shall have joints, breaks, and punctures sealed in facing with fire-retardant vapor barrier adhesive reinforced with 4-inch tape.

3.03 B.

Insulation shall be provided with a layer of open-weave glass cloth embedded into a wet coat of fire-retardant adhesive. Seams shall overlap at least 2 inches. A finish coat of fire-retardant adhesive shall be provided.

C. MEDIUM- AND HIGH-TEMPERATURE CLASS:

Joints shall be covered and cemented in place with 4-inch-wide strips of the same material as the laminated jackets specified in paragraph 2.03 A.

D. OUTDOOR EQUIPMENT:

Insulation shall be provided with a coat of weatherproof mastic and a layer of open-weave glass cloth embedded into a wet tack coat. Seams shall overlap at least 2 inches. A finish coat of weatherproof mastic shall be provided. The total coating thickness shall be a minimum of 1/8 inch.

3.04 SHIELDS

Metal shields shall be provided at pipe supports. Inside face of each shield shall be coated with insulation adhesive to prevent movement. Additional support shall be provided at each shield as specified on the drawing details.

3.05 FLASHING

Flashing shall be provided at jacket penetrations and terminations. Clearance for flashing shall be provided between insulation system and piping supports.

A heavy tack coat of sealant shall be troweled over the insulation, extending over the jacket edge 1 inch and over the pipe or protrusion 2 inches. Reinforcement shall be stretched over the tack coat after clipping to fit over pipe and jacket. Clipped reinforcing shall be strapped with a continuous band of reinforcing to prevent curling. Sealant shall then be troweled over the reinforcement to a minimum thickness of 1/8 inch.

Aluminum caps shall be formed to fit over the adjacent jacketing and to completely cover coated insulation. Cap shall be held in place with a jacket strap.

3.06 INSULATION THICKNESS SCHEDULE

The insulation dimensional tolerances shall comply with the specified standards. The minimum insulation thicknesses, exclusive of jacket, shall be as follows:

3.06

<u>Piping system types</u>	Fluid tempera- ture range, degrees F	Runouts up to 2 inches	Insulation thickness for for nominal pipe sizes, inches				
			1 inch and less	1.25-2	2.50-4	5,6	8 inch and larger
Cooling Systems:							
Refrigerant	Below 40	1.0	1.0	1.5	1.5	1.5	1.5
Plumbing Systems:							
Hot water	100-150	0.5	0.75	1.0	1.0	1.0	1.5

END OF SECTION

SECTION 15400

PLUMBING

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies drains, piping, appurtenances and general requirements for plumbing systems.

1.02 QUALITY ASSURANCE

A. WORK:

Work shall be in accordance with the Uniform Plumbing Code.

B. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
UPC (1979)	Uniform Plumbing Code

1.03 INFORMATION TO BE PROVIDED

Brochures of plumbing equipment, including catalog data and installation information, shall be provided.

1.04 PERMITS AND INSPECTIONS

The Contractor shall secure and pay for permits for plumbing work. The Contractor shall arrange and pay for inspections required and shall deliver inspection certificates to the Construction Manager.

PART 2 - PRODUCTS

2.01 CLEANOUTS

A. GENERAL:

Cleanouts located inside buildings shall be provided with polished bronze covers. Bronze plug with tapered thread shall be provided for cleanouts on pressurized systems.

2.01 B.

B. TYPE II CLEANOUT:

Type II cleanouts shall be Josam series 56010(-12), J. R. Smith series 4140, or equal.

C. TYPE III CLEANOUT:

Type III cleanouts shall be Josam series 58500 (-20), J. R. Smith series 4405, or equal, with cast iron frame and cover as specified on the drawing details.

D. TYPE V CLEANOUT:

Type V cleanouts shall be Josam series 53890, J. R. Smith series 4472, or equal.

2.02 DRAINS

A. FLOOR DRAINS:

Floor drains shall be provided with clamping collars as specified in paragraph 3.03. Type I drains shall be Josam series 32130, J. R. Smith series 2225, or equal. Type II, III, and IV drains shall be Josam series 32120, J. R. Smith series 2220, or equal.

B. CONDENSATE DRAINS:

Condensate drains shall be polyvinylchloride (PVC), ASTM D1785, Schedule 40, with fittings and joints as specified for 1W water piping in Section 15050.

2.03 VALVE ACCESSORIES

A. ACCESS COVERS:

Access covers shall be 12 inch by 12 inch minimum, stainless steel, J. R. Smith series 4762 or 4767, Karp 214-M or 214-P, or equal. Two keys or wrenches shall be provided for each type of key-operated valve.

B. ADJUSTABLE SHAFT VALVE BOXES:

Adjustable shaft valve boxes shall be Brooks No. 3 RT, Christie G5, or equal.

2.04 COUPLINGS, NIPPLES AND UNIONS

A. COUPLINGS:

Couplings shall be of the same material as the pipe on which they are used.

2.04 B.

B. NIPPLES:

Nipples shall be the same material as pipe.

C. UNIONS:

Unions 2 inches and smaller shall be ground joint screwed pattern unions. Unions larger than 2 inches shall be flanged. Unions shall be packed with 1/16-inch thick rubber packing.

2.05 HOSE BIBBS

Hose bibbs shall be Acorn No. 8126, Chicago 387-LF, or equal.

2.06 WATER HAMMER ARRESTERS

Water hammer arresters shall be Josam, J. R. Smith, Wade, or equal.

2.07 SLEEVES AND ESCUTCHEONS

A. SLEEVES:

Sleeves shall be 22-gage sheet metal.

B. ESCUTCHEONS:

Escutcheons shall be chrome-plated cold rolled steel or stainless steel.

PART 3 - EXECUTION

3.01 GENERAL

Plumbing shall be provided to avoid obstructions, allow 7 feet, 6 inches minimum headroom, and keep openings and passageways clear.

No holes shall be made in structural members.

Torn and pierced waterproofing shall be repaired.

Fixtures, fittings, valves, and copper and brass items shall be wrapped with burlap or building paper. Wrapping shall be removed at completion of the work.

3.02 CLEANOUTS

Cleanouts on chemical waste or drain lines shall be of the same material and type of joint as the pipe.

3.03 DRAINS

Floor and shower drains shall be provided with clamping collars where waterproofing membranes are located in floors.

3.04 VALVES AND ACCESSORIES

A. VALVES:

Valves shall be provided upstream of branches, apparatus and fixtures.

Valves on branch lines and at distribution points shall be provided with a 2-inch heavy brass disc, stamped and stenciled with 1/4-inch high letters, stating portion of system controlled by valve. Valves shall be located on record drawings. The Contractor shall provide a chart of location and use of main valves.

B. ACCESS COVERS:

Access covers for concealed valves shall be 316 stainless steel.

C. ADJUSTABLE SHAFT VALVE BOXES:

Adjustable shaft valve boxes shall be provided for underground valves. Box covers on waterlines shall be impressed with the letter "W." Gas line covers shall be impressed with the letter "G."

3.05 COUPLINGS, NIPPLES AND UNIONS

Dielectric bushings shall be provided at connections between pipe or fittings of different materials.

3.06 ESCUTCHEONS

Escutcheons shall be provided where pipes penetrate finished walls, ceilings or floors. Escutcheons shall be securely mounted allowing clearance for expansion.

3.07 PIPING

Piping shall be carried in chases or recesses where provided in walls, through floors and partitions, and over ceilings. Unless otherwise specified, piping shall not be run in floor slabs.

Pipes shall not be supported by plumbing fixtures or equipment. Changes in pipe size shall be made with reducing fittings. The use of bushings is not acceptable.

3.07

Where galvanized steel pipe is calked into a cast iron hub, a soil pipe adapter shall be provided on the calked end of the steel pipe.

Unless specified otherwise, underground piping outside buildings shall have a minimum cover of 24 inches. Piping under buildings shall have a minimum clearance from structure of 12 inches.

Hot and cold water piping shall be separated by at least 6 inches.

3.08 CLEANING AND FLUSHING

Piping and equipment shall be cleaned and flushed in accordance with paragraph 3.05 of Section 15055.

****END OF SECTION****

SECTION 15405

PLUMBING FIXTURES

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies plumbing fixtures, trim and fittings.

1.02 QUALITY ASSURANCE

A. WORK:

Work shall be in accordance with the Uniform Plumbing Code.

B. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
UPC (1979)	Uniform Plumbing Code

1.03 INFORMATION TO BE PROVIDED

Manufacturer's catalog data shall be provided.

PART 2 - PRODUCTS

2.01 LAVATORIES

A. COUNTER TOP MOUNTED:

Counter top mounted lavatories shall be vitreous china type, 19 inch diameter, with fitting ledge, front overflow, and 4-inch fitting openings. Lavatories shall be American Standard 0491.019, Kohler K-2201, or equal. Trim shall be American Standard 2103.828, Kohler K-7401-TL-2GM, or equal.

Lavatories shall be provided with chrome-plated strainer, tail piece, and tubular brass P-trap with flange.

2.01 B.

B. WALL MOUNTED:

Wall mounted lavatories shall be vitreous china type, 20 inch x 18 inch, with front overflow and 4-inch faucet opening. Lavatories shall be American Standard 0124.024, Kohler K-1746, or equal. Trim shall be American Standard 2103.828, Kohler K-7401-TL-2GM, or equal.

Lavatories shall be provided with chrome-plated strainer, tail piece and tubular brass P-trap with flange.

2.02 SERVICE SINKS

Service sinks shall be acid resisting enameled cast iron, black with rim guard, 22 inch x 18 inch, and shall be wall hanger type. Sinks shall be American Standard 7692.023 with 8379.018 rim guard, Kohler K-6718, or equal. Trim shall be American Standard 8340.234, Kohler K-8907, or equal. Sinks shall be provided with chrome-plated strainer, wall mountings, and floor trap.

2.03 TOILETS

Toilets shall be off-the-floor, elongated, siphon jet action, bowl type of vitreous china with 1-1/2-inch top spud. Toilets shall be American Standard 2477.016, Kohler K-4430ET, or equal. Toilets shall be provided with flush valves and seats. Seats shall be white Kohler K-4670C, American Standard 5321.112, or equal. Flush valves shall be Delany 402-AVB, Sloan Royal 110-FYV, or equal.

2.04 URINALS

Urinals shall be vitreous china, wall-hung blowout type with flushing rim, 1-1/4-inch top spud, and 2-inch outlet. Urinals shall be American Standard 6570.014, Kohler K-5007T, or equal. Urinals shall be provided with flush valves and support brackets. Flush valves shall be Delany 452-HVB, Sloan Royal 180, or equal.

2.05 SHOWER FITTINGS

Shower fittings shall be American Standard 1204.437, Kohler K-7226-T with K-7371 shower head, or equal.

2.06 WATER FOUNTAINS

Water fountain shall be Halsey Taylor Model 10200, or equal.

2.07 HOT WATER HEATERS

Hot water heater shall be electric compact unit suitable for installation in a limited space. Unit shall have a capacity of 30 gallons. Unit shall be Rheemglas Standard Closet model, or equal.

3.01

PART 3 - EXECUTION

3.01 GENERAL

Fixtures shall be provided plumb and level.

Fixtures shall remain in manufacturer's packaging until installation.

Fixtures shall be provided with required holes. Unoccupied fixture faucet holes are not acceptable. Exposed fixture setting bolts shall be fitted with china caps.

Fixtures shall be supported in accordance with manufacturer's recommendations. Wall mounted fixtures shall be provided with brackets and anchorage. Drop-eared fittings shall be provided at fixture outlets and securely fastened to backing.

Openings into pipes shall be capped during construction.

Vitreous finished surfaces shall have heavy paper pasted thereon during construction.

****END OF SECTION****

SECTION 15500

FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies fire extinguishers and cabinets.

B. TYPE:

Fire extinguishers shall be of the multipurpose dry chemical type.

1.02 QUALITY ASSURANCE

A. PERFORMANCE AND DESIGN REQUIREMENTS:

1. GENERAL: The fire extinguisher system shall meet the requirements of fire regulatory agencies whose jurisdiction governs this project.

2. EQUIPMENT REQUIREMENTS:

<u>Type</u>	<u>Number</u>
Multipurpose dry chemical	1

B. STANDARDS:

The multipurpose dry chemical fire extinguishers shall be UL and ULC rated at 2A-10-B:C.

All fire extinguishers shall comply with Underwriters Laboratory Standard 299, shall bear Factory Mutual Certification Underwriters Laboratories Certification, and shall be listed by the state fire marshall.

Distribution and installation of all fire extinguishers shall be in conformance with NFPA No. 10, Standard of the Installation of Portable Fire Extinguishers.

1.03 INFORMATION TO BE PROVIDED

The Contractor shall submit to the Construction Manager verification from the County Fire Department, Fire Prevention Bureau, that installation of the extinguishers is satisfactory.

1.04

1.04 SUBMITTALS

Submittals will be required only in the event the Contractor wishes to take exception to these provisions or wishes to propose a substitute.

PART 2 - PRODUCTS

(NOT APPLICABLE)

PART 3 - EXECUTION

3.01 INSTALLATION

The fire extinguishers shall be installed as shown on the drawings, or described in this section.

END OF SECTION

SECTION 15705

AIR TO AIR HEAT PUMP

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies a matched split system air to air heat pump suitable for supplying treated air to a building.

B. TYPE:

Self-contained heat pump system shall comprise an outdoor unit containing compressor, outdoor coil, outdoor coil fan, expansion valve, receiving valve, and an indoor unit mounted horizontally in the roof space containing supply air fan, indoor coil, supplementary electric heating coil and filter. A room thermostat shall also be provided. Each unit shall be preassembled at the factory. Unit shall be Lennox HP10-261V plus CBP 13-480FF, or equal.

C. EQUIPMENT:

<u>Item</u>	<u>Equipment No.</u>
Building air supply heat pump	HP390
Supply fan	F390A
Air filter	AF390
Compressor	CPR390
Evaporator coil	EPR390
Condenser coil	CDR390
Condenser fan	F390B
Electric heating coil	HC390

1.02 QUALITY ASSURANCE

A. GENERAL:

The heat pump shall be UL listed and ARI tested. The complete matched system shall be supplied by a company generally engaged in the manufacture of heat pumps.

Power supply to the unit will be 208 volts only.

1.02 B.

B. OPERATING REQUIREMENTS:

The package unit shall be designed to comply with the following:

Air flow rate, scfm	850
External static pressure, inches W.C.	1/2
Fan motor horsepower	1/4
Refrigerant compressors, number	1
Motor size, maximum HP	5
Cooling capacity	
Total cooling capacity, Btuh	24,000
Outside air design temperature, degrees F	98
Temperature air entering evaporator coil, dry bulb, degrees F	92
Temperature air entering evaporator coil, wet bulb, degrees F	68
EER minimum, Btu/watt	8.0
Heating capacity	
Heating capacity without supplemental	18,000
Outside air design temperature, degrees F	30
Heating capacity of backup electric heat, Btuh	13,000

1.03 ENVIRONMENTAL CONDITIONS

Equipment supplied under this section will be located at Sacramento, California. Compressor unit will be located outdoors where temperature is expected to range between 20 and 120 degrees F and relative humidity between 10 and 90 percent. Fan unit will be located indoors where temperature is expected to range from 35 to 101 degrees F and relative humidity between 10 and 90 percent.

1.04 SUBMITTALS

Submittals shall comply with the requirements of Section 11000 and shall include the following:

1. The motor data required under Section 11060.
2. Cooling and heating performance at design conditions.
3. Certification that the units have been tested and rated in accordance with the applicable ARI Test Procedure and that they meet the required appliance efficiency standards.

1.05 INFORMATION TO BE PROVIDED

Before final acceptance of work, the Contractor shall provide the following:

1.05

1. Operations and maintenance data in accordance with Section 01730.
2. Maintenance manuals in accordance with Section 01730.
3. List of recommended spare parts.

PART 2 - PRODUCTS

2.01 MATERIALS

<u>Component</u>	<u>Material</u>
Cabinet	Galvanized steel
Coil tubes	Copper
Coil fins	Aluminum
Refrigerant piping	Copper

2.02 CONSTRUCTION

A. ENCLOSURE:

The chassis shall be in rigid angle iron frame construction with galvanized steel panel enclosure. The panels shall be removable for access to components requiring services or replacement. The panels shall be internally insulated with minimum 1-1/2-pound density, 1-inch thick fiberglass insulation. The enclosure shall have standard epoxy type lacquer finish or baked enamel finish. The enclosure frame for the outside unit shall be provided with facilities for anchoring the unit to the concrete mounting pad. The enclosure for the inside unit shall be equipped for floor mounting with factory-supplied spring type vibration isolators. Both inside and outside units shall be provided with condensate drainage pans.

B. SUPPLY FAN:

The supply fan shall be of centrifugal design with a direct driven, permanently lubricated standard motor. The fan assembly shall be independently mounted and vibration isolated from the enclosure.

C. COMPRESSOR:

The compressor shall be of hermetic design, independently mounted and vibration isolated from the enclosure.

2.02 D.

D. COILS:

The evaporator shall be aluminum fin, copper tube construction with a galvanized coil casing manufactured from not less than 16-gage steel. The coil shall be tested for a minimum working pressure of 250 psig.

E. CONTROLS:

Control wiring and control components shall be furnished for a complete automatic system. The controls shall be mounted in a steel control cabinet enclosure integral with the unit and with an access panel. The wiring shall meet all local and state electrical and safety codes and shall include safety devices which will stop the heat pump in case of high or low refrigerant pressure. The unit shall be provided with an automatic defrost control. The units shall be provided with wiring and control components including room thermostat (TST390) to facilitate the following control sequence:

Fans shall be provided with a 7-day adjustable time clock suitable for starting and stopping the fan at the beginning and end of each week day. The compressor shall be controlled by the room thermostat for both heating and cooling modes. The control system shall provide for automatic changeover from cooling to heating or heating to cooling.

F. FILTER:

The unit shall be provided with a filter cabinet and in-line filter mounted in the outside air intake directly downstream of the louver. Filter shall be as specified in Section 15880.

PART 3 - EXECUTION

3.01 INSTALLATION

The heat pump shall be installed in accordance with the manufacturer's instructions.

END OF SECTION

SECTION 15800

HEATING, VENTILATING AND AIR CONDITIONING
SYSTEMS BALANCING

PART 1 - GENERAL

1.01 SCOPE

This section specifies the labor and services necessary to test and adjust under actual operating conditions all air moving systems, including related heating and cooling subsystems.

1.02 QUALITY ASSURANCE

A. RESPONSIBILITY:

The Contractor shall procure the services of an independent air balance and testing agency belonging to the Associated Air Balance Council (AABC) to perform air balancing, testing and adjustment of building and process air conditioning, heating and ventilating air systems. The Contractor shall submit a copy of the National Project Certification Performance Guaranty issued to the testing agency by the AABC as a part of the report specified in paragraph 1.03 B.3. Nothing herein shall be construed as relieving the Contractor of his overall responsibility for this portion of the work.

B. GENERAL:

Tests and adjustments shall include the complete testing of all heating ventilating and air conditioning systems and necessary adjustments to the volume and control functions of the air conditioning, heating and ventilating equipment to accomplish the design objectives shown and specified. The work shall include the balance of building and process air systems and verification of performance of automatic controls.

Effort has been made to show dampers and other equipment as required to balance the air systems. Contractor shall furnish and install, upon authorization by the Construction Manager, any additional such items required to satisfactorily balance the systems. The cost of additional equipment, including installation, will be borne by the Owner.

Where required, and authorized by the Construction Manager, fans shall be provided with larger or smaller sheaves by the Contractor, to drive the fans at speeds necessary to produce the indicated volumes. The cost of installing new sheaves will be borne by the Owner.

C. BALANCING:

1. GENERAL: Characteristics to be tested and adjusted to conform to values shown and specified include the following:

- a. Total air flow rates delivered by fans and air handling units.
- b. Flow rates at all hoods, grilles, registers, diffusers, supply, and exhaust and return ducts.
- c. Distribution patterns at air terminal outlets.
- d. Fluid quantities and temperatures of each heating and cooling system.

2. AIR FLOW RATE MEASUREMENTS: All flow rates shall be measured with supply, return, and exhaust systems operating, with heating and cooling coils wet, with filter bank resistance midway between the design values specified for clean and dirty filters, with all auxiliary systems in operation and with all doors and windows closed or under regular traffic.

Flow rate measurements for the plant odor reduction facilities shall be performed in compliance with criteria stated in the preceding paragraph and, in addition, shall be performed with the odor reduction towers, demisters, activated carbon beds and ORT transfer fans in operation and with covers gasketed and tightly bolted down and slide gate dampers installed in all channels utilized for air conveyance.

Total air flow rates shall be tested in strict accordance with the latest edition of the ASHRAE Standard, "Method of Testing for Rating Unit Ventilators." Flow rates at hoods, grilles, registers, branch ductwork and air distribution patterns shall be tested in strict accordance with the latest edition of the ASHRAE Standard, "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets."

3. ADJUSTMENTS: In all cases, air flow rates supplied, exhausted or returned shall be within plus or minus 5 percent of the design values shown and specified. Air flow rates shall be obtained by adjustment of the fan speeds, dampers or registers.

The deflection pattern of all supply outlets shall be adjusted to insure proper and uniform air distribution throughout the area served by such outlets.

Damper positions shall be permanently marked after air balance is complete so that they can be restored to their correct position if disturbed at any time.

1.02 C.3.

Automatic control systems shall be adjusted for normal operating conditions.

Should any piece of apparatus, material or work fail to meet the specified requirements in these tests, the Contractor shall make the necessary corrections and retest the apparatus, material or work at no additional cost to the Owner.

D. STANDARDS:

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. - ASHRAE Standards.

1.03 INFORMATION

Before final acceptance of the work, the Contractor shall provide the Construction Manager with records of each component adjustment within an HVAC system required to achieve the design requirements shown and specified. These records shall also include air flow rates measured after the adjustment was completed. The records shall be certified under penalty of perjury by an officer of the testing agency.

END OF SECTION

SECTION 15803

RADIANT HEATER

PART 1 - GENERAL

A. SCOPE:

This section specifies radiant heaters for comfort heating in the shop area.

B. TYPE:

Radiant heaters shall be electric powered infrared type. Heaters shall be Cromaflox RAD 5253 Aitkens IPH, OM or equal.

<u>Item</u>	<u>Equipment No.</u>
Shop radiant heater 1	HTR591
Shop radiant heater 2	HTR592

1.02 QUALITY ASSURANCE

A. PERFORMANCE AND DESIGN REQUIREMENTS:

Radiant heaters are for intermittent comfort heating service. Heating units shall be roof mounted and be directionally adjustable. Each unit shall be UL listed.

B. OPERATING REQUIREMENTS:

Radiant heaters shall be designed to comply with the following:

<u>Equipment number</u>	<u>Voltage</u>	<u>Wattage, kW</u>	<u>Heating Btu/hr</u>
HTR591	208	2.5	8000
HTR592	208	2.5	8000

1.03 SUBMITTALS

Submittals shall be limited to instances where the Contractor wishes to take exception to this specification.

1.04 INFORMATION TO BE PROVIDED

The manufacturer's standard operation, maintenance and installation information shall be provided.

2.01

PART 2 - PRODUCTS

2.01 MATERIALS

Radiant heaters shall have incoloy sheathed electric elements and polished aluminum reflectors. Heater frame and mounting bracket shall be sheet steel.

2.02 CONSTRUCTION

Radiant heater shall be designed for overhead mounting in an open air area. The direction of heat radiation shall be adjustable along its horizontal axis.

The unit shall be controlled by a local on-off switch with an adjustable timed cutout.

PART 3 - EXECUTION

3.01 INSTALLATION

Heaters shall be installed in accordance with manufacturer's instructions.

END OF SECTION

SECTION 15821

FILTERED AIR WALL SUPPLY FANS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies filtered, wall mounted supply fans including fans, motors, dampers, housing, filters and accessories required for complete installations.

B. TYPE:

Fans specified under this section shall be propeller, frame mounted, draw through, supply fans. Fans shall be Buffalo Forge Filter Vents, or equal.

C. EQUIPMENT LIST:

<u>Item</u>	<u>Equipment No.</u>
Shop supply fan	F588
MCC room wall supply fan	F198

1.02 QUALITY ASSURANCE

A. GENERAL:

All fans and filters shall be of a single manufacturer to assure compatibility and ease of installation. All fans shall bear the AMCA rating seal and shall be designed for continuous operation.

B. OPERATING REQUIREMENTS:

Fans shall be designed to comply with the following:

<u>Equipment number</u>	<u>Capacity, acfm</u>	<u>External^a static pressure, inches W.C.</u>	<u>Fan speed, rpm</u>	<u>Motor HP</u>	<u>Operating voltage</u>	<u>Backdraft damper</u>
F198	1000	1/10	1140	1/4	120	Yes
F588	400	1/10	1140	1/4	120	Yes

^aExternal static pressure does not include pressure drop through filter.

1.03 ENVIRONMENTAL CONDITIONS

Equipment furnished under this section will be located at Sacramento, California, and will be indoors. Temperature is expected to range from 20 to 120 degrees F and relative humidity from 10 to 90 percent.

1.04 SUBMITTALS

All of the material stipulated herein shall be submitted in one complete submittal. Submittals shall comply with the requirements of Section 11000 and shall include the following:

1. Fan performance curves for the specified operation conditions.
2. The motor data required under Section 11060.
3. Bearing ratings for the fan and motor at design conditions.
4. Backdraft damper information.
5. Certification that the units have been tested and rated in accordance with the applicable AMCA Standard Test Code and Certified Ratings Program.

1.05 INFORMATION TO BE PROVIDED

Before final acceptance of the work, the Contractor shall provide the following additional information:

1. Operations and maintenance data in accordance with Section 01730.
2. Maintenance manuals in accordance with Section 01730.

PART 2 - PRODUCTS

2.01 MATERIALS

Fans shall have the following materials:

<u>Component</u>	<u>Material</u>
Venturi	Galvanized steel
Housing	Galvanized steel
Propeller blades	Galvanized steel

2.02 A.

2.02 EQUIPMENT

A. FANS:

Fans shall be V-belt or direct driven and shall have fan blades designed for quiet operation.

The fan shafts shall be mounted in sealed ball bearings and heavy-duty pillow blocks with lubrication fittings, and all sheaves shall be attached to fan shafts with full length keys and set screws.

All fans specified shall be suitable for continuous operation. All fans shall bear the AMCA rating seal.

B. MOTORS:

Motors shall be the totally enclosed type as specified in Section 11060. V-belt drives shall be as specified in Section 11000.

C. FAN PANEL:

Each fan panel shall have a spun venturi to direct air smoothly to the propeller blades. The fan, drive motor and fan guard shall be securely attached to the fan panel by means of a four-legged angle or tubular frame and mounting pads. All steel component parts shall be coated with a rust-inhibitive phosphate dip, a baked type epoxy primer and a finish coat of an acrylic thermosetting enamel.

D. ACCESSORIES:

Each fan shall be provided with a steel housing and a spring-loaded backdraft damper. Housing shall be protected with a baked epoxy finish. Each fan shall be provided with a motor side guard and bird screen.

E. DAMPERS:

Fans shall be provided with spring loaded gravity type backdraft dampers directly upstream of the filter.

F. FILTERS:

Each fan shall be provided with a filter located at the fan discharge. Filters shall be housed in a galvanized steel frame. Filters shall be as specified in Section 15880.

2.03 SPARE PARTS

One set of spare V-belts shall be provided for each belt-driven fan.

3.01

PART 3 - EXECUTION

3.01 INSTALLATION

Each fan and damper shall be installed as shown on the contract drawings and in accordance with manufacturer's recommendations.

3.02 TESTING

After completion of installation, each fan shall be completely field tested to guarantee compliance with these specifications.

****END OF SECTION****

SECTION 15822

PROPELLER WALL EXHAUST FANS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies propeller fans for noncorrosive ventilating service.

B. TYPE:

Fans are propeller type, wall mounted, V-belt or direct driven, with spun venturi and a common fan mounting panel. Fans shall be Greenheck, Aerovent, or equal.

C. EQUIPMENT LIST:

<u>Item</u>	<u>Equipment No.</u>
Shop exhaust fan	F590

1.02 QUALITY ASSURANCE

A. PERFORMANCE AND DESIGN REQUIREMENT:

AU fans shall be AMCA certified.

B. OPERATING REQUIREMENTS:

Fans shall be designed to comply with the following:

<u>Equipment number</u>	<u>Capacity, scfm</u>	<u>Static pressure inches, W.C.</u>	<u>Fan speed, rpm</u>	<u>Motor HP</u>	<u>Operating voltage</u>	<u>Drive type</u>	<u>Backdraft damper</u>
F590	550	1/10	1140	1/20	110	Direct	Yes

1.03 ENVIRONMENTAL CONDITIONS

Equipment furnished under this section will be located at Sacramento, California, and will be indoors. Temperature is expected to range from 20 to 120 degrees F and relative humidity from 10 to 90 percent.

1.04 SUBMITTALS

Submittals shall comply with the requirements of Section 11000 and shall include the following:

1. Fan performance curves for the specified operation conditions.
2. The motor data required under Section 11060.
3. Bearing ratings for the fan and motor at design conditions.
4. Certification that the units have been tested and rated in accordance with the applicable AMCA Standard Test Code and Certified Ratings Program.

1.05 INFORMATION TO BE PROVIDED

Before final acceptance of the work, the Contractor shall provide the following additional information:

1. Operations and maintenance data in accordance with Section 01730.
2. Maintenance manuals in accordance with Section 01730.

PART 2 - PRODUCTS

2.01 CONSTRUCTION

<u>Component</u>	<u>Material</u>
Propeller	Aluminum
Venturi	Steel
Pillow blocks	Cast iron
All sheaves	Cast iron

2.02 EQUIPMENT

A. FANS:

Fans shall be V-belt or direct driven as specified and shall have fan blades designed for quiet operation.

The fan shafts shall be mounted in sealed ball bearings and heavy-duty pillow blocks with lubrication fittings, and all sheaves shall be attached to fan shafts with full length keys and set screws. Bearings shall be as specified under Section 11000.

2.02 A.

All fans specified shall be suitable for continuous operation. All fans shall bear the AMCA rating seal.

Fans shall comply with noise requirements and control as specified in Section 11030.

B. MOTORS:

Motors shall be the totally enclosed type as specified in Section 11060. V-belt drives shall be as specified in Section 11000.

C. FAN PANEL:

Each fan panel shall have a spun venturi to direct air smoothly to the propeller blades. The fan, drive motor and fan guard shall be securely attached to the fan panel by means of a four-legged angle or tubular frame and mounting pads. All steel component parts shall be coated with a rust-inhibitive phosphate dip, a baked type epoxy primer and a finish coat of an acrylic thermosetting enamel.

D. ACCESSORIES:

Each fan shall be provided with a steel mounting collar, and a spring-loaded backdraft damper where indicated. Mounting collars shall be protected with a baked epoxy finish.

2.03 SPARE PARTS

One set of spare V-belts shall be provided for each fan.

PART 3 - EXECUTION

3.01 INSTALLATION

Each fan and damper shall be installed as shown on the contract drawings and in accordance with manufacturer's recommendations.

3.02 TESTING

After completion of installation, each fan shall be completely field tested to guarantee compliance with these specifications.

****END OF SECTION****

SECTION 15823

SIDEWALL EXHAUST FANS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies wall mounted exhaust fans for noncorrosive service.

B. TYPE:

Fans specified under this section shall be of the centrifugal, direct-driven type.

C. EQUIPMENT LIST:

<u>Item</u>	<u>Equipment No.</u>
Utility rooms exhaust fan	F490

1.02 QUALITY ASSURANCE

A. GENERAL:

All fans shall have heavy gauge spun aluminum removable covers and bird screens. Fans shall be direct driven and shall bear the AMCA rating seal.

B. OPERATING REQUIREMENTS:

Fans shall be designed to comply with the following:

<u>Equipment number</u>	<u>Capacity, scfm</u>	<u>Static pressure, inches</u>	<u>Fan speed, rpm</u>	<u>Minimum motor HP</u>	<u>Operating voltage</u>
F490	400	0.375	1550	1/20	110

All fans shall be suitable for continuous operation.

Motors shall be as specified in Section 11060.

1.03 ENVIRONMENTAL CONDITIONS

Equipment furnished under this section will be located at Sacramento, California, and will be indoors. Temperature is expected to range from 35 to 101 degrees F. and relative humidity from 10 to 90 percent.

1.04

1.04 SUBMITTALS

Submittals shall comply with the requirements of Sections 01300 and 11000 and the following: Certification shall be provided that the units have been tested and rated in accordance with the applicable AMCA Standard Test Code and Certified Ratings Program.

PART 2 - PRODUCTS

2.01 MATERIALS

Fans shall have the following materials:

<u>Component</u>	<u>Material</u>
Fan cover	Spun aluminum
Fan wheel	Aluminum
Bird screen	Aluminum-PVC coated
Motor compartment wall	Spun galvanized steel
Fan wheel rivets	Aluminum
Vibration isolators	Neoprene
Fan base	Spun aluminum

2.02 EQUIPMENT

The fan base shall be of one-piece construction, designed for wall mounting as shown. The fan and motor assembly shall be mounted on the fan base through the bird screen. The fan wheel and the motor shall be supported by the motor compartment wall and shall be provided with vibration isolators.

The fan wheel shall have backward inclined blades and shall have nonoverloading characteristics. The fan wheel shall be assembled with the blades riveted to the hubs.

The motor shall be enclosed in a compartment away from the air stream. The compartment shall be formed by the motor compartment wall and the fan cover. The fan cover shall be of one-piece construction and shall be secured to the motor compartment wall by stainless steel screws. Vent holes shall be provided in the motor compartment to allow flow of motor cooling air. The fan shall be provided with a weatherproof shutoff switch, located in the motor compartment.

****END OF SECTION****

SECTION 15835

SMALL GAS BLOWER

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies gas blowers for use with landfill gas.

B. TYPE:

The blower shall be a centrifugal fiberglass reinforced plastic (FRP) exhaust fan with radial propellers. Blower shall be New York Blower model RFE 160, or equal.

C. EQUIPMENT LIST:

<u>Item</u>	<u>Equipment No.</u>
Blower 1	B630
Blower 2	B631

1.02 QUALITY ASSURANCE

A. GENERAL:

Blowers shall be designed and selected for continuous operation for use with landfill gas.

B. OPERATING REQUIREMENTS:

<u>Equipment No.</u>	<u>Capacity, cfm</u>	<u>Static pressure, inches W.C.</u>	<u>Motor HP</u>
B630	50	3	1/2
B631	50	3	1/2

1.03 SUBMITTALS

Submittals shall comply with the requirements of Section 11000 and shall include the following:

1. Fan performance curves for the specified operation conditions.
2. The motor data required under Section 11060.

1.03

3. Bearing ratings for the fan and motor at design conditions.

1.04 INFORMATION TO BE PROVIDED

Before final acceptance of the work, the Contractor shall provide the following additional information:

1. Operations and maintenance data in accordance with Section 01730.
2. Maintenance manuals in accordance with Section 01730.

PART 2 - PRODUCTS

2.01 MOTORS

Motors shall be totally enclosed type as specified in Section 11060.

2.02 ACCESSORIES

Each blower shall be provided with a weather cover and static grounding by graphite impregnation. Each fan shall also have a reducer to connect the discharge of the blower to the 4-inch PVC pipe as shown on the drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

Each blower shall be installed as shown on the contract drawings and in accordance with manufacturer's recommendations.

3.02 TESTING

After completion of installation, each blower shall be completely field tested.

****END OF SECTION****

SECTION 15840
SHEET METAL DUCTWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section provides specifications for sheet metal ductwork for HVAC systems and blower air intake systems.

B. TYPE:

Ductwork shall be either the low pressure or medium pressure type designed and custom fabricated specifically for the applications shown under the conditions specified.

1.02 QUALITY ASSURANCE

A. GENERAL:

Ductwork shall be fabricated to the configurations and dimensions shown. Dimensions shown indicate net free area; dimensions shall be increased by the thickness of the lining where internal lining is required.

B. DESIGN CRITERIA AND CONSIDERATIONS:

1. LOW PRESSURE DUCTWORK: Unless otherwise specified or noted on the drawings, sheet metal gage, reinforcing, hanger and support systems, ductwork joint types and other basic design and construction details shall be in accordance with the latest revision of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Low Pressure Duct Construction Standards or the following, whichever is more stringent.

<u>Maximum side, inches</u>	<u>Thickness, inches</u>	<u>Type of transverse joint</u>	<u>Reinforcing</u>	<u>Maximum hanger spacing</u>
Up to 12	0.025	S slip, drive slip, 1-inch pocket slip or 1 x 1 x 1/8 inch angle 8 feet on center	None	8 feet on center

1.02 B.1.

<u>Maximum side, inches</u>	<u>Thickness, inches</u>	<u>Type of transverse joint</u>	<u>Reinforcing</u>	<u>Maximum hanger spacing</u>
13 to 18	0.032	S-slip, drive slip, 1 inch pocket slip or 1 x 1 x 1/8 inch angle 8 feet on center	None	8 feet on center
19 to 30	0.032	1 inch pocket slip or 1 x 1 x 1/8 inch angle 4 feet on center	None	4 feet on center
31 to 42	0.040	1 inch pocket slip or 1 x 1 x 1/8 inch angle 4 feet on center	1 x 1 x 1/8 inch angles, 4 feet on center	4 feet on center
43 to 54	0.051	1-1/2 inch pocket slip or 1-1/2 x 1-1/8 inch angle, 4 feet on center	1-1/2 x 1-1/2 x 1/8 inch angles, 4 feet on center	4 feet on center
55 to 96	0.064	1-1/2 inch pocket slip or 1-1/2 x 1-1/2 x 1/8 inch angle, 4 feet on center	1-1/2 x 1-1/2 x 1/8 inch angles 2 feet on center	4 feet on center
97 and larger	0.080	1-1/2 inch pocket slip or 1-1/2 x 1-1/2 x 1/8 inch angle, 4 feet on center	2 x 2 x 1/4 inch angles, 2 feet on center	4 feet on center

2. MEDIUM PRESSURE DUCTWORK: Medium pressure ductwork, where shown or specified, shall comply with the latest revision of the SMACNA High Pressure Duct Construction Standards or the above table, whichever is more stringent.

3. CHANGE IN DUCT SIZE: Change in duct size shall be made by a uniformly tapering section. The change in direction of the tapering section shall not be more than 1 inch in 5 inches of run, unless otherwise shown.

1.02 B.4.

4. BENDS IN DUCTS: With the exception of miter bends, all bends in ducts shall have inside radii equal to the duct width or diameter. Double wall turning vanes shall be provided at all miters.

5. DUCT SLEEVES: Whenever ducts extend through concrete or masonry walls, floors or ceilings, they shall be provided with a sleeve as shown on the drawings.

6. DUCT OPENINGS: Access doors or hand holes shall be installed in ducts at suitable locations to reach modulating dampers, fusible links, controllers and any other movable devices in the ducts. The opening shall be of adequate size to reach in and maintain these devices. Duct test holes with patches in ducts shall be provided where directed or necessary for balancing the system.

7. FLEXIBLE CONNECTIONS: Flexible connections shall be installed at all duct connections to air handling equipment and other locations shown. Connections shall be installed with a minimum allowance of 1 inch slack all around. Flexible connection joints shall be airtight and removable without destroying their reusability.

8. INSULATION: Internal insulation shall be used in all areas where shown on the drawings or specified. Fresh air and exhaust air ducts need not be insulated.

C. STANDARDS:

SMACNA Low Pressure Duct Construction Standards

SMACNA High Pressure Duct Construction Standards

NFPA Standard 90A- Installation of Air Conditioning and Ventilating Systems

NFPA Standard 45 - Fire Protection for Laboratories Using Chemicals

1.03 ENVIRONMENTAL CONDITIONS

Equipment furnished under this section will be located at Sacramento, California, and will be indoors. Temperature is expected to range from 20 to 120 degrees F and relative humidity from 10 to 90 percent.

2.01

PART 2 - PRODUCTS

2.01 MATERIALS

<u>Component</u>	<u>Material</u>
Duct	Galvanized steel, FEDSPEC QQ-S-775, Class D, aluminum, FEDSPEC QQ-A-250/2, Temper H
Duct sleeve	Galvanized steel, 10 gage
Flexible duct connector	Noncombustible, weather and ozone resistant, abrasionproof glass fabric with coating weighing not less than 24 ounces per square yard.
Turning vanes	Aluminum or galvanized steel to match duct material
Duct insulation	
Internal	Fiberglass, 1-1/2 pounds per cubic foot density.

2.02 EQUIPMENT

A. JOINTS, REINFORCING AND SUPPORTS:

Transverse stiffeners and joints shall be on a maximum spacing of 34 inches. After joints are crimped, they shall be further secured by button punching or riveting. Longitudinal seams shall be Pittsburgh lock and shall be cross-broken outward. Intake, or exhaust, side ducts shall be cross-broken inward. All plenums and casings shall be similarly cross-broken and further reinforced with 1 inch x 1 inch x 1/8 inch angles running diagonally between joints riveted to the casings.

Unless otherwise shown, maximum hanger or support spacing shall be 8 feet on center for ducts up to 18 inches, and 4 feet on center for ducts larger than 18 inches.

B. SLEEVES:

Sleeve flanges shall not be less than 4 inches wide and shall be installed tight against each side of the barrier. Sleeves shall be 2 inches larger than the duct or external duct insulation. The

2.02 B.

space between the duct (of insulation) and sleeve shall be packed with commercial grade twisted asbestos rope. Duct flanges not less than 4 inches wide shall be installed tight against the wall on each side and fastened to the duct sleeves.

C. ACCESS DOORS:

Duct access doors shall be 12 inches by 12 inches unless otherwise indicated. Where size of duct will not accommodate this size, the door shall be as large as practical and shall be constructed of gage not less than the duct sheet. The doors shall be rigid and shall be provided with airtight gaskets and shall not vibrate or cause noise under the conditions of service. Doors in insulated ducts shall be the insulated type. Doors shall be continuous hinged type with ventlock latch on outside.

D. FLEXIBLE CONNECTIONS:

Flexible duct connections shall be provided with the necessary angle, straps, bolts, clips or other fasteners to secure the flexible material to the equipment and ducts. All flexible connections exposed to weather shall be provided with approved sheet metal weather covers.

E. TURNING VANES:

Turning vanes shall be 2-inch blades for ducts up to 18 inches in either direction and shall be 4-1/2-inch blades for larger ducts. All turning vane assemblies shall be finished with an air-dried phenolic corrosion resistant coating prior to installation.

F. INSULATION:

Insulation shall be as specified in Section 15846.

PART 3 - EXECUTION

Unless otherwise noted, installation of all ductwork shall conform to the standards of NFPA 90A.

All ductwork shall be made airtight by taping with canvas and Arabol paste.

The inside of all ducts visible through grilles and registers shall be painted black and exposed ducts on roof shall be painted white.

END OF SECTION

SECTION 15846

DUCTWORK THERMAL INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies internal and external thermal insulation for metal air ductwork systems.

B. TYPE:

External ductwork insulation shall be the flexible blanket type and have a reinforced foil kraft vapor barrier facing. Internal insulation shall be the rigid board type and have a smooth integral fiberglass mat that faces the air stream. Internal and external ductwork insulation shall be Knauf, Johns Manville, Owens Corning Fiberglass, or equal.

1.02 QUALITY ASSURANCE

A. INTERNAL DUCTWORK INSULATION:

Internal ductwork insulation shall be designed to comply with the following:

1. Thickness, inches	1
2. Temperature range, degrees F	40-250
3. Density, pounds per cubic foot	3
4. Moisture absorption, percent by volume	0.5
5. Conductance, Btu per sq ft per degree F per hour (based on mean temperature of 75 degrees F)	0.23

B. EXTERNAL DUCTWORK INSULATION:

External ductwork insulation shall be designed to comply with the following:

1. Thickness, inches	1-1/2
2. Temperature range, degrees F	40-250
3. Density, pounds per cubic foot	3/4
4. Moisture absorption, percent by volume	0.20
5. Thermal conductivity, Btu inches per hour per sq ft per degree F (based on mean temperature of 75 degrees F)	0.30

1.03

1.03 ENVIRONMENTAL CONDITIONS

Equipment furnished under this section will be located at Sacramento, California, and will be indoors. Temperature is expected to range from 20 to 120 degrees F and relative humidity from 10 to 90 percent.

PART 2 - PRODUCTS

2.01 INTERNAL DUCTWORK INSULATION

Internal insulation shall be made from long, flame-attenuated glass fibers bonded with a thermosetting resin. The air stream surface is covered with a tough, smooth, black fiberglass mat.

2.02 EXTERNAL DUCTWORK INSULATION

External insulation shall be made of long, extremely fine, flame attenuated glass fibers, bonded with a thermosetting resin. The facing shall be constructed out of reinforced foil kraft.

PART 3 - EXECUTION

3.01 GENERAL

Internal insulation shall be used in all exposed areas or where shown on the drawings or specified.

3.02 INTERNAL DUCTWORK INSULATION

Internal insulation shall be applied with edges tightly butted and shall be secured by applying 50 percent coverage (6-inch wide strips on 12-inch centers) of vapor barrier adhesive approved by the National Fire Protection Association. All leading and cross joint edges shall be coated with the same adhesive. In addition, internal insulation shall also be secured by mechanical fasteners such as speed clips or nail type stick clips fastened with adhesive. One mechanical fastener shall be used for every 1 square foot of duct surface. Fasteners shall be started a minimum of 2 inches from the leading edge of each section and a minimum of 3 inches from all cross joints.

****END OF SECTION****

SECTION 15860

DAMPERS

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes specifications for all dampers except fire dampers.

1.02 PERFORMANCE AND DESIGN REQUIREMENTS:

Dampers shall have a pressure drop no greater than 0.07 inch of water column when they are wide open and are operating with air velocities no less than 1500 feet per minute.

For backdraft dampers, air leakage shall not exceed 5 percent when the damper is closed and the differential pressure across it is at least 1 inch water column.

1.03 SUBMITTALS

Submittals shall comply with the requirements set forth in Section 01300.

PART 2 - PRODUCTS

2.01 GENERAL

A. MATERIALS:

Damper blades shall be constructed of at least 16 gage 6063 T5 extruded aluminum. Frames shall be 2 inches by 1/2 inch by 1/8 inch extruded aluminum channel. Linkages and operators for damper blades shall also be aluminum. The entire damper shall be finished with an air dried phenolic corrosion resistant coating prior to installation. Bearings shall be self-lubricating nylon or oil impregnated bronze. Damper jambs shall be closed cell neoprene sealed.

B. CONSTRUCTION:

Dampers shall be of heavy-duty construction and of the multiblade type. Dampers shall be of the opposed blade type unless otherwise specified or shown. The damper frame shall be of rigid construction and so designed that blade ends overlap for close fit. Dampers shall be center pivoted with two reinforcing bosses. The entire assembly shall operate freely and without binding. Dampers shall be sized and installed as shown.

2.02 BALANCING DAMPERS

Balancing dampers shall be furnished complete with a manual locking quadrant, unless otherwise specified, and position indicator dampers shall be operated externally to the ductwork. Motorized balancing dampers shall be furnished with linkages, blade drive ears, and mounting brackets for motor operators.

2.03 BACKDRAFT AND BAROMETRIC DAMPERS

Damper blades shall be sealed with neoprene gaskets for tight closure. Where backdraft dampers are used in vertical ductwork, they shall be counterbalanced. The blade interconnecting linkage shall be located within the damper frame and not in the air stream.

2.04 PNEUMATIC ACTUATED DAMPERS

Pneumatic actuated dampers for two position control shall be of parallel bladed design and operated by drive arms.

The pneumatic actuator shall be as specified in Section 15921. The actuators shall be mounted on the outside of the damper. The gear train shall be submerged in a lifelong oil bath and designed for quiet operation. Unless otherwise noted, the actuator shall have a single crank arm. The operating radius of the arm shall be adjustable and positioning of the arm shall be adjustable through 360 degrees in 22-1/2-degree increments. The full operating stroke shall be no less than 160 degrees. Operation time for the full stroke shall be 1 minute.

2.05 PNEUMATIC ACTUATED MIXING DAMPER OPERATORS

The actuators shall be as specified in Section 15921 and shall provide positive modulation of the mixing damper when activated by its control thermostat. All actuators shall be mounted on the outside of the dampers and shall have sufficient torque to accurately position the size damper serviced. The gear train shall be submerged in a lifelong oil bath and designed for quiet operation. Unless otherwise noted, actuators shall have a single crank arm. Operating radius of the linkage arms shall be adjustable and positioning of the arms shall be adjustable through 360 degrees in 22-1/2-degree increments. Full operating stroke shall be not less than 160 degrees. Operation time for the full stroke shall be 1 minute.

PART 3 - EXECUTION

3.01 INSTALLATION

All dampers shall be aligned, installed and connected in strict accordance with the manufacturer's recommendations.

3.02 TESTING

All motorized, mixing, balancing and backdraft dampers shall be tested for proper operation prior to acceptance.

****END OF SECTION****

SECTION 15872

CEILING DIFFUSERS, GRILLES, REGISTERS AND EXTRACTORS

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes specifications for all ceiling diffusers, grilles, registers and extractors associated with the heating, ventilating and air conditioning systems.

1.02 QUALITY ASSURANCE

All ceiling diffusers, grilles, registers and extractors shall be installed as shown on the drawings and shall be of the size and capacity indicated thereon.

1.03 SUBMITTALS

Submittals shall comply with the requirements set forth in Sections 01300 and 11000.

PART 2 - PRODUCTS

2.01 GENERAL

A factory applied finish shall be provided as scheduled on the drawings. Color for diffusers installed in suspended ceilings shall match ceiling tile color. Each unit shall be set flat against the room surface finish and shall have a felt gasket or seal. Ceiling diffusers, grilles and registers shall be as specified on the drawings.

2.02 EXTRACTORS

Extractors shall be furnished by the diffuser manufacturer and shall be operated by a No. 3 key through the grille face or a No. 2 adapter for operation from a knob located at the ceiling or on the duct. The extractor unit shall be aluminum, finished with an air-dried phenolic corrosion resistant coating prior to installation.

PART 3 - EXECUTION

3.01 INSTALLATION

Diffusers, grilles, registers and extractors shall be aligned, connected and installed in accordance with the manufacturer's recommendations and with SMACNA Standards.

2.03

3.02 TESTING AND BALANCING

Testing, adjusting and balancing shall be as specified in Section 15800.

END OF SECTION

SECTION 15879

LOUVERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section includes specifications for all intake and exhaust louvers and appurtenances as required for a complete installation.

B. TYPE:

Louvers shall be of the stormproof type used for inlet and exhaust air for ventilation in a wastewater treatment plant. Louvers shall be Construction Specialties, Airo-lite, Ruskins, or equal.

1.02 PERFORMANCE AND DESIGN REQUIREMENTS

A. GENERAL:

All equipment furnished under this section shall be the product of firms regularly engaged in the manufacture of this type of item and shall be of a single manufacture.

B. PERFORMANCE AND DESIGN REQUIREMENTS:

Louvers shall be suitable for air supply or discharge service and shall be sized as shown. Louvers with any dimension greater than 24 inches shall be considered large louvers and shall be a minimum of 4 inches deep. Small louvers shall be 2 inches deep.

Maximum pressure drop through any louver shall not exceed 0.06 inch of water column at 500 feet per minute velocity through its free area as determined in accordance with AMCA Standard 500.

C. STANDARDS:

All louvers shall bear the AMCA Certified Ratings seal for both Air Performance and Water Penetration.

1.03 SUBMITTALS

Submittals shall be in accordance with Sections 01300 and 11000. In addition, pressure drop test data for all louvers shall be provided prior to final acceptance by the Construction Manager.

PART 2 - PRODUCTS

2.01 MATERIALS

Louver frames and blades shall be of 6063-T52 extruded aluminum alloy. Louvers shall have a medium bronze Architectural Class 1 anodized finish to match the architectural trim color.

Louver bird screens shall be removable 1/2-inch mesh, 14-gage aluminum secured within a 10-gage extruded aluminum frame.

All fastenings shall be stainless steel or aluminum as shown.

2.02 CONSTRUCTION

A. BLADES:

Blades shall be of the fixed type with interlocking blade braces to provide an uninterrupted horizontal line. Intake louvers shall have a center baffle to enhance weatherproofing. Slideable interlocked mullions shall have provisions for expansion and contraction.

B. FRAMES:

Louver frames shall be assembled by welding. Heads, sills and jambs shall be one-piece structural members and shall have an integral calking slot and retaining bead.

C. SCREENS:

Louver screens shall be furnished on all louvers serving ventilation equipment air intakes or exhausts and shall be furnished with a removable louver bird screen mounted on the interior face but independent of the louver. Small louvers supplying combustion air to oil or gas fired equipment shall have interior screens similar to those of other louvers except that the screen shall be 1/4-inch mesh and 16 gage. All other small louvers shall be furnished with a removable insect screen in an extruded aluminum frame that is mounted on the interior face of the louvers.

PART 3 - EXECUTION

3.01 INSTALLATION

Equipment specified in this section shall be aligned, connected and installed as shown and in accordance with the manufacturer's recommendations. A bituminous coat shall be applied to all aluminum surfaces in contact with concrete or masonry.

3.02 LOUVER SCHEDULE

Louvers shall be provided as follows. All dimensions shown are approximate; for exact dimensions refer to the contract drawings.

<u>Area serviced</u>	<u>Louver dimensions, inches</u>			<u>Number of units</u>	<u>Backdraft damper</u>	<u>Construc. removable</u>
	<u>Width</u>	<u>Height</u>	<u>Depth</u>			
Office building	16	18	2	1	No	No
MCC room	16	16	2	1	Yes	No

END OF SECTION

SECTION 15880

VENTILATION AIR FILTERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies filters for ventilation air purification.

B. TYPE:

Filters shall be the replaceable cartridge type.

1.02 QUALITY ASSURANCE

A. PERFORMANCE AND DESIGN REQUIREMENTS:

1. GENERAL: Filters shall be of the types, sizes and capacities shown on the drawings and as specified herein.

In-line filters shall have total cross sectional surface areas as shown on the drawings. They shall be single or composite units using standard 24-inch x 24-inch and 24-inch x 12-inch units.

2. OPERATING REQUIREMENTS: Filter efficiency shall not be less than 30 percent by ASHRAE Standard 52-76, and such efficiency shall not be impaired with face air velocities up to 600 feet per minute. Average filter arrestance by ASHRAE Standard 52-76 shall not be less than 90 percent. Initial resistance shall not exceed 0.23 inch water column at an air approach velocity of 600 feet per minute.

B. STANDARDS:

Filters shall be rated by the following:

Methods for Testing Air Cleaning Devices Used in
General Ventilation for Removing Particulate Matter,
ASHRAE Standard 52-76.

Standard Government Accelerated Chloropicrin Test.

C. FACTORY TESTS:

Each filter to be furnished shall be subjected to factory tests in accordance with ASHRAE Standard 52-76 or the Standard Government Accelerated Chloropicrin Test. All tests shall be witnessed by an

1.02 C.

independent certified testing laboratory approved by ASHRAE. Upon completion of all tests, five certified copies of all test data shall be furnished to the Construction Manager. All certifications shall be under penalty of perjury and shall be by an officer of the manufacturer's firm.

1.03 ENVIRONMENTAL CONDITIONS

Equipment furnished under this section will be located at Sacramento, California, and will be indoors. Temperature is expected to range from 20 to 120 degrees F and relative humidity from 10 to 90 percent.

1.04 STANDBY COMPONENTS

Five complete replacements with proper identification shall be provided for each type filter.

1.05 INFORMATION TO BE PROVIDED

Information to be furnished to the Construction Manager shall include certified copies of all factory test results.

PART 2 - PRODUCTS

2.01 MATERIALS

A. IN-LINE FILTERS:

1. RIGID FILTERS:

Filter media	Reinforced nonwoven cotton fabric
Media support grid	Steel
Frame	Galvanized steel

B. ENCLOSURES:

Housing and holding frames	Galvanized steel, 16 gage
Mounting grid or tracks	Aluminum

2.02 EQUIPMENT

A. IN-LINE FILTERS:

Filters shall be factory constructed by pleating the filter media and continuously laminating it to a supporting grid. Effective filter media for 4-inch thick filters shall be pleated to provide 6.0 square feet of filtering media per square foot of

2.02 A.

2.02 EQUIPMENT

filter face area and, correspondingly, 2-inch thick filters shall have 3.5 square feet of filtering media per square foot of filter area. Media shall be packed and sealed either in a 4-inch or 2-inch thick frame. Filters shall be Class 2 as listed by the Underwriters Laboratories Inc.

B. ENCLOSURE:

1. GENERAL: Filter enclosures shall either be the side-access cabinet type housing suitable for installation in ductwork or individual holding frames which may be riveted or bolted together to form a filter bank or module of the desired size. Enclosures shall be as specified herein and as shown on the drawings or as indicated in paragraph 1.02.

2. SIDE-ACCESS CABINET ASSEMBLY: Each assembly shall consist of the housing, access doors, filter mounting grid or tracks and mechanism for securing and positive sealing of the filter elements and filter bank. The entire assembly shall be factory fabricated and assembled and shall be sized to accommodate the filters specified herein and shown on the drawings. The housing shall be of welded construction and shall be reinforced with bracing and equipped with flanges for ease of installation into the ductwork as shown. The periphery of each access door shall be gasketed and pressure clamped airtight.

3. HOLDING FRAME ASSEMBLY: Holding frames shall be sized to accommodate the filters specified herein and shown on the drawings. Each filter shall be pressure clamped to a holding frame with removable fasteners so that the filter can be removed and replaced without disturbing adjoining filters and frames. A knife edge seal or sealing gasket attached to the holding frame shall be provided for airtight operation. The perimeter of the assembly holding frames in the filter bank shall be calked for a leakproof seal.

END OF SECTION

SECTION 15920

HVAC CONTROL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies the control systems for heating, ventilating, and air conditioning equipment.

1.02 QUALITY ASSURANCE

A. GENERAL:

Functional descriptions of the major control systems are provided for the Contractor's reference. The information is provided in order to give the Contractor an understanding of each system's function and to aid him in the checkout of the installation. The Contractor shall not use the functional description as a basis for providing a system having equipment of lesser quality or fewer component parts than specified. The Contractor shall not assure that the functional description is an attempt to set forth a complete system specification.

B. PERFORMANCE AND DESIGN REQUIREMENTS:

1. GENERAL: The controlled electric motor in any automatic system shall be manually operated at its motor control center (MCC) by putting the HAND-OFF-AUTO (HOA) switch in the HAND position. In this mode, manual operation of the equipment will be possible with retention of functions considered as safety interlocks. The air flow schematic for the building is shown on Drawing H102.

2. SYSTEM OPERATION:

a. BUILDING MAIN AIR SUPPLY SYSTEM: The office, MCC room, toilet, locker room, and shop will be supplied directly or indirectly with air from the indoor fan unit, F390A, of the heat pump, HP390.

A thermostat, TST390, located in the office determines whether heating, cooling, or ventilating only is supplied by the heat pump. The thermostat has two set points, manually adjustable for heating and cooling set temperatures with a dead band in between.

This system shall enable cooling to be carried out by outside air only under appropriate conditions.

1.02 B.2.a.

Air is supplied from the fan F390A via ductwork to the office, MCC room, toilet, and locker room.

From the office, air passes through a door grille into the shop from where it is exhausted by fan F590. An additional supply fan F588 provides filtered air to the shop.

In the MCC room, air is exhausted by exfiltration through a louver, LVR199, fitted with a gravity backdraft damper.

From the toilet and locker room, the exhaust air is ducted to a centrifugal wall fan F490.

All the above-mentioned equipment is expected to run for 10 hours per day during weekdays only and should be so controlled by a 7-day time clock with manual override for operation outside these hours.

b. SUPPLEMENTARY HEATING FOR SHOP: Supplementary heating will be supplied by two infrared radiant heaters, HTR591 and HTR592, mounted above work areas. These are manually operated, but have a timed cut-out.

c. SUPPLEMENTARY MCC ROOM VENTILATION: At a temperature in the MCC room of 85 degrees F and rising as sensed by thermostat TST197, additional ventilation shall be provided by fan F198 supplying filtered air to the MCC room which then exhausts via louver LVR199. This fan F198 shall shut down when temperature reaches 85 degrees F falling.

PART 2 - PRODUCTS

110 volt and 208 volt power conduit and wiring to motors is supplied as shown on the electrical drawings and as specified under Division 16.

Any control conduit not shown on the electrical drawings but required for system operation shall be provided under Division 15.

Individual overload protection for HVAC equipment shall be provided under Division 15 if not shown on the electrical drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

All HVAC controls shall be connected and installed at the locations shown and in strict accordance with the controllers manufacturer's recommendations.

3.02

3.02 TESTING

After the completion of installation, the controllers shall be completely field tested to ensure compliance with the performance requirements as specified.

END OF SECTION

SECTION 15921
HVAC INSTRUMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section details various switches, related visual indicators and other appurtenances for HVAC system operation. Instruments to be provided under this section are shown on the HVAC schematic drawings.

B. TYPE:

Equipment delivered under this specification shall include HVAC instruments as follows:

- Panels
- Temperature controllers
- Damper operators
- Relays
- Duct pressure switches
- Pressure differential indicators
- Limit switches

1.02 ENVIRONMENTAL CONDITIONS

Equipment furnished under this section will be located at Sacramento, California, and will be indoors. Temperature is expected to range from 20 to 120 degrees F and relative humidity from 10 to 90 percent.

1.03 SUBMITTALS

Submittals shall comply with the requirements of Section 01300.

PART 2 - PRODUCTS

2.01 GENERAL

Discrete signal transmission shall be wired as shown or specified herein. Switches shall provide on-off control action in response to changes in the controlled variable. Unless otherwise noted, all switch contacts shall be single or double pole, pilot duty rated B600 per NEMA ICS 2-125, and have a minimum continuous

2.01

current rating of 5 amps at 120 volts AC. All switches shall be UL or CSA listed. All devices herein shall be mounted in accessible locations for maintenance and as recommended by the manufacturer.

2.02 PANELS

Electrical panels shall be NEMA 12, dust-tight with hinged doors and enamel finish. The external wiring shall be as specified in Division 16.

The panels shall contain the switches, relays and controllers required to control the HVAC equipment. The panels shall also contain:

1. Wiring space at the panel bottom.
2. 120V distribution panel for 120V fans.
3. Contactors for 120V fans.
4. I/O terminal strips (24V and 120V section).
5. Status lights on door for each piece of controlled equipment.

The panels shall be designed so as to be compatible with the interconnection diagrams showing the external equipment in the electrical "E" drawings. All HVAC panels and devices specified herein shall comply with Section 11090, Equipment Control Devices.

2.03 TEMPERATURE CONTROLLERS

A. GENERAL:

Unless shown or specified otherwise, mount bottom of room temperature controllers and room temperature switches 5 feet above floor.

Mount remote bulb temperature controllers and receiver-controllers on panels and mount duct mounted temperature controllers, and transmitters, on outside of duct in accessible location. On insulated duct, mount instrument on metal plate directly on duct and provide sheet metal trim strip for exposed edge of insulation. For fire protection temperature switches, use the latter method.

B. ROOM TEMPERATURE CONTROLLERS:

Provide gradual acting, two pipe, with pilot relay incorporating feedback control, and sensitivity, and set point adjustment.

2.03 C.

C. REMOTE BULB TEMPERATURE CONTROLLERS:

Provide gradual acting, two pipe controller with relay incorporating feedback control, with sensitivity and set point adjustment. Submaster controllers shall have feedback features or provide transmitter biasing relay and receiver-controller, unless specified otherwise. Submaster controls shall include a readjustment range specified.

Accuracy shall be plus or minus 1 degree F throughout minimum operating range shown. Instrument set point range shall be at least 20 degrees F on either side of set point or range shown, and safe bulb temperature at least 25 degrees F above highest operating temperature. Select capillary length sufficiently long to allow installation with right angle along radius bends and with no encroachment into maintenance areas. Securely strap capillaries to insulated pipe or ductwork only, or support inside copper tube or cable tray for long spans. Capillaries to be fully compensated.

D. FREEZE PROTECTION TEMPERATURE SWITCHES:

Provide electric two position switch rated at 8 amps minimum at 120 volts with manual reset and 20-foot averaging bulb. Range shall be 35 degrees F to 55 degrees F with stop at 35 degrees F. The summation of any 12 inches of bulb at temperature 1 degree F below set point of temperature switch shall break temperature switch contacts.

Bulb shall be mounted with a minimum amount of bulb in vertical position, securely fastened to copper tubing, evenly distributed across duct cross section. Provide two units if bulb length is less than 40 percent of the perimeter of the duct casing.

Where capillary penetrates duct or casing, provide duct flange and capillary bushing nut.

E. TWO POSITION ELECTRIC TEMPERATURE SWITCHES:

Provide enclosed contact switches, differential 2 degrees F or less. Range shall be 40 degrees F to 75 degrees F. Switches shall be rated to carry 8 amps at 120 volts.

F. RECEIVER-CONTROLLERS:

Provide gradual acting, relay type controllers incorporating feedback control, adjustable sensitivity, and adjustable range of remote set point (authority) to be same as for submaster temperature controllers.

2.04 DAMPER OPERATORS

Damper operators shall be piston rolling diaphragm type motors with replacable diaphragms, and provided with external adjustable stops to limit movement in either direction. Damper motors shall be sized for a damper size 15 percent larger than the catalog rating.

Mount damper operators in accessible location.

2.05 ELECTRIC-PNEUMATIC AND PNEUMATIC-ELECTRIC RELAYS

Provide selecting, switching, reversing or computing relays to obtain the function described. Electric-pneumatic and pneumatic-electric switches shall be rated to carry a minimum of 8 amps at 120 volts.

2.06 PRESSURE GAGES

Gages, except branch pressure from intermediate relays, shall be flush mounted, with chrome plated Bezel, Ashcroft Type 1079 or equivalent Crosby or Marshalltown.

Receiver gages for temperature indication shall be calibrated in degrees F, accurate to 1/2 percent of scale range, and 2-1/2 or 3-1/2 inches diameter as specified.

Provide 2-inch diameter gages elsewhere, accurate to within 2 percent of scale range.

2.07 DUCT PRESSURE SWITCHES

Duct pressure switches may be connected so as to act as pressure switches along the duct or differential pressure switches across the fan units. Each pressure switch shall have an adjustable (10 percent) differential (deadband) to eliminate instability due to pressure cycling. All pressure switches for use in low discharge pressure shutdown on ventilation fans and blowers, or as interlock switches for fan or blower pairs, shall have a start-up bypass wired into the circuit of each individual fan motor. The set point of each switch shall be selected so that it is less than the pressure of the fan system with clean filters and is in the middle of the switch's full scale range. Repeatability shall be within plus or minus 1 percent. Pressure switch installation shall be 1/4-inch metal type.

2.08 PRESSURE DIFFERENTIAL INDICATORS

Pressure differential indicators for ventilation filter cleanliness measurement shall have 4-inch dial faces, 2 percent of full-scale accuracy; shall be of the frictionless magnetic

2.08

movement type; and shall be provided with zero adjustment, adjustable signal flag, vent valve, die cast aluminum case and metal tubing connections. Unless otherwise specified, the range shall be 0 to 1.0 inch of water with minor division markings not to exceed 0.02 inch of water.

2.09 LIMIT OR POSITION SWITCHES

All limit switches shall be of the positive lever arm or button actuated type and shall be suitable for permanent mounting directly on the equipment to be controlled. All switches shall have weatherproof NEMA 4 type enclosures except for switches mounted in hazardous areas which shall be NEMA 7. All switch installations shall be capable of field disassembly for maintenance purposes. All switches shall have enclosed terminal connections and a conduit connection to facilitate wiring.

PART 3 - EXECUTION

3.01 INSTALLATION

All HVAC instruments shall be connected, wired and installed as recommended by the manufacturer and as specified in Section 11090 and in Divisions 16 and 17.

3.02 CALIBRATION AND TESTING

Calibration and testing of all HVAC instruments shall be done as part of the related equipment testing and as part of the HVAC systems balancing as specified in Section 15800.

****END OF SECTION****

SECTION 15931

WALL MOUNTED THERMOSTATS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies duct wall mounted thermostats for motor operated dampers.

B. TYPE:

Thermostats shall be of the locking cover, mercury switch, bimetal element type, mounted on a subbase for wall attachment.

1.02 QUALITY ASSURANCE

Wall mounted thermostats shall be designed and selected for continuous exposure to air containing small concentrations of moisture and dirt.

1.03 SUBMITTALS

Submittals shall comply with Section 01300 and paragraph 11000-1.03.

PART 2 - PRODUCTS

2.01 MATERIALS

<u>Component</u>	<u>Material</u>
Cover	Thermoplastic
Switching levers	Thermoplastic modified polystyrene
Terminals and circuits	Brass

2.02 EQUIPMENT

A. GENERAL:

The number of bimetal elements for each thermostat shall correspond to the total number of stages for heating and cooling of the controlled unit. Each element shall operate a mercury switch

2.02 A.

and the circuits shall be electrically isolated from each other. An adjustable resistor type anticipator shall provide 0.10 to 1.20 amps per stage anticipation for heating applications. A fixed resistor type anticipator shall provide 5100 ohms anticipation for stage 1 cooling and 10,000 ohms for stage 2. Each thermostat shall have an external scale and a setting lever to provide selection of any room temperature within the range of the thermostat. Each thermostat shall be furnished with a bimetal thermometer on the cover, enclosed by a clear plastic face.

B. DAMPER POSITIONING THERMOSTATS:

The thermostat shall be compatible with the associated damper motor and shall be furnished by the same supplier as the motor. It shall be a unit with a bellows operated potentiometer, designed to provide two-position control of the damper motor for regulation of the room temperature. The thermostat shall be provided with all necessary relays for transmission of signals to the motor and control of the motor operation.

END OF SECTION

SECTION 15932

REMOTE BULB THERMOSTATS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies remote bulb thermostats for controlling pumps, valves, and dampers.

B. TYPE:

Remote bulb thermostats shall be of the single stage, double throw switch, adjustable deadband type with the bulb sensing element separated from the controlling switch by a short section of capillary tubing.

1.02 QUALITY ASSURANCE

A. GENERAL:

Remote bulb thermostats shall be specifically designed and selected for air temperatures ranging from 24 degrees F to 110 degrees F. The air will have a relative humidity range of 0 to 100 percent and will contain small concentrations of dust.

B. DESIGN REQUIREMENTS:

Remote bulb thermostats shall have an operating control range from 0 degrees F to 100 degrees F, with an adjustable differential from 3 to 10 degrees F. Capillary tube length for all remote bulb thermostats shall be 5 feet.

C. STANDARDS:

Underwriters Laboratories Inc. - Thermostats

Canadian Standards Institution - Thermostats

1.03 ENVIRONMENTAL CONDITIONS

Equipment furnished under this section will be located at Sacramento, California, and will be indoors. Temperature is expected to range from 20 to 120 degrees F and relative humidity from 10 to 90 percent.

1.04

1.04 SUBMITTALS

Submittals shall comply with all requirements set for in Sections 01300 and 11000. They shall include all items designated in paragraph 1.03 B of Section 11000 except items 1, 6, 7, 8, 9, 11, and 12.

PART 2 - PRODUCTS

2.01 MATERIALS

<u>Component</u>	<u>Material</u>
Cover	Thermoplastic
Switching levers	Thermoplastic modified polystyrene
Terminals and circuits	Brass
Capillary tube	Copper tubing

2.02 EQUIPMENT

Each thermostat shall have an external scale and key operated setting mechanism level to provide selection of any room temperature within the operating control range of the thermostat. Thermostats shall have a full load electrical rating of 120 volts and 8 amps.

END OF SECTION

DIVISION 16

ELECTRICAL

<u>Section</u>	<u>Title</u>
16000	GENERAL REQUIREMENTS FOR ELECTRICAL WORK
16110	RACEWAYS, FITTINGS AND SUPPORTS
16140	WIRING DEVICES
16175	MISCELLANEOUS ELECTRICAL DEVICES
16450	GROUNDING SYSTEM
16460	DRY-TYPE TRANSFORMERS
16470	LIGHTING AND POWER DISTRIBUTION PANELBOARDS
16500	LIGHTING FIXTURES
16920	600 VOLT MOTOR CONTROL CENTERS

SECTION 16000

GENERAL REQUIREMENTS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

This section specifies general requirements for electrical work. Detailed requirements for specific electrical items are specified in other sections.

B. LOGIC DIAGRAMS:

Logic diagrams define functional requirements of solid-state devices which perform logic (interlocking and sequencing) functions. The Contractor shall provide programming, documentation of programming, and reprogramming apparatus as specified in Section 16920.

1.02 QUALITY ASSURANCE

A. REFERENCES:

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
JIC EGP-1-67	Electrical Standards for General Purpose Machine Tools
JIC EMP-1-67	Electrical Standards for Mass Production Equipment
NFPA No. 70-1981	National Electric Code

B. TEST REPORTS:

The Contractor shall provide the Construction Manager with two certified copies of the results of specified tests.

1.02 C.

C. NOTIFICATION OF TESTS:

The Contractor shall notify the Construction Manager within 5 working days in advance of the performance of each test.

1.03 SUBMITTALS

A. GENERAL:

Submittals shall be as specified in this section and Section 01300. Offers of substitution for items specified by name shall be submitted.

B. DRAWINGS:

1. GENERAL: Drawings shall be prepared on 22-inch by 34-inch drafting media. Smaller sized drawings may be combined on one full-size drawing. Media shall be vellum, linen, or Mylar. Drawings shall have borders and title blocks identifying the scope of the drawing. Diagrams shall carry a uniform and coordinated set of conductor numbers and terminal block numbers in accordance with paragraph 16000-1.05. Drawings for control equipment shall be made in compliance with JIC EGP-1, and JIC EMP-1.

2. ELEMENTARY DIAGRAMS: The Contractor shall submit elementary diagrams for custom assemblies and package systems for which elementary diagrams have not been included in the contract documents. Elementary diagrams shall illustrate the functions of circuits and devices of a given system.

3. CONNECTION DIAGRAMS: Connection diagrams shall be submitted for panels where specified. Connection diagrams shall illustrate the physical arrangement of the panel and components. Interconnecting wiring between devices shall be shown and shall indicate conductor sizes and types. The source of power supply for each panel shall be shown. Instruments mounted on the front, in the interior or on the back of panels shall be so noted.

1.04 INFORMATION TO BE PROVIDED

A. GENERAL:

Information shall be provided in accordance with this section.

B. MATERIAL LIST:

Within 90 days after "Notice to Proceed," the Contractor shall provide information as specified in Division 16.

Catalog information shall include technical specifications and application information for each piece of equipment,

1.04 B.

including range flexibility and performance accuracy with changing operating conditions. Where information covers more than one model or optional equipment, the Contractor shall clearly mark out information which does not apply to the particular model he intends to supply.

C. OVERLOAD PROTECTIVE DEVICES (THERMAL):

For each motor, the Contractor shall compile the following data in tabulated form. Data shall be obtained from the equipment as provided on the job.

Equipment driven
Motor nameplate data
Overload device heater catalog number and ampere rating

This information shall be provided to the Construction Manager 10 working days prior to start-up of any equipment.

D. INTERCONNECTION DIAGRAMS:

Interconnection diagrams showing terminal blocks of distribution and control assemblies, devices, and interconnecting wiring shall be provided. Diagrams shall contain conductor color code as applicable.

1.05 CLASSIFIED AREAS

A. CORROSIVE AREAS:

(NOT IN CONTRACT)

B. HAZARDOUS AREAS:

(NOT IN CONTRACT)

1.06 ELECTRICAL NUMBERING SYSTEM

A. RACEWAY NUMBERS:

Raceway numbers have been assigned as follows.

Raceway numbers are prefixed for one or more of the following functions:

1.06 A.

<u>Raceway Prefix</u>	<u>Type of Function</u>
C	Control and/or 120V or less power
H	Power above 600V
N	Pneumatic tubing
P	Power 208V to 600V
S	Low level signal (less than 90 volt communication or less than 30 volt instrumentation)
X	Spare

Prefixes are followed by a 4-digit number. Where there is more than one raceway to a particular piece of equipment, a letter suffix is added to distinguish the raceways.

Example

Raceway number = PC3109A

where: PC = conduit contains power and control conductors
3109 = unique 4-digit number
A = letter to distinguish from other raceways to same equipment

B. TAG NUMBERS:

Conductors shall be identified with numbers at both ends with printed heat shrinkable or slip-on sleeves. These tag numbers shall consist of the equipment number followed by a dash followed by the conductor number specified on the control diagram.

Example

Tag number = 1900 - L1

where: 1900 = cable number
L1 = conductor number

Conductors which are in parallel or in series between equipment shall have the same conductor number. Neutral conductors shall have the same conductor number. Wherever possible, the conductor number shall be the same as the terminal to which it connects.

When factory wired equipment has terminal numbers different than the conductor numbers shown on the control diagrams, both shall be shown on the interconnection diagram, and a copy of the interconnection diagram shall be fastened to the inside of the equipment cabinet.

1.07 PRODUCT HANDLING AND STORAGE

Equipment and materials to be installed outdoors may be stored outdoors if protected against moisture condensation. Equipment shall be stored at least 6 inches aboveground. Equipment and materials to be installed indoors shall be stored indoors and sealed with at least two layers of plastic. Space heaters shall be energized without disturbing the sealed enclosure.

PART 2 - PRODUCTS

2.01 GENERAL

A. CORROSION PROTECTION:

Unless otherwise specified, material provided under Division 16 shall be treated with zinc phosphate, bonderized, or otherwise given a rust-preventive treatment, then primed and painted with a durable enamel finish. Minimum dry film thickness shall be 3 mils. Panels and enclosures shall match in exterior color to Federal Standard 26306, grey. Interiors shall be painted white.

Field painting of equipment shall conform to Section 09900.

Galvanizing, where specified, shall conform to Section 05910 of this specification. Galvanized equipment and appurtenances shall not be shop primed or painted but will be field painted as specified in Section 09900.

B. APPROVAL:

Electrical equipment and material shall be approved by Underwriters Laboratories Inc. (UL) or Canadian Standards Association (CSA) for the purpose for which it is used.

PART 3 - EXECUTION

3.01 GENERAL

A. INSTALLATION:

As a minimum, installation provided under Division 16 shall be performed in accordance with NFPA No. 70 (NEC). Layout and arrangement drawings are generally diagrammatic, and the location of outlets and equipment are approximate unless detailed or dimensional. The Contractor shall coordinate the final location and routing of conductors and conduit with final structural, mechanical and instrumentation arrangements and the locations of electrical terminations on equipment.

3.01 A.

Equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Contractor agrees that the Owner has the right to require minor changes in location of outlets or equipment, prior to roughing in, without the Owner incurring additional charges.

B. DUST CONTROL:

Operations involving grinding of concrete, sweeping or similar activities shall be accomplished under controlled conditions of ventilation which keep cement dust or other dust and particles from contaminating the electrical equipment.

C. PROTECTIVE RELAY AND CIRCUIT BREAKER SETTINGS:

(NOT IN CONTRACT)

3.02 CIRCUIT ARRANGEMENT

Alternating current control circuits shall be 120 volts or less, shall be grounded, and one terminal of each load device shall be connected to the grounded conductor. Control contacts, including overload device contacts, shall be installed in the ungrounded side of the circuit.

Thermal overload relays shall be provided in ungrounded conductors supplying a motor.

3.03 PHASE ROTATION

Phase rotations for equipment connections shall be A, B, C, counting from front to back, top to bottom, and left to right as viewed from the operating mechanism side. Three phase receptacles shall have a counterclockwise phase rotation as viewed from the front.

The Contractor shall verify that motors are connected to rotate as required. Verification may be accomplished by momentarily energizing the motor provided the Contractor confirms that neither the motor nor the driven equipment will be damaged by reverse operation.

3.04 TESTING AND START-UP

A. GENERAL:

The Contractor shall perform tests to ensure compliance with the specifications prior to energizing the equipment or circuits.

3.04 A.

Before testing and energizing a system, steps shall be taken for the safety of personnel and equipment. Minimum requirements include signs, restricted access, and lockable switches in accordance with OSHA.

Insulation resistance measurements shall be made on conductors and energized parts of electrical equipment. Minimum acceptable values of insulation resistance shall be in accordance with the applicable ICEA, NEMA or ANSI standards for the equipment or material being tested unless otherwise specified. The ambient temperature at which insulation resistance is measured shall be recorded. Test results shall be provided to the Construction Manager.

Protective devices shall be set and operative during the testing period. A record of tests and protective device settings shall be made and two copies provided to the Construction Manager.

B. CONDUCTOR AND CABLE TESTS:

The phase-to-ground insulation resistance shall be measured for 480 volt circuits, except lighting branch circuits. Measurements shall be made using a 1000 volt megohmmeter. Measurements may be made with motors and other equipment connected.

Insulation resistance measurements shall be recorded in a format similar to Form 16000-A, contained in Section 01999. Insulation with resistance of less than 10 megohms is not acceptable.

C. MOTOR TESTS:

Motors rated 460 volts shall be tested for insulation resistance (winding to ground) within 30 days of commissioning. Motors 50 HP and larger shall have their insulation resistance measured at time of delivery to the job site also. Measurements shall be made with a 1000 volt megohmmeter. Insulation with resistance less than 10 megohms is not acceptable. Measurements shall be recorded in a format similar to Form 16000-B, contained in Section 01999.

After start-up of each motor, the current on each phase shall be measured with the motor running at maximum operating load. Measurements shall be recorded and provided to the Construction Manager.

D. FUNCTIONAL CHECKOUT:

The Contractor shall perform a functional checkout on control circuits. The checkout shall consist of energizing each control circuit and operating each control, alarm, or malfunction device,

3.04 D.

and each interlock in turn to verify that the specified action occurs. This may be performed with the motor connected or disconnected.

The detailed sequence of actions used to test each drive or system shall be provided to the Construction Manager. After the checkout has been performed, signed and dated, copies of the procedure shall be provided to the Construction Manager.

****END OF SECTION****

SECTION 16110

RACEWAYS, FITTINGS AND SUPPORTS

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies raceways, fittings and supports for electrical conductors and conduit.

1.02 NUMBERING

Raceways shall be numbered in accordance with Section 16000.

1.03 REFERENCES

This section references the following documents. They are a part of this section insofar as specified and modified herein. In case of conflict between the requirements of this section and the listed documents, the requirements of this section shall prevail.

AASHTO H20-44	Highway Bridges
ANSI C80.1-77	Rigid Steel Conduit, Zinc Coated
ANSI C80.3-77	Electrical Metallic Tubing, Zinc Coated
ANSI C80.5-77	Rigid Aluminum Conduit
ASTM A193-78	Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Services
ASME	Boiler and Pressure Vessel Code
FEDSPEC WW-C-581E	Conduit, Metal, Rigid; and Coupling, Elbow, and Nipple, Electrical Conduit; Zinc Coated
JIC EMP-1	Electrical Standards for Mass Production Equipment
NEMA TC2-78	Electrical Plastic Tubing (EPT) and Conduit (EPC 40 and EPC 80)
NEMA VE1-79	Cable Tray Systems
NFPA No. 70-1981	National Electric Code
UL 1242-1977	Intermediate Metal Conduit

2.01 A.1.

PART 2 - PRODUCTS

2.01 RACEWAY

A. STEEL CONDUIT:

1. RIGID STEEL CONDUIT: Rigid steel conduit shall be ANSI C80.1 with smooth finished surfaces. Conduit shall be hot-dip galvanized after fabrication. Unless otherwise specified, minimum size shall be 3/4 inch exposed and 1 inch embedded.

2. INTERMEDIATE METAL CONDUIT: Intermediate metal conduit shall be UL 1242 and FEDSPEC WW-C-581E with smooth finished surfaces. Conduit shall be hot-dip galvanized after fabrication.

3. FITTINGS: Locknuts shall be extra heavy electro-galvanized steel for sizes through 2 inches. Locknuts larger than 2 inches shall be electrogalvanized malleable iron. Bushings shall be electrogalvanized malleable iron with insulating collar. Grounding bushings shall be locking type and shall be provided with a feed-through compression lug for securing the ground cables. Unions shall be electrogalvanized ferrous alloy type Appleton UNF or UNY, Crouse-Hinds UNF or UNY, or equal.

Expansion fittings in embedded runs shall be watertight and shall be provided with an internal bonding jumper. The expansion material shall be neoprene and shall allow for 3/4-inch movement in any direction.

B. PLASTIC COATED RIGID STEEL CONDUIT AND FITTINGS:

Plastic coated conduit shall be rigid steel conduit to which a 40-mil thick polyvinylchloride coating has been bonded. Coating shall be free of pinholes. Bond strength shall exceed the tensile strength of the plastic coat. Elbows shall be factory made and coated. Fittings used with plastic coated conduit shall be similarly coated to the same thickness as the conduit and shall be provided with type 304 stainless steel hardware. Conduit and fittings shall be manufactured by the same company.

C. ELECTRICAL METALLIC TUBING (EMT):

EMT shall be electrogalvanized and shall be ANSI C80.3. EMT fittings shall be compression type. Boxes used with EMT may be electrogalvanized sheet steel. Minimum size shall be 3/4 inch.

D. FLEXIBLE METAL CONDUIT:

Flexible metal conduit shall be formed from spirally wound galvanized steel strip with successive convolutions securely interlocked. Minimum size shall be 1/2 inch. Fittings shall be compression type. Flexible metal conduit shall be provided with ground wire.

2.01 E.

E. LIQUID-TIGHT FLEXIBLE METAL CONDUIT:

Liquid-tight flexible metal (UL listed as liquid-tight flexible steel) conduit shall be formed from spirally wound galvanized steel strip with successive convolutions securely interlocked and jacketed with liquidtight plastic cover. Minimum size shall be 1/2 inch. Fittings for liquid-tight conduit shall have cadmium-plated malleable iron body and gland nut with cast-in lug, brass grounding ferrule threaded to engage conduit spiral and O-ring seals around the conduit and box connection and insulated throat. Forty-five and 90-degree fittings shall be used where applicable.

F. EXPLOSIONPROOF FLEXIBLE CONDUIT:

(NOT IN CONTRACT)

G. RIGID NONMETALLIC CONDUIT:

Rigid nonmetallic conduit shall be NEMA TC2, high impact, polyvinylchloride (PVC). Fittings used with PVC conduit shall be PVC solvent weld type. Nonmetallic conduits shall be UL listed for their respective applications.

H. WIREWAYS:

Wireways and auxiliary gutters shall be JIC EMP-1 sectional flanged oiltight type with hinged covers and shall be 8 inch by 8 inch in cross section unless otherwise specified.

I. CABLE TRAYS:

(NOT IN CONTRACT)

2.02 BOXES AND FITTINGS

A. GENERAL:

Junction boxes, device boxes, fixture support boxes, and conduit fittings shall be hot-dip galvanized cast ferrous alloy. Integrally cast threaded hubs or bosses shall be provided for conduit entrances and shall provide for full 5-thread contact on tightening. Drilling and threading shall be done before galvanizing. Cover plates shall be of similar hot-dip galvanized cast ferrous alloy material. A full body neoprene gasket shall be provided with the cover. Type 304 stainless steel screws shall be provided for covers. Boxes shall be FS or FD boxes as manufactured by Crouse-Hinds, Appleton, or equal.

2.02 B.

B. GANG BOXES:

Outlet and device boxes shall be gang type where two or more devices are located together. Device covers shall be suitable for gang boxes with neoprene gaskets to fit the devices and box used. Covers shall be hot-dip galvanized cast ferrous alloy unless the particular device requires a cover that is not manufactured in this material.

C. FLOOR BOXES:

Floor boxes shall be hot-dip galvanized cast boxes with a NEMA 4 rating. Boxes shall be provided with a recessed ring neoprene gasket, hot-dip galvanized steel checker plate covers and type 304 stainless steel machine screws of not less than 1/4 inch diameter. The cover screws shall be flat head type of recessed socket head screws with no material projecting above the level of the cover.

D. SHEET STEEL BOXES:

Boxes larger than FD boxes shall be fabricated from welded steel and hot-dip galvanized after fabrication. Thickness of steel used for box fabrication shall conform to JIC. Before finish is applied, a grounding pad drilled for two bolted grounding lugs or a grounding stud shall be welded to the inside of the box. Hardware shall be 304 stainless steel. Boxes shall, as a minimum, meet NEMA 12 and JIC requirements and shall be NEMA 4 where exposed to the weather or dripping water.

Galvanized sheet steel boxes may be used where electrical metallic tubing is specified. Boxes shall be a minimum of 4 inch square by 2-1/8 inch depth.

E. BOXES AND FITTINGS FOR HAZARDOUS AREAS:

(NOT IN CONTRACT)

F. BOXES AND FITTINGS IN CORROSIVE AREAS:

Boxes and fittings located in areas specified as corrosive shall be NEMA 4X fiberglass. Conduit entering plastic boxes and exposed metal on plastic boxes which are not isolated from the interior of the box shall be bonded together with a suitable grounding conductor.

Seals for entry into corrosive areas shall be oblong conduit bodies filled with soft nonsetting compound, such as Dux-seal, or equal.

2.02 G.

G. TERMINAL CABINETS:

Terminal cabinets shall meet NEMA 12 and JIC requirements, shall be sheet steel, and shall be provided with hinged doors. Cabinets exposed to weather or dripping water shall meet NEMA 4 requirements. Cabinets, except those located in electrical equipment rooms, shall be finished inside and out by a powdered thermosetting resin system resistant to abrasion, moisture, acids, alkalies, high temperatures, and flame. Exterior color shall be gray. Interior shall be white. Before finish is applied, a copper grounding pad for a two-bolt ground lug or grounding stud shall be provided inside of these terminal cabinets. Hardware shall be 304 stainless steel.

Terminal cabinets shall be provided with terminal blocks of size and capacity for the required loads and shall be rated 30 amperes, 600V AC minimum. Contacts shall be No. 8 minimum strap screw type suitable for ring tongue or locking spade terminals. Similar cabinet with a mounting panel shall be provided for mounting miscellaneous field equipment when required.

Terminals shall be numbered with conductor numbers in accordance with Section 16000 and shall be provided with white fiber marking strips. The numbering shall be hand printed or machine printed with black india ink in a neat and legible manner and sprayed with clear fixative.

H. HUBS:

Hubs for connection of conduit to junction, device or terminal boxes shall be made of cast ferrous alloy, electroplated with zinc and shall have insulating bushings. The hubs shall utilize a neoprene "O" ring and shall provide a watertight connection.

I. ELECTRICAL HANDHOLES, PULL BOXES AND MANHOLES:

(NOT IN CONTRACT)

2.03 RACEWAY SUPPORTS

A. GENERAL:

Raceway support systems shall be designed to provide a factor of safety of not less than five.

B. CONDUIT SUPPORTS:

Conduit supports shall be one-hole galvanized malleable iron pipe straps used with galvanized clamp backs and nesting backs where required. Conduit supports for PVC coated rigid steel and PVC conduit systems shall be one hole PVC coated clamps or PVC conduit wall hangers.

2.03 C.

C. CEILING HANGERS:

Ceiling hangers shall be adjustable galvanized carbon steel rod hangers as specified. Straps or hangers of plumber's perforated tape are not acceptable. Unless otherwise specified, hanger rods shall be 1/2-inch all-thread rod and shall meet ASTM A193 and ASME Boiler and Pressure Vessel Code specifications. Hanger rods in corrosive areas and those exposed to weather or moisture shall be stainless steel.

D. STRUCTURAL ATTACHMENTS (RACKS):

Structural attachments shall be constructed from framing channel as specified.

2.04 CONCRETE

Concrete used for duct banks shall be Class E as specified in Section 03300.

PART 3 - EXECUTION

3.01 CONDUIT

A. GENERAL:

1. CONDUIT LOCATIONS: Unless otherwise specified, conduits shall be installed in locations as specified in Table A.

Table A, Conduit Locations

<u>Conduit type</u>	<u>Location</u>
1. Rigid steel	Exposed noncorrosive areas
2. Rigid nonmetallic, Schedule 40	Buried, embedded, or encased
3. Rigid nonmetallic, Schedule 80	Corrosive nonhazardous areas, exposed, or direct burial
4. Electrical metallic tubing	Within stud walls, above suspended ceilings, within elevator shafts, within elevator machine rooms
5. Plastic coated rigid steel	Corrosive hazardous areas
6. Flexible metal ^a	Lighting fixture connections (in suspended ceilings)
7. Liquidtight flexible metallic ^a	Final raceway runs to equipment, connections to vibrating or moving equipment

^aConduit shall be used only for connections requiring flexibility.

2. CONDUIT RUNS BETWEEN BOXES: The Contractor shall limit the number of directional changes of the conduit to total not more than 270 degrees in any run between pull boxes. Conduit runs shall be limited to 400 feet, less 100 feet for every 90 degrees of change in direction. Bends and offsets shall be avoided where possible, but where necessary shall be made with a hickey or conduit bending machine, or shall be factory preformed bends. Turns shall be made with cast metal fittings or conduit bends. Welding, brazing or otherwise heating of conduit is not acceptable.

3. JUNCTION AND PULL BOXES: Where required for pulling cable and as necessary to meet NFPA No. 70, the Contractor shall provide cast junction or pull boxes. Pull boxes used for multiple conduit runs shall not combine circuits fed from different MCCs, switchboards, or switchgear.

4. CONDUIT TERMINATIONS: Conduit entering sheet steel boxes or cabinets shall be secured by locknuts on both the interior and exterior of the device and shall have an insulating grounding

3.01 A.4.

or bonding bushing constructed over the conduit end. Conduit entering NEMA 12 boxes shall be terminated with a raintight hub having an insulated liner. Surface-mounted cast boxes and plastic enclosures shall have threaded hubs. Joints shall be made with standard couplings or specified unions. Metal parts of plastic control stations and coated boxes shall be bonded to the conduit system. Running threads shall not be used in lieu of conduit nipples, nor shall excessive thread be used on any conduit. The ends of conduit shall be cut square, reamed, and threaded with straight threads. Rigid steel conduit shall be made up tight and without thread compound. Male threads on rigid steel conduit shall be coated with electrically conductive zinc-rich paint.

PVC conduit entering fiberglass boxes or cabinets shall be secured by threaded bushings on the interior of the device and shall be terminated with a threaded male terminal adapter having a neoprene "O" ring. Joints shall be made with standard couplings.

B. CONDUIT SUPPORT:

Exposed rigid steel or plastic coated conduit shall be run on supports spaced not more than 10 feet apart and shall be constructed with runs parallel or perpendicular to walls, structural members or intersections of vertical planes and ceiling. Exposed PVC conduit shall be run on supports spaced not more than 3 feet apart for conduits up to 1 inch, 5 feet apart for conduits 1-1/4 inches to 2 inches and 6 feet apart for conduits 2-1/2 inches and larger. No conduit shall approach closer than 6 inches to any object operating above the rated temperature of the cable insulation it contains.

Conduit, except PVC, supported directly from the concrete structure shall be spaced out at least 1/4 inch using one-hole hot-dip galvanized malleable iron straps with nesting backs or, if three or more conduits are located in a parallel run, they may be spaced out from the wall approximately 5/8 to 1 inch by means of framing channel. Runs of individual conduit suspended from the ceiling shall be supported with galvanized carbon steel rod hangers. Where three or more conduits are suspended from the ceiling, steel racks shall be constructed.

PVC conduit supported directly from the concrete structure shall be spaced out at least 1/4 inch using PVC conduit wall hangers.

Conduit rack and tray supports shall be secured to concrete walls and ceilings by means of cast-in-place anchors as specified. Individual conduit supports may be similar cast-in-place anchors, die-cast, rustproof alloy expansion shields or cast flush anchors. Wooden plugs, plastic inserts or gunpowder-driven inserts are not acceptable as a base to secure conduit supports.

3.01 C.

C. CONDUIT ENCASEMENT OR EMBEDMENT (STRUCTURES AND DUCT BANKS):

Conduit constructed in concrete which is in contact with the earth shall be separated from the earth by at least 3 inches of concrete. PVC conduit may be used for underground runs external to buildings or structures. Clearances equal to the nominal conduit diameter, but not less than 1-1/2 inches, shall be maintained between conduits encased in slabs. Clearances of less than 1-1/2 inches at conduit crossing and terminating locations are acceptable.

Expansion fittings shall be provided whenever embedded conduit crosses building expansion joints, between two adjacent structures, and between a duct bank and structure.

Duct banks shall be placed on an undisturbed soil base wherever possible. Where duct banks pass through backfilled areas, the soil base shall be as specified in Section 02200.

Plastic spacers shall be located 5 feet on centers. Wire ties shall be made at each spacer location and shall be securely anchored to prevent conduit flotation during concreting. Conduit runs shall be watertight.

The ends of conduits shall be protected from damage during construction. When using plugs for protection, a 1/4-inch hole shall be drilled in the lower portion of the plug to provide drainage.

Where conduits are specified "spare" or for future use, a nylon cord shall be provided in conduits and fastened at each end.

Conduits shall be thoroughly swabbed immediately upon completion of pouring concrete. After the concrete has set, but before backfilling, a mandrel having a diameter equal to the nominal conduit inside diameter minus 1/2 inch, and not less than 4 inches long, shall be pulled through each conduit. The mandrel shall be lead covered or painted white to indicate any protrusion on the inside of the conduit.

D. CONDUIT PENETRATIONS:

Conduit routed through floors, walls or other concrete structures shall be oriented to pass through cast-in-place openings wherever possible. For the cases where cast-in-place openings are not possible, appropriate size holes shall be bored through the concrete to accommodate the conduit passage. The size and location of the holes shall not impair the structure's integrity. After completion, grout and calk surface to be watertight and refinish to match existing surroundings.

3.01. D.

Wherever conduits penetrate concrete wall panels or walls to outdoors, the Contractor shall provide a watertight seal as manufactured by O. Z. Gedney Co., Type CSMC, Thunderline Corp., Link Seal, or equal.

Firestops and seals shall be provided for penetrations through building floors and walls. Firestops and seals shall be Flamemastic 71A, Vimasco No. 1-A, or equal, and shall be applied in accordance with manufacturer's recommendations. Products which are effected by water are not acceptable.

E. CONDUIT SEPARATION:

Signal conduits shall be separated from AC power or control conduits by a minimum of 12 inches for rigid steel conduits and 24 inches for nonmetallic conduits.

F. CONDUIT NUMBERS:

Conduit numbers shall be pressure stamped into a noncorrosive metal tag. A tag with number shall be fixed to each end of each conduit and at each manhole, pull box and handhole with type 304 stainless steel wire.

G. CONDUIT SEALS FOR HAZARDOUS AREAS:

(NOT IN CONTRACT)

H. PLASTIC COATED CONDUIT:

Plastic coated conduit shall be made up tight with strap wrenches, and the plastic overlap shall be coated and sealed per manufacturer's recommendations. Pipe wrenches and channel locks shall not be used for tightening plastic coated conduits. Damaged areas shall be patched, using manufacturer's recommended material. The area to be patched shall be built up to the full thickness of the coating.

I. LIQUIDTIGHT FLEXIBLE CONDUIT:

Liquidtight flexible conduit shall be used for motor connections. Where flexibility is required for electrical raceways on equipment, liquidtight flexible conduit shall be used in accordance with JIC standards and these specifications. The maximum length of conduit shall be 24 inches for conduits 1-1/2 inches or smaller and 36 inches for conduits 2 inches or larger. The terminating fittings and sealing shall be as specified.

3.02 CABLE TRAYS

(NOT IN CONTRACT)

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 - GENERAL

1.01 SCOPE

This section specifies wiring devices consisting of receptacles, plugs, switches and appurtenances.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
NEMA WD-1-1974	General Purpose Wiring Devices
NFPA No. 70-81	National Electric Code

PART 2 - PRODUCTS

2.01 GENERAL

Wiring devices shall be UL approved for the current and voltage specified and shall comply with NEMA WD-1. Devices shall contain provisions for back wiring and side wiring with captively held binding screws. Devices shall be brown, except those located in finished areas shall be ivory.

2.02 RECEPTACLES AND PLUGS

A. GENERAL:

Receptacles shall be grounding type.

B. 120V RECEPTACLES:

Receptacles shall be duplex 20 amp NEMA 5-20R and shall accept NEMA 5-15P or 5-20P plug caps. Receptacles and plug caps shall be General Electric Co. GE 4108-2, Hubbell 5362, or equal.

C. 250V RECEPTACLES:

Receptacles shall be duplex 15 amp NEMA 6-15R and shall accept NEMA 6-15P plug caps. Receptacles and plug caps shall be Hubbell 5662, Arrow Hart 5662, or equal.

2.02 C.

Male plug caps for 120V and 250V receptacles shall be of the cord grip armored type with heavy phenolic housing, of the same manufacture as the receptacle. Plug caps shall be rated 15 amps. One plug cap shall be provided for every four receptacles furnished, with a minimum of two plug caps being provided. Plug caps shall be delivered to the Construction Manager.

D. THREE PHASE RECEPTACLES AND PLUGS:

Receptacles shall be suitable for 480V, 3 phase, 4 wire service, with ampere ratings as specified. Receptacles and plugs shall be designed so that the grounding pole is permanently connected to the housing. The grounding pole shall make contact before the line poles are engaged when the plug is connected to the receptacle housing. The plug sleeve shall also make contact with the receptacle housing before the line and load poles make contact. Receptacles shall be provided complete with cast back box, angle adapter, gaskets, and a gasketed screw-type, weathertight cap with chain fastener. Each receptacle shall be provided with one plug. Receptacles shall be Crouse-Hinds "Arktite," Appleton "Powertite," or equal.

E. RECEPTACLES FOR HAZARDOUS AREAS:

(NOT IN CONTRACT)

2.03 SWITCHES

A. GENERAL PURPOSE:

General purpose switches shall be quiet AC type, specification grade, and shall be provided in accordance with rated capacities as required. Switches shall match receptacles in color. Switches shall be manufactured by General Electric Co., Hubbell, or equal, as follows:

	<u>15A, 120-277V</u>		<u>20A, 120-277V</u>	
	<u>G.E. Co.</u>	<u>Hubbell</u>	<u>G.E. Co.</u>	<u>Hubbell</u>
Single:	GE5931	1201	GE5951	1221
Three-way:	GE5933	1203	GE5953	1223
Four-way:	GE5934	1204	GE5954	1224
SPST momentary:	GE5953	1206		

B. SWITCHES FOR HAZARDOUS AREAS:

(NOT IN CONTRACT)

2.03 C.

C. SWITCHES FOR WEATHER-EXPOSED OR CORROSIVE AREAS:

Maintained contact switches shall be the presswitch type as manufactured by Arrow Hart Co., Hubbell, or equal.

Switches shall be mounted in "FS" type copper-free aluminum or PVC mounting boxes with weatherproof Hypalon or neoprene cover plates.

Momentary contact switches shall be the same as specified for general purpose except a Crouse-Hinds DS181, Appleton FSK-1V, or equal, weatherproof cast device plate as specified in paragraph 2.04 shall be used.

Receptacles and switches shall be provided with weatherproof lift covers.

2.04 DEVICE PLATES

Device plates shall be provided with switches. In noncorrosive indoor areas, receptacle device plates shall be made of sheet steel, zinc electroplated with chrome finish as manufactured by Crouse-Hinds, Appleton, or equal.

Device plates in corrosive or outdoor areas shall be copper-free aluminum with neoprene gasket and corrosion-resistant metallic hardware. Device plates for explosionproof equipment shall be factory provided with the equipment.

Device plates shall be provided with engraved laminated phenolic nameplates with 1/8-inch white characters on black background.

Nameplates for switches shall identify panel and circuit number and area served. Nameplates for receptacles shall identify circuit and also voltage if other than 120 volts, single phase.

2.05 PLUG STRIPS

(NOT IN CONTRACT)

PART 3 - EXECUTION

The location of outlet boxes shall be determined as specified in Section 16000.

Boxes shall be independently and securely supported by galvanized brackets, expansion bolts, toggle bolts, or machine or wood screws as required. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure boxes, nor shall welding or brazing be used for attachment.

Receptacles and switches provided in architecturally finished areas shall be flush mounted in sheet steel outlet boxes. Other receptacles and switches in nonhazardous areas shall be mounted in cast metal boxes and provided as specified. Receptacles in hazardous areas shall be mounted in metal boxes, which are part of the receptacle assemblies.

Receptacle boxes shall be mounted 18 inches above the floor in architecturally finished areas and 48 inches above the floor in other areas. Switch boxes shall be mounted 48 inches above the floor. Blank covers shall be provided for unused openings.

****END OF SECTION****

SECTION 16175

MISCELLANEOUS ELECTRICAL DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies miscellaneous electrical devices consisting of motor and circuit disconnect switches, manual starters, control stations and appurtenances.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
NEMA ICS-1978	Industrial Controls and Systems
NEMA KS-1975	Enclosed Switches

1.03 INFORMATION TO BE PROVIDED

Operation and maintenance items 2 through 9 as specified in Section 01730 shall be provided to the Construction Manager.

1.04 SUBMITTALS

Abbreviations used on nameplates shall be submitted in accordance with Section 01300.

PART 2 - PRODUCTS

2.01 LOW VOLTAGE DISCONNECT SWITCHES

Switches shall be heavy-duty, nonfusible, safety type. Unless otherwise specified, enclosures shall be NEMA 12, dust-tight, except in outdoor areas which shall be NEMA 4. Switch enclosures located in classified areas shall be suitable for the location. The operating handle shall have positions that are easily recognizable and padlockable in the "off" position. The operator shall be a nontearable, positive, quick-make, quick-break mechanism. Switch mechanisms shall be provided with one auxiliary contact rated B-150, per NEMA ICS.

2.01

Switches shall be UL listed, horsepower rated for motors, and meet NEMA KS 1. Switches shall be provided with defeatable door interlocks that prevent the door from opening when the operating handle is in the "on" position. Heavy-duty switches shall have line terminal shields. Switches shall be Westinghouse Type H-600, General Electric Type TH, or equal.

2.02 MANUAL STARTERS

Manual starters shall consist of a quick-make, quick-break, toggle mechanism together with one or two overloads as specified. Unless specified otherwise, indoor enclosures shall be NEMA 1 and outdoor enclosures shall be NEMA 4.

2.03 CONTROL STATIONS

A. GENERAL:

Unless specified otherwise, control stations located indoors shall be heavy-duty industrial units with NEMA 13 oiltight and dust-tight cast aluminum enclosures. Control stations located outdoors shall be NEMA 4X of fiberglass reinforced high impact plastic, Allen Bradley 800 H series, Crouse-Hinds NCS series, or equal. Control stations located in hazardous classified areas shall be rated NEMA 9F or NEMA 7, Group A, B, C or D as specified.

Legend plates ("STOP," "AUTO," etc.) shall be as specified.

B. INDICATING LIGHTS:

Indicating lights shall be heavy-duty oiltight construction with colored lenses as specified.

AC indicating lights shall be transformer type with 6.3 volt lamps and shall be push-to-test type.

DC indicating lights shall be full voltage type.

C. CONTROL SWITCHES:

Pushbuttons and control switches shall be heavy-duty oiltight construction.

Selector switches requiring more than three contact blocks as standard industrial units shall be rotary switches, General Electric Type SB-1/SBM, Westinghouse Type W-2, or equal.

Unless otherwise specified, pushbutton operators shall be red for stop and emergency stop and black for other functions.

2.04 NAMEPLATES

Miscellaneous electrical devices shall be provided with laminated phenolic nameplates. Nameplates shall be black, with minimum 3/16-inch white letters. Nominal size shall be 3/4 inch high by 2 inches long. If abbreviations are required because of space limitations, abbreviations shall be submitted to the Construction Manager prior to manufacture.

PART 3 - EXECUTION

3.01 FIELD TESTING

Miscellaneous electrical devices shall be tested as specified in Section 16000.

****END OF SECTION****

SECTION 16450
GROUNDING SYSTEM

PART 1 - GENERAL

1.01 SCOPE

This section specifies the system for grounding electrical equipment, exposed nonenergized metal surfaces of equipment, and metal structures.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
NFPA No. 70-81	National Electric Code

PART 2 - PRODUCTS

2.01 CABLE

Ground cable shall be annealed bare copper, concentric stranded as specified. If cable sizes are not specified, the minimum sizes shall be as follows:

5 and 15 kV switchgear	4/0 AWG
15 kV - 5 kV transformers	4/0 AWG
5 kV - 480V transformers	4/0 AWG
480V switchgear	4/0 AWG
480V MCC and switchboards	2/0 AWG
Cable tray	2/0 AWG
Lighting panels	2 AWG
Exposed metal	2 AWG

2.02 GROUND RODS

Ground rods shall be copper covered steel, 3/4 inch diameter and 30 feet long. Rods shall have threaded type removable caps so that extension rods of same diameter and length may be added where necessary.

2.03 EXOTHERMIC CONNECTORS

Exothermic connectors shall be as manufactured by Thermoweld, Cadweld by Erico Products Inc., or equal.

2.04 BOLTED CONNECTORS

Bolted connectors shall be Burndy, O. Z. Gedney, or equal.

PART 3 - EXECUTION

3.01 GENERAL

Embedded and buried ground connections shall be made by exothermic connectors. Conductors and molds shall be prepared in accordance with the manufacturer's instructions. Exposed ground connections to equipment shall be made by bolted clamps unless otherwise specified. No solder shall be used in any part of the ground circuits.

Embedded ground cables and fittings shall be securely attached to concrete reinforcing steel with tie wires and prevented from displacement during concrete placement. As each part of the grounding system which is laid below finished grade is completed, the Construction Manager shall be notified 2 hours prior to backfilling.

Grounding conductors which are extended beyond concrete surfaces for later connection shall be extended a sufficient length to reach the final connection point without splicing. Minimum extension shall be 3 feet. Grounding conductors which project from a concrete surface shall be located as close as possible to a corner, protected by conduit, or terminated in a flush grounding plate. Exposed grounding conductors shall be supported by noncorrosive metallic hardware at 4-foot intervals or less.

Ground conductors, except signal conductor shields, entering enclosures shall be bonded together, to the enclosure if it is metallic, and to metallic raceways within or terminating at the enclosure. Prior to making ground connections or bonds, the metal surface at the point of connection shall be cleaned.

Compression-type lugs shall be used in accordance with manufacturer's recommendations.

Grounding conductor shall not be used as a system neutral.

Lightning arrestors shall be directly connected to the ground system using copper conductors, sized as specified.

Metallic sheaths or shields of shielded power cable shall be terminated by a copper grounding strip provided with cable connection for connection to the grounding system.

Grounding system shall be provided in compliance with NFPA No. 70.

3.02

3.02 RACEWAY GROUND

Metallic conduits shall be assembled to provide a continuous ground path. Conduits feeding loads greater than 25 horsepower or kilowatts shall contain an insulated ground conductor sized in compliance with NFPA No. 70. Metallic conduits shall be bonded using insulated grounding bushings. Grounding bushings shall be connected to the grounding system using conductors sized in compliance with NFPA No. 70. Nonmetallic conduits shall contain an insulated ground conductor sized in compliance with NFPA No. 70.

3.03 EQUIPMENT AND ENCLOSURE GROUND

Electrical and distribution equipment shall be connected to the grounding system. Cables shall be sized as specified in paragraph 2.01 and provided as specified on the drawings.

Nonelectrical equipment with metallic enclosures shall be connected to the grounding system.

3.04 GROUND SYSTEM RESISTANCE

The measured grounding system resistance shall be as specified in Section 16000.

3.05 GROUNDING SYSTEM TESTS

The Contractor shall test each grounding connection to determine the ground resistance at the end of the summer when the water table elevation is low. The grounding test shall be IEEE Std. 81. A plot of ground resistance readings for each isolated ground rod or ground mat shall be provided to the Construction Manager on 8-1/2 x 11 inch size graph paper. The current reference rod shall be driven at least 100 feet from the ground rod or grid under test. The measurements shall be made at 10-foot intervals beginning 25 feet from the test electrode and ending 75 feet from it, in direct line between the ground rod or center of grid and the current reference electrode.

A grounding system that shows greater than 2 ohm resistance for the flat portion of the plotted data shall be considered inadequately grounded. The Contractor shall determine the reason for the deficiency and make necessary corrections. The Contractor shall add additional parallel connected ground rods and/or deeper driven rods until the ground resistance measurements meet the 2 ohm requirement. Use of salts, water or compounds to attain the specified ground resistance is not acceptable.

****END OF SECTION****

SECTION 16460

DRY-TYPE TRANSFORMERS

PART 1 - GENERAL

1.01 SCOPE

This section specifies dry-type transformers used for step-down and isolation purposes.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
ANSI C89.1-72	Specialty Transformers (except general purpose)
ANSI C89.2-72	Dry Type Transformers for General Applications
NEMA ST20-72	Dry Type Transformers for General Applications
NEMA TR27-75	Commercial, Institutional, and Industrial Dry Type Transformers

1.03 INFORMATION TO BE PROVIDED

The following information shall be provided:

1. Manufacturer's certification that bracing and insulation for coils is capable of withstanding the specified short circuit condition.
2. Operation and maintenance information items 1 through 9 as specified in Section 01730.

PART 2 - PRODUCTS

2.01 GENERAL

Transformers rated 10 KVA and smaller shall be single phase unless otherwise specified. Transformers rated 15 KVA and greater

2.01

shall be 3 phase unless otherwise specified. Transformers shall conform to ANSI C89.1, ANSI C89.2, NEMA ST20, and NEMA TR27 depending on KVA rating.

2.02 INSULATION

A. HIGH VOLTAGE, 600V OR LESS

Transformers rated 2 KVA and less shall be provided with an insulation system rated for an 80 degree C temperature rise (150 degree C rated). Transformers 3 KVA through 30 KVA shall be provided with a 115 degree C temperature rise (185 degree C rated) insulation system. Transformers rated greater than 30 KVA shall be provided with a 150 degree C temperature rise (220 degree C rated) insulation. Insulation shall be of the fire-resistant type.

B. HIGH VOLTAGE, 601V OR GREATER

(NOT IN CONTRACT)

2.03 COILS

Coils shall be copper and shall be encapsulated to comply with sound level requirements of ANSI C89.1 and C89.2. Coils shall be braced and insulated to withstand a short circuit equal to 25 times full load current for 2 seconds.

2.04 WINDING CONFIGURATION

High voltage windings shall be delta connected. Low voltage windings shall be star connected with the neutral brought out. Provisions shall be made to permit separate grounding of the neutral and the enclosure.

2.05 TRANSFORMER TAPS

Transformers shall be provided with two 2-1/2 percent taps above and below rated voltage on the high voltage winding.

2.06 TERMINAL COMPARTMENTS

Terminal compartments shall be sized to permit termination of cables specified. Terminal compartments for windings rated greater than 60 KV shall be sized to permit the installation of stress cones where specified.

2.07 ENCLOSURES

Transformers rated 30 KVA and smaller shall be provided with UL-approved weatherproof nonventilated enclosures.

Transformers rated greater than 30 KVA shall be provided with UL-approved drip-proof ventilated enclosures.

PART 3 - EXECUTION

3.01 GENERAL

Transformer enclosures and neutrals shall be grounded.

3.02 FACTORY TESTS

Transformers shall be tested in accordance with NEMA ST20 and NEMA TR27 depending on KVA rating.

3.03 ACCEPTANCE TESTS

Transformers shall be tested as specified in Section 16000.

END OF SECTION

SECTION 16470

LIGHTING AND POWER DISTRIBUTION PANELBOARDS

PART 1 - GENERAL

1.01 SCOPE

This section specifies panelboards for lighting and power distribution.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Item</u>
NFPA 70-81	National Electrical Code
UL 67-79	Underwriters Laboratories, Electric Panelboards
UL 489-72	Underwriters Laboratories, Circuit Breakers, Molded Case and Circuit Breaker Enclosures

1.03 INFORMATION TO BE PROVIDED

The following information shall be provided:

1. Manufacturer's certification that bus bracing is capable of withstanding the specified short circuit condition.
2. Operation and maintenance information items 2 through 9 as specified in Section 01730.

PART 2 - PRODUCTS

2.01 GENERAL

Panelboards shall be circuit breaker, dead front type, with bus bar construction.

Panelboards shall be provided with panel back box, flush hinged door, cylinder door lock, bus bars, circuit breakers, directory and trim.

2.01

Panelboards shall conform to NFPA 70 and shall bear the UL label.

2.02 ARRANGEMENT AND CONSTRUCTION

Panelboard shall be steel, hot-dip galvanized after fabrication.

Panelboard shall be fabricated with top, bottom and side wiring gutters.

Panelboard shall be composed of individually mounted circuit breakers designed to be removable without disturbing other breakers.

A directory holder with clear plastic plate and metal frame shall be mounted on the inside of the door.

2.03 BUS

Bus shall be copper, sized in accordance with UL 67. Minimum bus size shall be for 100 amperes. Bus and bracing shall be sized for the interrupting rating of the smallest circuit breaker in the panel.

Panelboards shall be provided with a separate ground bus and, where specified, with a full capacity neutral bus.

2.04 CIRCUIT BREAKERS

Circuit breakers shall be molded-case type provided for the current ratings and pole configurations specified. Circuit breakers rated 120/208 volt and 120/240 volt alternating current shall have a minimum interrupting current rating of 10,000 amperes (symmetrical). Circuit breakers rated 277/480 volt alternating current shall have a minimum interrupting current rating of 22,000 amperes (symmetrical) or as specified.

Circuit breakers shall be bolt-in type.

Circuit breakers shall be UL approved for the service specified.

Load terminals of circuit breakers shall be solderless connectors.

2.05 FINISH

Panelboards shall be hot-dip galvanized after fabrication and then painted. Paint finish shall consist of one primer coat, one filler coat, and a finish coat of enamel. The color shall be Fed. Spec. 26306, light grey. Touch-up paint shall be provided with each panel.

3.01

PART 3 - EXECUTION

3.01 TESTING

Panelboards shall be tested in accordance with Section 16000.

PANEL BOARD: LOW VOLT MCC ROOM
 VOLTS: 208/120, 3PH, 4W, 3N. MAIN: 150AMPS CKT RKR
 MOUNTING: SURFACE CABLE ENTRY: BOTTOM DWG REF: E104

CKT	BREAKER		DESCRIPTION	LOAD-VA		
	A	P		A	B	C
1	20	1	LIGHTING-WORK SHOP	600	0	0
3	20	1	LIGHTING-WORK SHOP	0	600	0
5	20	1	LIGHTING-WORK SHOP	0	0	400
7	20	1	LIGHTING-RESTROOMS, LOCKER & SHOWER RMS	900	0	0
9	20	1	LIGHTING-OFFICE	0	600	0
11	20	1	LIGHTING-MCC ROOM	0	0	400
13	20	1	LIGHTING-EMER & EXITS	130	0	0
15	20	1	LIGHTING-BLDG EXTERIOR PHOTO CELL & TIMER	0	500	0
17	20	1	MCC ROOM SUPPLY FAN F198	0	0	670
19	20	1	SHOP EXH FAN F590	230	0	0
21	20	1	UTILITIES EXH FAN F490	0	230	0
23	20	1	SUMP PUMP P620	0	0	670
25	20	1	SPARE	600	0	0
27	20	1	SPARE	0	600	0
29	20	1	SPARE	0	0	600
31	20	1	SPARE	600	0	0
33	20	1	SPARE	0	600	0
35	20	1	SPARE	0	0	600
2	20	1	RECEPTACLES-WORK SHOP	900	0	0
4	20	1	RECEPTACLES-WORK SHOP	0	900	0
6	20	1	RECEPTACLES-OFFICE	0	0	1080
8	20	1	RECEPTACLES-MCC & RESTROOMS	1080	0	0
10	20	1	RECEPTACLES-BLDG EXT & CONVEYOR AREA	0	640	0
12	20	1	RECEPTACLES-CONVEYOR AREA	0	0	540
14	30	2	SUPPLY HEAT PUMP COMP CPR390	2500	2500	0
18	30	2	SUPPLY HEAT PUMP ELEC COIL & FAN HC390	2500	0	2500
22	20	2	SHOP RAD HEATER HTR591	0	1250	1250
26	20	1	SHOP SUPPLY FAN F588	670	0	0
28	20	2	SHOP RAD HEATER HTR592	0	1250	1250
32	20	1	SMOKE DETECTOR & HORN	200	0	0
34	20	1	SPARE	0	600	0
36	20	1	SPARE	0	0	600
PHASE TOTALS---VOLTAMPS				10910	10270	10560
TOTAL CONNECTED LOAD---VOLTAMPS				31740		
---AMPS				88		

16470-4

SECTION 16500

LIGHTING FIXTURES

PART 1 - GENERAL

1.01 SCOPE

This section specifies lighting fixtures which shall be wired, shall meet the requirements of NFPA No. 70, and shall bear the UL label.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
NFPA 70-81	National Electrical Code

1.03 SUBMITTALS

Proposals for substitution shall be submitted in accordance with Section 01300 and shall include the following:

- A. Polar plots on 8-1/2 x 11 inch paper providing candlepower vs. angle and foot-lamberts (brightness) vs. angle for longitudinal and transverse axis.
- B. Table of utilization factors for calculation of illumination levels by the zonal cavity method.
- C. Catalog information describing fixture make, materials and dimensions.

1.04 INFORMATION TO BE PROVIDED

The following items of operation and maintenance information as specified in Section 01730 shall be provided: 2,3,4,6,7,8 and 9.

PART 2 - PRODUCTS

2.01 BALLASTS

A. FLUORESCENT:

Ballasts for fluorescent lamps shall be nonleaking, filled with thermosetting compound, rated for 120 volt service as required.

2.01 A.

Two lamp ballasts shall be used where applicable. Ballasts for fixtures located in covered unheated areas and open areas shall be low temperature type. Ballasts shall be Class P, protected type, high power factor and shall carry the CBM and UL label. Ballasts shall be designed for case temperature lower than the nominal UL 90 degrees C requirement.

B. MERCURY VAPOR:

(NOT IN CONTRACT)

C. HIGH PRESSURE SODIUM:

Ballasts for high pressure sodium lamps shall be regulated high power factor type with copper windings. Starting current shall not exceed normal running current.

2.02 FIXTURE HANGERS:

Pendant mounted fixtures shall be supported from swivel fixture hangers. Fluorescent fixture stems shall be 1/2 galvanized conduit. Fixtures mounted on stems less than 12 inches long may be suspended rigidly.

2.03 LAMPS

A. GENERAL:

Spares shall be provided for lamps except medium base incandescent lamps less than 300 watts. Number of spares shall be equal to 5 percent of each rating type, with a minimum of one standard package.

B. FLUORESCENT:

Unless otherwise specified, fluorescent lamps shall be warm white.

C. MERCURY VAPOR:

(NOT IN CONTRACT)

2.04 PHOTOELECTRIC CELL UNITS

Photoelectric cell units shall consist of cadmium sulfide cell housed in a plug receptacle assembly. The plug receptacle assembly shall be three-prong polarized locking type. Assembly shall be suitable for outdoor mounting and shall be rated for 1800 VA at 120V maximum capacity.

PART 3 - EXECUTION

3.01 GENERAL

Fixtures labeled to require conductors with a temperature rating exceeding 75 degrees C shall be spliced to circuit conductors in a separately mounted junction box. Fixture shall be connected to junction box using flexible conduit with a temperature rating equal to that of the fixture.

Photoelectric cells shall be oriented toward the north.

Fluorescent vapor and high pressure sodium lamps and lamps which have been operated for more than half their rated life shall be replaced when the project is ready for acceptance.

Labels and marks, except the UL label, shall be removed from exposed parts of the fixtures. Fixtures shall be cleaned when the project is ready for acceptance.

Where recessed fixtures are required, the fixture shall be provided with mounting hardware for the ceiling system specified. Catalog numbers given on the fixture schedule shall not be used for selection of mounting hardware, but only as a reference to the type of fixture required. A concealed latch and hinge mechanism shall be provided to permit access to the lamps and ballasts and for removal and replacement of the diffuser without removing the fixture from ceiling panels. Fixtures recessed in concrete shall have protective coating of bituminous paint.

Fixtures shall be aligned and directed to illuminate an area as specified. Fixtures shall be directly and rigidly mounted on their supporting structures. Unless otherwise specified, conduit system shall not be used to support fixtures. Where brackets or supports for lighting fixtures are welded to steel members, the welded area shall be treated with rust-resistant primer and finish paint.

Lighting fixtures shall be grounded with conductor sized in accordance with NFPA No. 70. Insulation of the ground conductor shall be green.

3.02 LIGHTING FIXTURE SCHEDULE

<u>Type</u>	<u>Description</u>	<u>Mounting</u>	<u>Volts</u>	<u>Lamps</u>	<u>Mfg</u>
A	Fluorescent, industrial, 1'x4', 10% upright, porcelain enamel reflector, reinforcing ribs and baked enamel finish, HPF ballast.	Stem	120	2/40WRS	Benjamin #FL-1024-U or equal
B	Fluorescent, 1'x4', 20 gage die-formed housing, virgin acrylic diffuser, white baked enamel finish, w/end caps, HPF ballast.	Surface ceiling	120	2/40WRS	Benjamin #CD-2224-4 or equal
C	Incandescent, round, black canopy with snap-on opal diffuser.	Surface ceiling	120	1/100WIF	Prescolite #9424 or equal
D	Exit lights, with power pack unit, test switch and ready light, satin finish, single face, 6" stencil red letters w/white background.	Wall surface	120	2/40WT10	Benjamin #EXM-120 or equal
E	Emergency light, 6 volt Ni-cad battery with charger, pilot lights, test switch and meters with mtg bracket, walnut grain front.	Wall bracket	120	2/25W par 36	Light Alarms #2SN4VA & #MP-A mtg bracket or equal
F	HPS, one piece die cast aluminum housing, vandal-resistant Lexan refractor, totally enclosed, weatherproof.	Wall	120	70WHPS	General Electric #C583N507 or equal
G	Floodlight, HPS, heavy duty, die cast housing, NEMA beam 7x6, auto-reg. ballast, with bracket for pole mtg.	Pole	480	1000W HPS	General Electric #C537N509 or equal
	30'-0 pole, round tapered, galvanized steel, with anchor bolts and brackets for three Luminaires in a line.				General Electric #C790H63X or equal

END OF SECTION

SECTION 16920

600 VOLT MOTOR CONTROL CENTERS

PART 1 - GENERAL

1.01 SCOPE

This section specifies 600 volt motor control centers.

1.02 REFERENCES

This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
NEMA ICS 2-78	Industrial Control Devices, Controllers and Assemblies
NEMA ICS 3-78	Industrial Systems
NEMA ST 20-72	Dry Type Transformers for General Application
UL 845-80	Motor Control Centers

1.03 INFORMATION TO BE PROVIDED

The following information shall be provided:

1. Manufacturer's certification that the following items are capable of withstanding the specified short circuit condition:
 - a. Bus bar bracing
 - b. Feeder tap units
 - c. Starters
2. Operation and maintenance information items 1 through 9 as specified in Section 01730.

PART 2 - PRODUCTS

2.01 SERVICE

Motor control centers shall be rated 600 volts, 3 phase, 3 or 4 wire as specified, and shall be suitable for operation at the specified voltages and short circuit capacities.

2.02 A.

2.02 STRUCTURE AND ARRANGEMENT

A. STRUCTURE:

Motor control center shall be made of bolted No. 14 gage steel. A removable lifting angle shall be mounted on top and shall extend the width of the motor control center lineup.

Bottom channel sills shall be mounted front and rear of the vertical sections extending the full length of the motor control center lineup. Channel sills shall be removable.

B. ARRANGEMENT:

Motor control centers located in enclosed, protected areas shall have NEMA 1 enclosures; motor control centers exposed to the elements shall have NEMA-3R weatherproof walk-in enclosures with NEMA 1 motor control centers inside.

Motor control center sections shall have a 72-inch working height in front to accommodate up to six 12-inch compartments. Sections shall be 20 inches wide by 20 inches deep with a 90 inch height. Compartments shall have pan-type doors with quarter turn hold-down latches and neoprene gaskets. Doors for compartments with starter and feeder tap units shall be mechanically interlocked with the unit's disconnect device to prevent unintentional opening of the door while energized and unintentional application of power while the door is open.

Starters and feeder tap units shall be drawout plug-in construction with hardened, plated copper free-floating stabs, steel spring backups, and interference tabs which prevent door closure if unit is improperly installed. Units shall be latched to assure proper bus contact. Unit disconnect device and the motor control center structure shall also be interlocked to prevent removal or reinsertion of a unit when the disconnect is in the "ON" or "TRIPPED" positions.

Fusible switch or circuit breaker disconnect operators shall be capable of accommodating three padlocks for locking in the "open" position.

Hardware for mounting future starter and feeder tap units shall be provided at compartments specified as "future."

2.03 FINISH

Painted parts shall undergo a phosphatizing prepaint treatment for rust resistance and paint bond. Vertical sections and cover plates shall be painted with one coat of enamel; doors shall be painted Fed. Spec. 26306, light gray. Inside shall be white. Bus

2.03

support angles, control unit back plates, and top and bottom unit barrier plates shall be given one coat of white enamel. Paint shall be applied by electrostatic process and baked to a durable hard finish.

2.04 BUS

Bus shall be tin-plated copper with connections between vertical and horizontal power bus bars made with 3/8-inch bolts and conical dished steel washers. Access for tightening these connections shall be from the front, without the need for tools on the rear of the connection.

Unless otherwise specified, power bus shall be braced to withstand a minimum fault current of 22,000 amperes, symmetrical. Insulated horizontal and vertical bus barriers shall be provided. Barriers shall be fabricated from high strength, glass filled polyester resin.

A. HORIZONTAL BUS:

Unless otherwise specified, main horizontal bus shall be rated a minimum 600 amperes continuous and shall be mounted near the top of the motor control center.

B. VERTICAL BUS:

Unless otherwise specified, vertical bus shall be rated a minimum 300 amperes continuous.

C. NEUTRAL BUS:

Where specified, a full capacity neutral bus shall be provided. Neutral bus shall be mounted in close proximity to and rated the same as main horizontal bus.

D. GROUND BUS:

A 1/4-inch by 2-inch minimum ground bus shall be provided the full length of the motor control center. Ground bus shall be located at the bottom of the motor control center and shall contain lugs to terminate, as a minimum, two (one at each end of ground bus) No. 4/0 AWG bare copper ground conductors.

2.05 WIRING

A. GENERAL:

Motor control centers shall be provided with NEMA Class II, Type "B" wiring. Where specified, motor control center sections that contain centralized relay panels or solid state programmable logic controllers shall be provided with NEMA Class II, Type "C" wiring.

2.05 A.

Full height vertical wireway, 20 square inch minimum, shall be provided for each vertical motor control center section. Wireway shall contain full height removable doors. Horizontal wireways shall be provided top and bottom, extending the length of motor control centers.

B. POWER WIRE:

Power wire shall be copper 90 degrees C "MTW" insulated, sized to suit load; minimum power wire size shall be No. 12 AWG copper stranded.

C. CONTROL WIRE:

Control wire shall be copper 105 degrees C, "PVC" insulated, No. 14 AWG stranded.

D. TERMINALS AND CABLE CONNECTIONS:

1. TERMINALS: Terminals for use with stranded copper wire, sizes from No. 14 to No. 10 AWG, shall be ring or locking spade, crimp type, made from electrolytic copper, tin-plated.

Insulation for terminals shall be rated equal to or greater than the insulation rating of the conductor being terminated.

2. CABLE CONNECTORS: Cable connectors for use with stranded copper wire, sizes from No. 8 AWG to 1000 MCM, shall be UL listed as a compression connector, and shall be sized, one connector for one wire size. Dished conical washers shall be used for each bolted connection. Connectors shall be reusable and shall be rated for use with copper conductors.

E. CONDUCTOR MARKERS:

Markers used for identification shall be of the sleeve type made of solvent and heat resistant nylon or PVC. Markers shall be flame-resistant and shall tightly grip conductors. Legend's shall be 1/8 inch high, printed with a permanent, nonfading black ink.

2.06 MOTOR AND FEEDER BRANCH CIRCUIT PROTECTION

A. GENERAL:

Motor and feeder branch circuit protection shall consist of fused disconnect switches or molded case, magnetic only or thermal magnetic circuit breakers, as specified.

B. FUSED DISCONNECT SWITCHES:

Fused disconnect switches shall be used as branch circuit protection for motors and branch feeders and shall be equipped with visible knife blades, shielded line terminals and a quick-make, quick-break switch operator. Fuse clips shall be sized for UL standard, Class K or L, nonrenewable, time delay fuses. Unless otherwise specified, assembly shall have a minimum short circuit capacity of 50,000 amps, symmetrical. Fuse removal shall be readily accomplished with the use of fuse pullers.

C. MOLDED CASE MAGNETIC ONLY CIRCUIT BREAKERS:

Molded case magnetic only circuit breakers shall be used as branch circuit protection for motors only. Breakers shall be adjustable, instantaneous trip, designed specifically for the protection of motor branch circuits. Magnetic trip setting for the three circuit breaker poles shall be accomplished by a single dial with locking pin. Maximum trip setting shall be 1300 percent of motor full load current. Circuit breaker shall be set for a value 50 percent of full load current greater than the setting obtained as a minimum sealed-in setting by field operations. Minimum short circuit capacity when coordinated with the starter shall be 22,000 amps symmetrical.

D. MOLDED CASE THERMAL-MAGNETIC CIRCUIT BREAKERS:

Molded case thermal-magnetic circuit breakers shall be used as branch circuit protection for motors and branch feeders. Breakers shall be equipped with toggle type handle, quick-make, quick-break over center switching mechanism that is trip-free so that breaker cannot be held closed against short circuits and abnormal currents. Tripped position shall be clearly indicated by breaker handle maintaining a position between "ON" and "OFF." All poles shall open, close, and trip simultaneously. Minimum short circuit capacity shall be 22,000 amps symmetrical.

E. CONTROL FUSES:

Each control transformer shall be provided with a 1/4 by 1-1/4 inch time-delay, slow-blow secondary fuse rated to interrupt 10,000 amperes short circuit at 250 volts AC. Additionally, two 13/32 by 1-1/2 inch primary fuses rated to interrupt 200,000 amperes at 600 volts shall be provided on starters size 2 and larger. Secondary fuses shall be sized at 125 percent of the control transformer rating. Primary fuses shall be rated 600 percent of the control transformer rating.

Fuse holders for secondary fuses shall be drawout indicating type. Fuse holders for primary fuses shall be fuse clips with full barriers between fuses.

2.07 CONTROL TRANSFORMERS

Each combination motor control unit shall be provided with an individual control transformer rated for 480 to 240-120V, single phase, 2 wire, 60 Hz. The transformer shall be sized for the load it feeds but shall not be less than the minimum ratings tabulated as follows. Control circuit fuses shall be as described in paragraph 2.06 E.

<u>Starter</u>	<u>Minimum transformer volt-ampere rating</u>
Size 1	100
Size 2	150
Size 3	200
Size 4	300

2.08 STARTERS

A. CONTACTORS:

Contactors shall be full voltage, 3-pole, 600 volt AC, NEMA size 1 minimum. Contacts shall be double break, silver-cadmium oxide, and weld resistant. Contacts shall be isolated to prevent arcing.

Coils and magnets shall be of the plug-in, snap-out type, capable of being removed or replaced without special tools.

B. OVERLOAD RELAYS:

Overload relays shall be three-coil, bimetallic, manual reset, ambient compensating type.

C. TRANSIENT SURGE SUPPRESSORS:

Transient surge suppressors shall be provided in each starter. Suppressors shall be encapsulated, three component, solid state circuit, in a small package suitable for mounting directly to the starter coil. Additional panel space for suppressor shall not be required. Suppressors shall be rated 120V AC/DC.

D. AUXILIARY CONTACTS:

Starters shall be equipped with auxiliary contacts, rated 10 amperes at 120 volts AC. As a minimum, each starter shall be equipped with one normally open and one normally closed auxiliary contact in addition to a normally open seal-in contact.

2.09 DRY TYPE TRANSFORMERS

(NOT IN CONTRACT)

2.10 PANELBOARDS

(NOT IN CONTRACT)

2.11 RELAYS AND TIMERS

A. HEAVY-DUTY MAGNETIC RELAYS:

1. GENERAL: Heavy-duty magnetic relays shall be machine tool type with NEMA ICS 2 contact rating designation A600 (make 60 amperes and break 6 amperes at 120 volts AC, 0.35 lagging power factor; carry 10 amperes continuous; insulation level 600 volts).

2. CONTROL RELAYS (CR): Control relays shall be provided with a minimum of four field convertible poles. Where eight poles or less are specified on a relay, poles shall be operated by a single coil. Where more than eight poles are specified, one or more coils may be provided.

3. LATCHING RELAYS: Latching relays shall be held in the closed position by a permanent magnet after momentary energization of the closing coil (CC). Relay shall unlatch after momentary energization of the trip coil (TC).

4. TIMING RELAYS (TR). Timing relays shall be sealed head pneumatic type with time delays available from 0.1 seconds to 60 minutes. Each relay model shall be adjustable over a 10:1 timing range with a calibrated linear dial. Timing repeatability shall be within 5 percent or better for set time delays of less than 200 seconds and within 10 percent for set time delays greater than 200 seconds. Pneumatic timing relay shall be Square D.

Relays shall be provided with not less than two form-C timed contacts and one form-C instantaneous contact. Two additional form-C timed contacts shall be provided where required.

B. MOTOR DRIVEN TIMERS (TM):

Motor driven timers shall be ATC series 305D, Eagle series HP5, or equal, full-size plug-in units with timing ranges and wiring configuration as shown in the control diagram.

C. MINIATURE PLUG-IN RELAYS:

Relays shall be provided with 0.187 inch by 0.02 inch quick-connect terminals designed for 11-tab screw-terminal type sockets. Sockets shall be Agastat BTSAllSC, Potter and Brumfield 27E121,

2.11 C.

Square-D NR-8, or equal. Relay contacts for control circuits shall be rated not less than 10 amperes at 120 volts AC and at 30 volts DC. Contacts for signal circuits shall be gold flashed fine silver. Relays shall be UL or CSA approved.

Control relays shall be Potter and Brumfield KU, Square D Type KU, or equal. Three form-C contacts shall be provided on each relay.

Timing relays shall be solid state pulse count type utilizing a high frequency RC oscillator and integrated circuit counter for timing. Electrolytic capacitors shall not be utilized in the timing circuits. Time delays from 0.1 seconds to 48 hours shall be available with each timer model adjustable over a 20:1 minimum range. On-delay, off-delay, and single-shot timing modes shall be available. Timer shall reset in 0.03 seconds or less. Timer accuracy shall be plus or minus 2.0 percent with a supply voltage range of plus 10 to minus 15 percent of nominal rating and temperature range of minus 25 to plus 65 degrees C. Transient protection shall be 2500 volts or greater for 1 millisecond on 120 volt powered units. Two form-C contacts shall be provided on each relay.

Sensitive relays shall be similar to control relays and shall incorporate a solid state amplifier to provide operation on a 2.4 to 30 volt DC control signal and dropout at 0.5 volts minimum. Two form-C contacts shall be provided on each relay.

2.12 PROGRAMMABLE CONTROLLERS

(NOT IN CONTRACT)

2.13 CONTROL SWITCHES AND INDICATING LIGHTS

A. PUSHBUTTONS:

Pushbuttons shall be momentary or maintained contact, flush head, heavy-duty, oiltight, with red button for stop functions and black button for start functions. Pushbuttons shall be heavy-duty, oiltight rated at 600 volts, 10 amps continuous. Nameplate engravings shall be as specified.

B. SELECTOR SWITCHES:

Selector switches shall be maintained or spring return contacts, with operating knob, contact blocks and positions as required to perform the specified operations. Selector switches shall be heavy-duty, oiltight rated at 600 volts, 10 amps continuous. Nameplate engravings shall be as specified.

2.13 C.

C. INDICATING LIGHTS:

Indicating lights shall be 6-volt transformer type, heavy-duty, oiltight. Nameplate engravings and lens colors shall be as specified.

2.14 TERMINAL BLOCKS

Terminal blocks shall be heavy-duty, 10-24 stud type rated at 600V AC, 20 amperes minimum for control wiring and 30 amperes for power wiring. Terminal blocks shall be provided for external control conductors, and for power wiring from size 2 starters and smaller. Terminals shall be provided with integral marking strips and shall be plainly marked with conductor numbers as specified. Not more than one voltage shall be terminated on a given block. Outgoing conductors shall be connected to one side of terminal block and internal conductors connected to the other side.

Terminal blocks for control conductors carrying external power sources shall be disconnecting type.

2.15 NAMEPLATES

In addition to manufacturer's identification and warning labels, each unit shall be provided with an identification nameplate indicating motor name, motor number, and feeder number, as specified. Identification nameplates shall be laminated plastic with white letters on black background. Minimum size shall be 1 inch by 3 inches, and nameplates shall be attached by means of stainless steel threaded or self-tapping screws.

2.16 SPACE HEATERS AND THERMOSTATS

Where specified, motor control centers shall be provided with space heaters and thermostats to raise interior temperature to 45 degrees F whenever ambient temperature falls below 32 degrees F. Space heaters and thermostats shall be rated 120 volt AC and shall be wired to terminal blocks to facilitate the connection of an external power supply. Provisions shall be made to allow the space heaters to be energized without removing protective shipping packaging during storage on the job site.

PART 3 - EXECUTION

3.01 GENERAL

Motor control centers shall be level and otherwise provided as recommended by the manufacturer within the space limitations specified.

3.02 A.

3.02 TESTING

A. FACTORY TESTS:

Prior to shipping motor control centers, manufacturer shall test assembled units at factory, in accordance with NEMA standards.

B. FIELD TESTS:

Prior to energizing motor control centers, Contractor shall field test as specified in Section 16000.

END OF SECTION