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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**NOTICE TO CONTRACTORS
INSTRUCTIONS TO BIDDERS
GENERAL CONDITIONS
AND
SPECIAL PROVISIONS**

FOR BUILDING CONSTRUCTION IN

**SACRAMENTO COUNTY IN SACRAMENTO AT THE TRANSPORTATION LABORATORY 5900 FOLSOM
BOULEVARD**

CONTRACT NO. 03-2C8434

03-Sac-5501

Bids Open: February 27, 2008

Dated: December 31, 2007

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IMPORTANT SPECIAL NOTICES

- Attention is directed to Division 0.3, "Award and Execution of Contract," of these Special Provisions regarding submittal of insurance documents.

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DEPARTMENT OF TRANSPORTATION

NOTICE TO CONTRACTORS

CONTRACT NO. 03-2C8434

03-Sac-5501

Sealed proposals for the work shown on the plans entitled:

**STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROJECT PLANS FOR BUILDING
CONSTRUCTION IN SACRAMENTO COUNTY IN SACRAMENTO AT THE TRANSPORTATION
LABORATORY 5900 FOLSOM BOULEVARD**

will be received at the Department of Transportation, 1120 N Street, Room 0200, MS #26, Sacramento, CA 95814, until 2 o'clock p.m. on February 27, 2008, at which time they will be publicly opened and read in Room 0100 at the same address.

Proposal forms for this work are included in a separate book entitled:

**STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROPOSAL AND CONTRACT FOR
BUILDING CONSTRUCTION IN SACRAMENTO COUNTY IN SACRAMENTO AT THE TRANSPORTATION
LABORATORY 5900 FOLSOM BOULEVARD**

General work description: Major renovations and seismic retrofits to the Main Building.

This project has a goal of 3 percent Disabled Veteran Business Enterprise (DVBE) participation.

A prebid meeting is scheduled for 10:00 am, January 23, 2008, at Department of Transportation (Caltrans), Transportation Laboratory Facility (Translab), Main Building Entrance Lobby, 5900 Folsom Boulevard, Sacramento, CA 95819. This meeting is to inform DVBEs of subcontracting and material supply opportunities. Bidder's attendance at this meeting will be considered in determining the bidder's good faith effort to obtain DVBE participation.

Bids are required for the entire work described herein.

At the time this contract is awarded, the Contractor shall possess either a Class A license or Class B license or a combination of Class C licenses which constitutes a majority of the work.

The Contractor must also be properly licensed at the time the bid is submitted, except that on a joint venture bid a joint venture license may be obtained by a combination of licenses after bid opening but before award in conformance with Business and Professions Code, Section 7029.1.

This contract is subject to state contract nondiscrimination and compliance requirements pursuant to Government Code, Section 12990.

This project is subject to the State Small Business Preference, Non-Small Business Subcontractor Preference, and California Company Reciprocal Preference.

The District in which the work for this project is located has been incorporated into the Department's Northern Region. References in the Instructions to Bidders or the General Conditions or in the special provisions to the district shall be deemed to mean the Northern Region. The office of the District Director for the Northern Region is located at Marysville.

Inquiries or questions based on alleged patent ambiguity of the plans, specifications or estimate must be communicated as a bidder inquiry prior to bid opening. Any such inquiries or questions, submitted after bid opening, will not be treated as a bid protest.

Contract No. 03-2C8434

The Department will consider bidder inquiries only when made in writing and shall be submitted to CALTRANS North Region Construction Office by either E-mail or Fax:

E-mail: inquiry_nr_bid@dot.ca.gov
FAX Number: (530) 822-4324

Responses to the bidder will be posted on the Internet at:

www.dot.ca.gov/dist3/departments/construction/bidders/find_res.htm

Project plans, special provisions, and proposal forms for bidding this project can only be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, MS #26, Transportation Building, 1120 N Street, Sacramento, California 95814, FAX No. (916) 654-7028, Telephone No. (916) 654-4490. Use FAX orders to expedite orders for project plans, special provisions and proposal forms. FAX orders must include credit card charge number, card expiration date and authorizing signature. Project plans, special provisions, and proposal forms may be seen at the above Department of Transportation office and at the offices of the District Directors of Transportation at Irvine, Oakland, and the district in which the work is situated.

The successful bidder shall furnish a payment bond and a performance bond.

Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the county, or counties, in which the work is to be done have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project, available at the Labor Compliance Office at the offices of the District Director of Transportation for the district in which the work is situated, and available from the California Department of Industrial Relations' Internet Web Site at: <http://www.dir.ca.gov>. Future effective general prevailing wage rates which have been predetermined and are on file with the Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

DEPARTMENT OF TRANSPORTATION

Deputy Director Transportation Engineering

Dated December 31, 2007

LLS

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

**INSTRUCTIONS TO BIDDERS
AND
GENERAL CONDITIONS
FOR
BUILDING CONSTRUCTION**

October 2007

Issued by

DEPARTMENT OF TRANSPORTATION



Contract No. 03-2C8434

INSTRUCTIONS TO BIDDERS
SECTION 1
PROPOSAL REQUIREMENTS AND CONDITIONS

1-1.01 GENERAL

The bidder shall carefully examine the instructions contained herein and shall be satisfied as to the conditions with which the bidder must comply prior to bid and to the conditions affecting the award of contract.

These instructions form a part of the contract documents.

Attention is directed to Section 1-1.01, "General," of the General Conditions regarding the use of masculine gender pronouns in these Instructions to Bidders.

1-1.02 CONTRACTOR'S LICENSING LAWS

Attention is directed to the provisions of Chapter 9 of Division 3 of the Business and Professions Code concerning the licensing of contractors.

All bidders and contractors shall be licensed in conformance with the laws of this State and any bidder or contractor not so licensed is subject to the penalties imposed by those laws.

Attention is directed to the requirements in Public Contract Code Section 10164. In all projects where Federal funds are involved, the Contractor shall be properly licensed at the time the contract is awarded.

1-1.03 EXAMINATION OF PLANS, SPECIAL PROVISIONS AND SITE OF THE WORK

The bidder shall examine carefully the site of the work contemplated, the plans and special provisions and these Instructions to Bidders and contract forms therefor. The submission of a bid shall be conclusive evidence that the bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and scope of work to be performed, the quantities of materials to be furnished, and as to the requirements of these Instructions to Bidders, plans, special provisions, and the contract.

The submission of a bid shall also be conclusive evidence that the bidder is satisfied as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information was reasonably ascertainable from an inspection of the site and the records of exploratory work done by the Department as shown in the bid documents, as well as from the plans and special provisions made a part of the contract.

Where the Department has made investigations of site conditions, including subsurface conditions in areas where work is to be performed under the contract, bidders or contractors may, upon written request, inspect the records of the Department as to those investigations subject to and upon the conditions hereinafter set forth.

Where there has been prior construction by the Department or other public agencies within the project limits, records of the prior construction that are currently in the possession of the Department and which have been used by, or are known to, the designers and administrators of the project will be made available for inspection by bidders or contractors, upon written request, subject to the conditions hereinafter set forth. Those records may include, but are not limited to, as-built drawings, design calculations, foundation and site studies, project reports and other data assembled in connection with the investigation, design, construction and maintenance of those prior projects.

Inspection of the records of investigations and project records may be made at the office of the district in which the work is situated, or in the case of records of investigations related to structure work, at the Transportation Laboratory in Sacramento, California.

When a log of test borings or other record of geotechnical data obtained by the Department's investigation of surface and subsurface conditions is included with the contract plans, it is furnished for the bidders' or Contractor's information and its use shall be subject to the conditions and limitations set forth in this Section 1-1.03.

In some instances, information considered by the Department to be of possible interest to bidders or contractors has been compiled as "Materials Information." The use of the "Materials Information" shall be subject to the conditions and limitations set forth in this Section 1-1.03.

The availability or use of information described in this Section 1-1.03 is not to be construed in any way as a waiver of the provisions of the first paragraph in this Section 1-1.03 and bidders and contractors are cautioned to make independent investigations and examinations as they deem necessary to be satisfied as to conditions to be encountered in the performance of the work.

The Department assumes no responsibility for conclusions or interpretations made by a bidder or contractor based on the information or data made available by the Department. The Department does not assume responsibility for representation made by its officers or agents before the execution of the contract concerning surface or subsurface conditions, unless that representation is expressly stated in the contract.

No conclusions or interpretations made by a bidder or contractor from the information and data made available by the Department will relieve a bidder or contractor from properly fulfilling the terms of the contract.

1-1.04 PROPOSAL FORMS

The Department will furnish to each bidder a standard proposal form, which, when filled out and executed may be submitted as that bidder's bid. Bids not presented on forms so furnished, and copies or facsimiles of the bidder's completed and executed proposal forms submitted as a bid will be rejected.

The proposal form is bound together with the contract in a book entitled "Proposal and Contract." The proposal shall set forth the bid price, in clearly legible figures, in the space provided, and shall be signed by the bidder, who shall fill out all blanks in the proposal form as therein required.

The proposal shall be submitted as directed in the "Notice to Contractors" under sealed cover plainly marked as a proposal, and identifying the project to which the proposal relates and the date of the bid opening therefor. Proposals which are not properly marked may be disregarded.

All proposal forms other than for "District Opening" projects shall be obtained from the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, California 95814, or as otherwise designated in the "Notice to Contractor."

Proposals for "District Opening" projects shall be made on forms obtained from the District Director of Transportation in whose district the work is to be performed, but in all other respects the provisions in this Section 1-1.04 shall apply.

1-1.05 REQUIRED LISTING OF PROPOSED SUBCONTRACTORS

Each proposal shall have listed therein the name and address of each subcontractor to whom the bidder proposes to subcontract portions of the work in an amount in excess of one-half of one percent of the total bid, in conformance with the Subletting and Subcontracting Fair Practices Act, commencing with Section 4100 of the Public Contract Code. The bidder's attention is invited to other provisions of the Act related to the imposition of penalties for a failure to observe its provisions by using unauthorized subcontractors or by making unauthorized substitutions.

A sheet for listing the subcontractors, as required herein, is included in the "Proposal and Contract" book.

1-1.06 STATE EMPLOYEES AND DESIGN ENGINEERS MAY NOT BID ON CONSTRUCTION CONTRACTS

No employee of the State shall be eligible to submit a proposal for, nor to subcontract for any portion of, nor to supply any materials for any contract administered by the Department.

No engineering or architectural firm which has provided design services for a project shall be eligible to submit a proposal for the contract to construct the project nor to subcontract for any portion of the work. The ineligible firms include the prime contractor for design, subcontractors of portions of the design, and affiliates of either. An affiliate is a firm which is subject to the control of the same persons, through joint ownership or otherwise.

1-1.07 PREVIOUS DISQUALIFICATION, REMOVAL OR OTHER PREVENTION OF BIDDING

Pursuant to Section 10162 of the Public Contract Code the bidder shall complete, under penalty of perjury, the questionnaire in the Proposal relating to previous disqualification, removal or other prevention of bidding of the bidder, or officers or employees of the bidder because of violation of law or a safety regulation.

A bid may be rejected on the basis of a bidder, any officer of the bidder, or any employee of the bidder who has a proprietary interest in the bidder, having been disqualified, removed, or otherwise prevented from bidding on, or completing a Federal, State, or local project because of a violation of law or a safety regulation.

1-1.08 PROPOSAL GUARANTY

All bids shall be presented under sealed cover and accompanied by one of the following forms of bidder's security:

Cash, a cashier's check, a certified check, or a bidder's bond executed by an admitted surety insurer, made payable to the Department.

The security shall be in an amount equal to at least 10 percent of the amount bid. A bid will not be considered unless one of the forms of bidder's security is enclosed with it.

The bidder's bond shall conform to the bond form in the book entitled "Proposal and Contract" for the project and shall be properly filled out and executed. The bidder's bond form included in that book may be used. Upon request, "Bidder's Bond" forms may be obtained from the Department of Transportation.

1-1.09 COMPLIANCE WITH ORDERS OF THE NATIONAL LABOR RELATIONS BOARD

Pursuant to Public Contract Code Section 10232, the Contractor shall swear by a statement, under penalty of perjury, that no more than one final, unappealable finding of contempt of court by a Federal court has been issued against the Contractor within the immediately preceding 2-year period because of the Contractor's failure to comply with an order of a Federal court which orders the Contractor to comply with an order of the National Labor Relations Board. For purposes of Section 10232 a finding of contempt does not include any finding which has been vacated, dismissed, or otherwise removed by the court because the Contractor has complied with the order which was the basis for the finding. The State may rescind any contract in which the Contractor falsely swears to the truth of the statement required by Section 10232.

The statement required by Public Contract Code Section 10232 is on the page preceding the signature page of the Proposal.

1-1.10 WITHDRAWAL OF PROPOSALS

Any bid may be withdrawn at any time prior to the date and time fixed for the opening of bids only by written request for the withdrawal of the bid filed at the location at which the bid was received by the Department. The request shall be executed by the bidder or the bidder's duly authorized representative. The withdrawal of a bid does not prejudice the right of the bidder to file a new bid. Whether or not bids are opened exactly at the time fixed for opening bids, a bid will not be received after that time, nor may any bid be withdrawn after the time fixed for the opening of bids.

1-1.11 PUBLIC OPENING OF PROPOSALS

Proposals will be opened and read publicly at the time and place indicated in the Notice to Contractors. Bidders or their authorized agents are invited to be present.

1-1.12 REJECTION OF PROPOSALS

Proposals may be rejected if they have been transferred to another bidder, or if they show any alterations of form, additions not called for, conditional bids, incomplete bids, erasures, or irregularities of any kind.

When proposals are signed by an agent, other than the officer or officers of a corporation authorized to sign contracts on its behalf or a member of a partnership, a "Power of Attorney" must be on file with the Department prior to opening bids or shall be submitted with the proposal; otherwise, the proposal may be rejected as irregular and unauthorized.

1-1.13 COMPETITIVE BIDDING

If more than one proposal be offered by any individual, firm, copartnership, corporation, association, or any combination thereof, under the same or different names, all of those proposals may be rejected. A party who has quoted prices on materials or work to a bidder is not thereby disqualified from quoting prices to other bidders, or from submitting a bid directly for the materials or work.

All bidders are put on notice that any collusive agreement to control or affect the awarding of this contract is in violation of the competitive bidding requirements of the State Contract Act and the Business and Professions Code and may render void any contract let under those circumstances.

1-1.14 RELIEF OF BIDDERS

Attention is directed to the provisions of Public Contract Code Sections 5100 to 5107, inclusive, concerning relief of bidders and in particular to the requirement therein, that if the bidder claims a mistake was made in the bid presented, the bidder shall give the Department written notice within 5 days after the opening of the bids of the alleged mistake, specifying in the notice in detail how the mistake occurred.

1-1.15 INELIGIBILITY TO CONTRACT

Public Contract Code Section 10285.1 provides as follows:

Any State agency may suspend, for a period of up to three years from the date of conviction, any person from bidding upon, or being awarded, a public works or services contract with the agency under this part or from being a subcontractor at any tier upon the contract, if that person, or any partner, member, officer, director, responsible managing officer, or responsible managing employee thereof, has been convicted by a court of competent jurisdiction of any charge of fraud, bribery, collusion, conspiracy, or any other act in violation of any State or Federal antitrust law in connection with the bidding upon, award of, or performance of, any public works contract, as defined in Section 1101, with any public entity, as defined in Section 1100, including, for the purposes of this article, the Regents of the University of California or the Trustees of the California State University. A State agency may determine the eligibility of any person to enter into a contract under this article by requiring the person to submit a statement under penalty of perjury declaring that neither the person nor any subcontractor to be engaged by the person has been convicted of any of the offenses referred to in this section within the preceding three years.

A form for the statement required by Section 10285.1 is included in the Proposal.

SECTION 2

AWARD AND EXECUTION OF CONTRACT

2-1.01 AWARD OF CONTRACT

The right is reserved to reject any and all proposals. The award of the contract, if it be awarded, will be to the lowest responsible bidder whose proposal complies with all the requirements prescribed. The award, if made, will be made within 30 days after the opening of the proposals. This period will be subject to extension for any further period as may be agreed upon in writing between the Department and the bidder concerned.

2-1.02 RETURN OF PROPOSAL GUARANTIES

The proposal guaranties accompanying the proposals of the first, second and third lowest responsible bidders will be retained until the contract has been finally executed, after which all those proposal guaranties, except bidders' bonds and any guaranties which have been forfeited, will be returned to the respective bidders whose proposals they accompany. The proposal guaranties, other than bidder's bonds, submitted by all other unsuccessful bidders will be returned upon determination, by the Department, of the first, second and third lowest responsible bidders.

2-1.03 CONTRACT BONDS

The successful bidder shall furnish the 2 bonds required by the State Contract Act. One bond shall secure the payment of the claims of laborers, mechanics or materialmen employed on the work under the contract and the other bond shall guarantee the faithful performance of the contract. The bond forms will be furnished to the successful bidder by the Department.

Except as otherwise provided in Section 3248 of the Civil Code and Section 30154 of the Streets and Highways Code, the payment bond shall be in a sum equal to the contract price and the performance bond shall be in a sum equal to at least one-half of the contract price.

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

2-1.04 INSURANCE POLICIES

The successful bidder shall submit:

1. Copy of its commercial general liability policy and its excess policy or binder until such time as a policy is available, including the declarations page, applicable endorsements, riders, and other modifications in effect at the time of contract execution. Standard ISO form No. CG 0001 or similar exclusions are allowed if not inconsistent with Section 5-1.03, "Indemnification and Insurance." Allowance of additional exclusions is at the discretion of the Department.
2. Certificate of insurance showing all other required coverages. Certificates of insurance, as evidence of required insurance for the auto liability and any other required policy, shall set forth deductible amounts applicable to each policy and all exclusions that are added by endorsement to each policy. The evidence of insurance shall provide that no cancellation, lapse, or reduction of coverage will occur without 10 days prior written notice to the Department.

3. A declaration under the penalty of perjury by a certified public accountant certifying the accountant has applied Generally Accepted Accounting Principles (GAAP) guidelines confirming the successful bidder has sufficient funds and resources to cover any self-insured retentions if the self-insured retention is \$50,000 or higher.

If the successful bidder uses any form of self-insurance for workers compensation in lieu of an insurance policy, it shall submit a certificate of consent to self-insure in accordance with the provisions of Section 3700 of the Labor Code.

2-1.05 EXECUTION OF CONTRACT

The contract shall be signed by the successful bidder and returned, together with the contract bonds and the documents identified in Section 2-1.04, "Insurance Policies," within 10 business days of receiving the contract for execution.

2-1.06 FAILURE TO EXECUTE CONTRACT

Failure of the lowest responsible bidder, the second lowest responsible bidder, or the third lowest responsible bidder to execute the contract as required in Section 2-1.05, "Execution of Contract," within 10 business days of receiving the contract for execution shall be just cause for the forfeiture of the proposal guaranty. The successful bidder may file with the Department a written notice, signed by the bidder or the bidder's authorized representative, specifying that the bidder will refuse to execute the contract if it is presented. The filing of this notice shall have the same force and effect as the failure of the bidder to execute the contract and furnish acceptable bonds within the time specified.

2-1.05 RETURN OF PROPOSAL GUARANTIES

The Department keeps the proposal guaranties of the 1st, 2nd and 3rd lowest responsible bidders until the contract has been executed. The other bidders' guaranties, other than bidders' bonds, are returned upon determination of the 1st, 2nd, and 3rd apparent lowest bidders, and their bidders' bonds are of no further effect.

GENERAL CONDITIONS

SECTION 1

DEFINITIONS AND TERMS

1-1.01 GENERAL

Unless the context otherwise requires, wherever in the specifications and other contract documents the following abbreviations and terms, or pronouns in place of them, appear in the contract documents, the intent and meaning shall be interpreted as provided in this Section 1.

Working titles having a masculine gender, such as "workman" and "journeyman" and pronouns, such as "he" and "himself", are utilized in these General Conditions, the Instructions to Bidders and the special provisions for the sake of brevity, and are intended to refer to persons of either gender.

The Department is gradually changing the style and language of the specifications. The new style and language includes:

1. Use of:
 - 1.1. Imperative mood
 - 1.2. Introductory modifiers
 - 1.3. Conditional clauses
2. Elimination of:
 - 2.1. Language variations
 - 2.2. Definitions for industry-standard terms
 - 2.3. Redundant specifications
 - 2.4. Needless cross-references

The use of this new style does not change the meaning of a specification not yet using this style.

The specifications are written to the Bidder before award and the Contractor after. Before award, interpret sentences written in the imperative mood as starting with "The Bidder must" and interpret "you" as "the Bidder" and "your" as "the

Bidder's." After award, interpret sentences written in the imperative mood as starting with "The Contractor must" and interpret "you" as "the Contractor" and "your" as "the Contractor's."

Unless an object or activity is specified to be less than the total, the quantity or amount is all of the object or activity.

All items in a list apply unless the items are specified as choices.

Interpret terms as defined in the Contract documents. A term not defined in the Contract documents has the meaning defined in Means Illustrated Construction Dictionary, Condensed Version, Second Edition.

1-1.02 ACCEPTANCE

The formal written acceptance by the Director of Transportation of an entire contract which has been completed in all respects in conformance with the contract documents and any modifications thereof previously approved.

1-1.03 ADDENDUM

A document or written communication issued by the Department during the bidding period which modifies, supersedes, or supplements the original contract documents.

1-1.04 BIDDER

Any individual, firm, partnership, corporation, or combination thereof, submitting a proposal for the work contemplated, acting directly, or through a duly authorized representative.

1-1.042 BUSINESS DAY

Day on the calendar except Saturday or holiday.

1-1.047 CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

The California Manual on Uniform Traffic Control Devices for Streets and Highways (California MUTCD) is issued by the Department of Transportation and is the Federal Highway Administration's MUTCD 2003 Edition, as amended for use in California. Part 6 of the California MUTCD, "Temporary Traffic Control," supersedes the Department's Manual of Traffic Controls.

1-1.05 CONTRACT

The written agreement covering the performance of the work and the furnishing of labor, materials, tools and equipment in the construction of the work. The contract shall include the notice to contractors, Instructions to Bidders, proposal, plans, General Conditions, special provisions and contract bonds; also any and all supplemental agreements amending or extending the work contemplated and which may be required to complete the work in a substantial and acceptable manner. Supplementary agreements are written agreements covering alterations, amendments, or extensions to the contract and include contract change orders.

1-1.06 CONTRACTOR

The person or persons, firm, partnership, corporation, or combination thereof, private or municipal, who have entered into a contract with the Department of Transportation, as party or parties of the second part or their legal representatives.

1-1.07 DAYS

Unless otherwise designated, days as used in the contract documents will be understood to mean calendar days.

1-1.075 DEDUCTION

Amount of money permanently taken from progress payment and final payment. Deductions are cumulative and are not retentions under Pub Cont Code § 7107.

1-1.08 DEPARTMENT

The Department of Transportation of the State of California, as created by law.

1-1.09 DIRECTOR

The executive officer of the Department of Transportation, as created by law.

1-1.10 ENGINEER

The Chief Engineer, Department of Transportation, acting either directly or through properly authorized agents, the agents acting within the scope of the particular duties delegated to them.

1-1.105 FEDERAL-AID CONTRACT

Contract that has a Federal-aid project number on the cover of the Notice to Contractors, Instruction to Bidders and General Conditions and Special Provisions.

1-1.11 GENERAL NOTES

The written instructions, provisions, conditions or other requirements appearing on the plans, and so identified thereon, which pertain to the performance of the work.

1-1.114 HOLIDAY

1. Every Sunday
2. January 1st, New Year's Day
3. 3rd Monday in January, Birthday of Martin Luther King, Jr.
4. February 12th, Lincoln's Birthday
5. 3rd Monday in February, Washington's Birthday
6. March 31st, Cesar Chavez Day
7. Last Monday in May, Memorial Day
8. July 4th, Independence Day
9. 1st Monday in September, Labor Day
10. 2nd Monday in October, Columbus Day
11. November 11th, Veterans Day
12. 4th Thursday in November, Thanksgiving Day
13. 4th Friday in November, Day after Thanksgiving Day
14. December 25th, Christmas Day

• If January 1st, February 12th, March 31st, July 4th, November 11th, or December 25th falls on a Sunday, the Monday following is a holiday. If November 11th falls on a Saturday, the preceding Friday is a holiday.

1-1.12 LABORATORY

The Division of Engineering Services - Materials Engineering and Testing Services and the Division of Engineering Services - Geotechnical Services of the Department of Transportation, or established laboratories of the various Districts of the Department, or other laboratories authorized by the Department to test materials and work involved in the contract. When a reference is made in the specifications to the "Transportation Laboratory," the reference shall mean the Division of Engineering Services - Materials Engineering and Testing Services and the Division of Engineering Services - Geotechnical Services, located at 5900 Folsom Boulevard, Sacramento, CA 95819, Telephone (916) 227-7000.

1-1.14 LIQUIDATED DAMAGES

The amount prescribed in the special provisions, pursuant to the authority of Public Contract Code Section 10226, to be paid to the State or to be deducted from any payments due or to become due the Contractor for each day's delay in completing the whole or any specified portion of the work beyond the time allowed in the special provisions.

1-1.146 OFFICES OF STRUCTURE DESIGN

The Offices of Structure Design of the Department of Transportation. When the specifications require working drawings to be submitted to the Offices of Structure Design, the drawings shall be submitted to: Offices of Structure Design, Documents Unit, Mail Station 9-4/4I, 1801 30th Street, Sacramento, CA 95816, Telephone (916) 227-8252.

1-1.15 PLANS

The official drawings including plans, elevations, sections, detail drawings, diagrams, plates, general notes, information and schedules thereon, or exact reproductions thereof, approved by the Engineer, which show the location, character, dimensions and details of the work to be performed. The plans include any drawings or plates bound within the special provisions.

1-1.16 PREMISES

The area of State-owned property which surrounds the work site, limited by the property lines thereof. In some cases the premises may coincide with the work site.

1-1.17 PROPOSAL

The offer of the bidder for the work when made out and submitted on the prescribed proposal form, properly signed and guaranteed.

1-1.18 PROPOSAL FORM

The approved form upon which the Department of Transportation requires formal bids be prepared and submitted for the work.

1-1.19 PROPOSAL GUARANTY

The cash, cashier's check, certified check, or bidder's bond accompanying the proposal submitted by the bidder, as a guaranty that the bidder will enter into a contract with the Department of Transportation for the performance of the work if the contract is awarded to the bidder.

1-1.20 SPECIAL PROVISIONS

The special provisions are specific clauses setting forth conditions or requirements of the work and supplementary to these General Conditions and the Instructions to Bidders. The Department of Transportation publication entitled Labor Surcharge And Equipment Rental Rates is to be considered as a part of the special provisions.

1-1.21 STATE

The State of California, including its agencies, departments, or divisions, whose conduct or action is related to the work.

1-1.22 STATE CONTRACT ACT

An act to regulate contracts for the erection, construction, alteration, repair or improvement of any state structure, building, road, or other State improvements of any kind, to be found in Chapter 1, Division 2 of the Public Contract Code.

1-1.225 WITHHOLD

Money temporarily or permanently taken from progress payment. Withholds are cumulative and are not retentions under Pub Cont Code § 7107.

1-1.23 WORK

The furnishing of all labor, and the furnishing and installing of all materials, articles, supplies and equipment as specified, designated, or required by the contract.

1-1.24 WORK SITE

The area of actual construction and the areas immediately adjacent thereto.

1-1.25 ABBREVIATIONS

AAMA	Architectural Aluminum Manufacturers' Association
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGA	American Gas Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
APA	American Plywood Association
APHA	American Public Health Association
API	American Petroleum Institute.
AREMA	American Railway Engineering and Maintenance-of-Way Association
ARI	American Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
AWPA	American Wood Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CBC	California Building Code
CEC	California Electrical Code
CMC	California Mechanical Code
CPC	California Plumbing Code
CS	Commercial Standards (US Department of Commerce)
EIA	Electronic Industries Association
ESO	Electrical Safety Orders
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
FS	Federal Specification
IEEE	Institute of Electrical and Electronics Engineers
ICBO	International Conference of Building Officials
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Board Fire Underwriters
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
NPCA	National Precast Concrete Association
PEI	Porcelain Enamel Institute
PS	Product Standard (US Department of Commerce)
RIS	Redwood Inspection Service
SCPI	Structural Clay Products Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SSPC	The Society for Protective Coatings
TCA	Tile Council of America
TPI	Truss Plate Institute
UBC	Uniform Building Code
UL	Underwriters' Laboratory
UPC	Uniform Plumbing Code
WCLB	Grade Stamp for WCLIB
WCLIB	West Coast Lumber Inspection Bureau (Grade Stamped WCLB)
WIC	Woodwork Institute of California

Units of Measurement

Some of the symbols for units of measurement used in the specifications are defined as follows. The symbols for other units of measurement used in the specifications are as defined in ASTM Designation: E-380, or in the various specifications and test referenced in the specifications.

Symbols as used in the Specifications	Definitions
A	amperes
feet	feet
g	gram
kg	kilogram
ha	hectare (10 000 m ²)
h	hour
J	joule
ksi	kips per square inch
L	liter
m	meter
km	kilometer
mm	millimeter
µm	micrometer
nm	nanometer
m ²	square meter
m ³	cubic meter
N	newton
N·m	newton meter
Ω	ohm
pcf	pounds per cubic foot
Pa	pascal
kPa	kilopascal
MPa	megapascal
s	second
ton	2,000 pounds
tonne	metric ton (1000 kg)
W	watt
V	volt

SECTION 2
CONTROL AND SCOPE OF THE WORK

2-1.005 General

Failure to comply with any specification part is a breach of the contract and a waiver of your right to time or payment adjustment.

After contract approval, submit documents and direct questions to the Engineer. Orders, approvals, and requests to the Contractor are by the Engineer.

The Engineer furnishes the following in writing:

1. Approvals
2. Notifications
3. Orders

The Contractor must furnish the following in writing:

1. Assignments
2. Notifications
3. Proposals
4. Requests, sequentially numbered
5. Subcontracts
6. Test results

The Department rejects a form if it has any error or any omission.

Convert foreign language documents to English.

Use contract administration forms available at the Department's Web site.

If the last day for submitting a document falls on a Saturday or holiday, it may be submitted on the next business day with the same effect as if it had been submitted on the day specified.

2-1.015 RECORD RETENTION, INSPECTION, COPYING, AND AUDITING

Retain project records and make them available for inspection, copying, and auditing by State representatives from bid preparation through:

1. Final payment
2. Resolution of claims, if any

For at least 3 years after the later of these, retain and make available for inspection, copying, and auditing cost records by State representatives including:

1. Records pertaining to bid preparation
2. Overhead
3. Payroll records and certified payroll
4. Payments to suppliers and subcontractors
5. Cost accounting records
6. Records of subcontractors and suppliers

Maintain the records in an organized way in the original format, electronic and hard copy, conducive to professional review and audit.

Before contract acceptance, the State representative notifies the Contractor, subcontractor, or supplier 5 days before inspection, copying, or auditing.

If an audit is to start more than 30 days after contract acceptance, the State representative notifies the Contractor, subcontractor, or supplier when the audit is to start.

2-1.01 AUTHORITY OF ENGINEER

The Engineer shall decide all questions which may arise as to the quality or acceptability of materials furnished and work performed and as to the manner of performance and rate of progress of the work; all questions which may arise as to the interpretation of the plans and special provisions; all questions as to the acceptable fulfillment of the contract on the part of the Contractor; and all questions as to compensation. The Engineer's decision shall be final, and the Engineer shall have authority to enforce and make effective those decisions and orders which the Contractor fails to carry out promptly. Failure to enforce a contract provision does not waive enforcement of any contract provision.

2-1.02 INTENT OF PLANS AND SPECIAL PROVISIONS

The intent of the plans and special provisions is to prescribe the details for the construction and completion of the work which the Contractor undertakes to perform in conformance with the terms of the contract. Where the plans or special provisions describe portions of the work in general terms, but not in complete detail, it is understood that only the best general practice is to prevail and that only materials and workmanship of the first quality are to be used. Unless otherwise specified, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals, and do all the work involved in executing the contract in a satisfactory and workmanlike manner. Nothing in the specifications voids the Contractor's public safety responsibilities.

2-1.03 CONTRACT COMPONENTS

A component in one contract part applies as if appearing in each. The parts are complementary and describe and provide for a complete work.

If a discrepancy exists:

1. The governing ranking of contract parts in descending order is:
 - 1.1. Special provisions
 - 1.2. Project drawings
 - 1.5. Amendments to the Instructions to Bidders and to the General Conditions
 - 1.6. Instructions to Bidders and General Conditions
 - 1.7. Project information
2. Written numbers and notes on a drawing govern over graphics
3. A detail drawing governs over a general drawing
4. A detail specification governs over a general specification
5. A specification in a section governs over a specification referenced by that section

If a discrepancy is found or confusion arises, request correction or clarification.

2-1.04 SHOP DRAWINGS, DESCRIPTIVE DATA, SAMPLES, AND ALTERNATIVES

It shall be the Contractor's responsibility to submit, so as to cause no delay in the work, all shop drawings, descriptive data, samples for the various trades as required by the special provisions, and offers of alternatives, if any. The submittals shall be checked and coordinated by the Contractor with the work of other trades involved before they are submitted to the Engineer for examination.

Submittals shall be delivered to the locations indicated in the special provisions.

Work requiring the submittal of shop drawings, descriptive data or samples shall not begin prior to approval of that submittal by the Engineer. Fifteen working days shall be allowed for approval or return for correction of each submittal or resubmittal. Approval of submittals shall not operate to waive any of the requirements of the plans and specifications or relieve the Contractor of any obligation thereunder, and defective work, materials and equipment may be rejected notwithstanding the approval of that submittal. Should the Engineer fail to complete his review within the time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review, an extension of time commensurate with the delay in completion of the work thus caused will be granted pursuant to the provisions in Section 6-1.08, "Liquidated Damages," of these General Conditions, and no additional compensation will be allowed for the delay.

Submittals shall be made by a letter of transmittal which shall contain a list of all matter submitted and identification of all variations from the plans and special provisions contained in the submittal. The letter and all items accompanying the same shall be fully identified as to project name and location, Contractor's name, district, county, and contract number, with ample cross references to the contract documents, to facilitate identification of items and their location in the work. Additional specific requirements shall be as follows:

Shop Drawings

The Contractor shall submit at least 5 copies of all shop drawings required by the special provisions. Two copies will be returned to the Contractor either approved for use or returned for correction and resubmittal. Shop drawings include any drawing which requires execution by a draftsman as distinguished from printed matter. The size of shop drawings shall be 22 inches x 34 inches (559 mm x 864 mm) or 11 inches x 17 inches (279 mm x 432 mm) in size.

Descriptive Data

The Contractor shall submit 5 copies of each set of manufacturer's brochures or other data required by the special provisions. The State will examine the submittals and return 2 copies either approved for use or returned for correction and resubmittal.

Samples

The Contractor shall submit samples of articles, materials or equipment as required by the special provisions. The work shall be in conformance with the approved samples. Samples shall be removed from State property when directed or may be incorporated in the work if approved by the Engineer. Samples not removed by the Contractor will become the property of the State or, at the State's option, will be removed or disposed of by the State at the Contractor's expense.

Alternatives

A reference to a specific brand or trade name establishes a quality standard and is not intended to limit competition. You may use a product that is equal to or better than the specified brand or trade name if approved.

Submit a substitution request within a time period that:

1. Follows Contract award
2. Allows 30 days for review
3. Causes no delay

Include substantiating data with the substitution request that proves the substitution:

1. Is of equal or better quality and suitability
2. Causes no delay in product delivery and installation

Approval of submittals by the Engineer shall not relieve the Contractor from responsibility for the successful completion of the work, nor shall it relieve the Contractor from responsibility for errors in the submittals. A failure by the Contractor to identify in the letter of transmittal, material deviations from the plans or specifications shall void the submittal and any action taken thereon by the Engineer. When specifically requested by the Engineer, the Contractor shall resubmit the shop drawings, descriptive data and samples as may be required.

If any mechanical, electrical, structural, or other changes are required for the proper installation and fit of alternative materials, articles, or equipment, or because of deviations from the contract plans and special provisions, the changes shall not be made without the approval of the Engineer and shall be made without additional cost to the State.

2-1.045 DIFFERING SITE CONDITIONS

During the progress of the work, if subsurface or latent physical conditions are encountered at the site differing materially from those indicated in the contract or if unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract, are encountered at the site, the party discovering those conditions shall promptly notify the other party in writing of the specific differing conditions before they are disturbed and before the affected work is performed.

Upon written notification, the Engineer will investigate the conditions, and if the Engineer determines that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any work under the contract, an adjustment, excluding loss of anticipated profits, will be made and the contract modified in writing accordingly. The Engineer will notify the Contractor of his determination whether or not an adjustment of the contract is warranted.

No contract adjustment which results in a benefit to the Contractor will be allowed unless the Contractor has provided the required written notice.

No contract adjustment will be allowed under the provisions specified in this section for any effects caused on unchanged work.

Any contract adjustment warranted due to differing site conditions will be made in conformance with the provisions in Section 3-1.01, "Changes," of these General Conditions, except as otherwise provided.

2-1.05 PRESERVATION AND CLEANING

The Contractor shall clean up the work at frequent intervals and at other times when directed by the Engineer. While finish work is being accomplished, floors shall be kept clean, free of dust, construction debris and trash. Upon completion of the work, the Contractor shall remove from the premises the Contractor's construction equipment and any waste materials not previously disposed of, leaving the premises thoroughly clean and ready for final inspection.

2-1.06 LIMITATIONS ON WORK SITE AND PREMISES

The Contractor shall limit the Contractor's construction operations to the work site unless otherwise shown on the plans or specified. The Contractor shall perform no operations of any nature over or on the premises except those operations as are authorized by the plans or special provisions, or as authorized by the Engineer.

2-1.07 SUPERINTENDENCE

The Contractor shall designate in writing before starting work, an authorized representative who shall have the authority to represent and act for the Contractor.

When the Contractor is comprised of 2 or more persons, firms, partnerships, or corporations functioning on a joint venture basis, the Contractor shall designate in writing before starting work, the name of one authorized representative who shall have the authority to represent and act for the Contractor.

The authorized representative shall be present at the site of the work at all times while work is actually in progress on the contract. When work is not in progress and during periods when work is suspended, arrangements acceptable to the Engineer shall be made for any emergency work which may be required.

Whenever the Contractor or the Contractor's authorized representative is not present on any particular part of the work where it may be desired to give direction, orders will be given by the Engineer, which shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which the orders are given.

Any order given by the Engineer, not otherwise required by the specifications to be in writing, will on request of the Contractor, be given or confirmed by the Engineer in writing.

2-1.08 CHARACTER OF WORKMEN

If any subcontractor or person employed by the Contractor shall appear to the Engineer to be incompetent or to act in a disorderly or improper manner, they shall be discharged immediately on the request of the Engineer, and that person shall not again be employed on the work.

2-1.09 INSPECTION

The Contractor shall at all times permit the Engineer and the Engineer's authorized agents to inspect the work or any part thereof. The Contractor shall maintain proper facilities and provide safe access for inspection by the Engineer to all parts of the work, and to the shops where the work is in preparation. Work shall not be covered up until authorized by the Engineer and the Contractor shall be solely responsible for notifying the Engineer where and when the work is in readiness for inspection and testing. Should any work be covered without authorization, it shall, if so ordered, be uncovered at the Contractor's expense.

Whenever the Contractor intends to perform work on Saturday or holiday, the Contractor shall give notice to the Engineer of the Contractor's intention 48 hours prior to performing that work, or a longer period as may be specified so that the Engineer may make necessary arrangements.

2-1.095 FINAL INSPECTION

When the work has been completed, the Engineer will make the final inspection.

2-1.10 REMOVAL OF REJECTED AND UNAUTHORIZED WORK

All work which has been rejected shall be remedied, or removed and replaced by the Contractor in a manner acceptable to the Engineer and no compensation will be allowed to the Contractor for the removal, replacement, or remedial work.

Any work done beyond the lines shown on the plans or established by the Engineer, or any work done without written authority will be considered as unauthorized work and will not be paid for. Upon order of the Engineer, unauthorized work shall be remedied, removed, or replaced at the Contractor's expense.

Upon failure of the Contractor to comply promptly with any order of the Engineer made under this Section 2-1.10, the Department may cause rejected or unauthorized work to be remedied, removed, or replaced, and the costs thereof will be deducted from any moneys due or to become due the Contractor.

2-1.11 COST REDUCTION INCENTIVE

The Contractor may submit to the Engineer, in writing, proposals for modifying the plans, special provisions or other requirements of the contract for the sole purpose of reducing the total cost of construction. The cost reduction proposal shall not impair, in any manner, the essential functions or characteristics of the project, including but not limited to service life, economy of operation, ease of maintenance, desired appearance, or design and safety standards.

Prior to preparing a cost reduction proposal, the Contractor shall request a meeting with the Engineer to discuss the proposal in concept and to determine the merit of the cost reduction proposal. Items of discussion will also include permit issues, impact on other projects, impact on the project schedule, peer reviews, and review times required by the Department and other agencies.

Cost reduction proposals shall contain the following information:

1. A description of both the existing contract requirements for performing the work and the proposed changes.
2. An itemization of the contract requirements that must be changed if the proposal is adopted.
3. A detailed estimate of the cost of performing the work under the existing contract and under the proposed change. The estimates of cost shall be determined in the same manner as if the work were to be paid for as a change in the work as provided in Section 3, "Changes in the Work," of these General Conditions.
4. A statement of the time within which the Engineer must make a decision thereon.
5. The contract work affected by the proposed changes, including any quantity variation attributable thereto.

The provisions of this Section 2-1.11 shall not be construed to require the Engineer to consider any cost reduction proposal which may be submitted hereunder; proposed changes in basic design will not be considered as an acceptable cost reduction proposal; and the Department will not be liable to the Contractor for failure to accept or act upon any cost reduction proposal submitted pursuant to this section nor for any delays to the work attributable to any cost reduction proposal. If a cost reduction proposal is similar to a change in the plans or special provisions, under consideration by the Department for the project, at the time the proposal is submitted or if the proposal is based upon or similar to standard special provisions adopted by the Department after the advertisement for the contract, the Engineer will not accept the proposal, and the Department reserves the right to make the changes without compensation to the Contractor under the provisions of this section.

The Contractor shall continue to perform the work in conformance with the requirements of the contract until an executed change order, incorporating the cost reduction proposal has been issued. If an executed change order has not been issued by the date upon which the Contractor's cost reduction proposal specifies that a decision thereon should be made, or such other date as the Contractor may subsequently have specified in writing, the cost reduction proposal shall be deemed rejected.

The Engineer shall be the sole judge of the acceptability of a cost reduction proposal and of the estimated net savings in construction costs from the adoption of all or any part of the proposal. In determining the estimated net savings, the right is reserved to disregard the schedules of values if, in the judgment of the Engineer, the schedule does not represent a fair measure of the value of work to be performed or to be deleted.

The Department reserves the right where it deems action is appropriate, to require the Contractor to share in the Department's costs of investigating a cost reduction proposal submitted by the Contractor as a condition of considering the proposal. Where this condition is imposed, the Contractor shall indicate acceptance thereof in writing, and that acceptance shall constitute full authority for the Department to deduct amounts payable to the Department from any moneys due or that may become due to the Contractor under the contract.

If the Contractor's cost reduction proposal is accepted in whole or in part the acceptance will be by a contract change order, which shall specifically state that it is executed pursuant to this Section 2-1.11. The change order shall incorporate the changes in the plans and special provisions which are necessary to permit the cost reduction proposal or that part of it as has been accepted to be put into effect, and shall include any conditions upon which the Department's approval thereof is based if the approval of the Department is conditional. The change order shall also set forth the estimated net savings in construction costs attributable to the cost reduction proposal effectuated by the change order, and shall further provide that the Contractor be paid 50 percent of that estimated net savings amount. The Contractor's cost of preparing the cost reduction incentive proposal and the Department's costs of investigating a cost reduction incentive proposal, including any portion thereof paid by the Contractor, shall be excluded from consideration in determining the estimated net savings in construction costs.

If a cost reduction proposal submitted by the Contractor, and subsequently approved by the Engineer, provides for a reduction in contract time, 50 percent of that contract time reduction shall be credited to the State by reducing the contract working days. Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions regarding the working days.

Acceptance of the cost reduction proposal and performance of the work thereunder shall not extend the time of completion of the contract unless specifically provided for in the contract change order authorizing the use of the cost reduction proposal.

The amount specified to be paid to the Contractor in the change order which effectuates a cost reduction proposal shall constitute full compensation to the Contractor for the cost reduction proposal and the performance of the work thereof pursuant to the change order.

The Department expressly reserves the right to adopt a cost reduction proposal for general use on contracts administered by the Department when it determines that the proposal is suitable for application to other contracts. When an accepted cost reduction proposal is adopted for general use, only the Contractor who first submitted that proposal will be eligible for compensation pursuant to this section, and in that case, only as to those contracts awarded to that Contractor prior to submission of the accepted cost reduction proposal and as to which the cost reduction proposal is also submitted and accepted. Cost reduction proposals identical or similar to previously submitted proposals will be eligible for consideration and compensation under the provisions of this Section 2-1.11 if the identical or similar previously submitted proposals were not adopted for general application to other contracts administered by the Department. Subject to the provisions contained herein, the State or any other public agency shall have the right to use all or any part of any submitted cost reduction proposal without obligation or compensation of any kind to the Contractor.

This Section 2-1.11 shall apply only to contracts awarded to the lowest bidder pursuant to competitive bidding.

SECTION 3

CHANGES IN THE WORK

3-1.01 CHANGES

The Department reserves the right to order changes in the contract at any time prior to the acceptance of the work by the Director, and the Contractor shall comply with the ordered changes. Changes or deviations from the contract shall not be made without authority in writing from the Engineer, and changes to the work without the Engineer's written approval will be considered unauthorized work and will not be paid for.

On the basis set forth in this Section 3, the contract lump sum price will be adjusted for any ordered change which results in a change in the cost of the work.

When ordered by the Engineer, the Contractor shall halt work in the area affected by a proposed change. Whenever it appears to the Contractor that a change is necessary, the Contractor shall immediately notify the Engineer of the reasons for that change; however, work in the area affected shall not be discontinued unless ordered by the Engineer.

For any approved change in the work, the Contractor shall be entitled to an adjustment in time equal to the number of working days which completion of the entire work is delayed due to the changed work, and the State will be entitled to an adjustment in time equal to the number of working days which completion of the entire work is advanced due to the changed work. For ordinary changes, the Contractor's cost estimate for the changed work shall state the amount of extra time, if any, that the Contractor considers should be allowed for making the requested change. Failure to request additional time when submitting the estimate, or failure to submit the estimate, shall constitute a waiver of the right to later claim any adjustment in time based upon changed work. For ordinary changes which decrease the amount of work and for indeterminate type changes, an adjustment in time commensurate with the changed work will be determined by the Engineer. Disagreement as to time adjustments shall not affect contract price adjustments, nor shall it be cause for not proceeding with the changed work

when ordered by the Engineer. The Contractor shall have the right, however, to further pursue a time adjustment in the event agreement is not reached.

3-1.01A Ordinary Changes

The Engineer will notify the Contractor in writing of any proposed changes and describe the intended change. Within 15 days after receipt of a written request, the Contractor shall submit his proposed price to be added or deducted from the contract price due to the change. The Contractor's proposed price to be added to or deducted from the contract price shall be supported by detailed estimates of cost prepared by the Contractor. The Contractor shall also provide information to support any request for an adjustment in contract time which is directly attributable to the changed work. The Contractor shall, upon request by the Engineer, permit inspection of his original contract estimate, subcontract agreements or purchase orders relating to the change.

If agreement is reached on the adjustment in compensation as provided in Section 3-1.01C, "Agreed Cost for Changes," of these General Conditions, the Contractor shall proceed with the work at the agreed price.

If the Contractor and the Engineer fail to agree as to the adjustment in compensation for the performance of the changed work, the Contractor, upon written order from the Engineer, shall proceed immediately with the changed work and the contract price will be adjusted in conformance with the provisions in Section 3-1.01D, "Failure to Agree to the Cost of Changes," of these General Conditions.

If the Contractor fails to submit his cost estimate within the specified 15 day period, the specified period may be extended in writing by the Engineer. If the Engineer does not so extend the specified period, or if the Contractor fails to submit his cost estimate within the extended time period, the Contractor shall commence the work immediately upon receipt of written order from the Engineer and the contract price will be adjusted in conformance with the provisions in Section 3-1.01D, "Failure to Agree to the Cost of Changes," of these General Conditions.

3-1.01B Indeterminate Type Changes

Changes in the work of a kind where the cost of the work cannot be determined until completed, may be authorized by the Engineer in writing. The written order shall state that it is issued pursuant to this Section 3-1.01B. Upon receipt of a written order from the Engineer, the Contractor shall proceed with the ordered work and the contract price will be adjusted in conformance with the provisions in Section 3-1.01D, "Failure to Agree to the Cost of Changes," of these General Conditions.

3-1.01C Agreed Cost For Changes

If the Engineer and the Contractor agree as to the adjustment in compensation for the performance of changed work on the basis of the Contractor's proposed cost estimate of the work, the contract lump sum price will be adjusted accordingly. The adjustment in compensation shall be agreed to in writing and executed by both parties.

3-1.01D Failure To Agree To The Cost Of Changes

When a proposed change order decreases the cost of the work and the Engineer and the Contractor fail to agree upon the decreased cost thereof, the Engineer's estimated decrease in cost will be deducted from the contract price. The Contractor will be allowed 15 days after receipt of a contract change order approved by the Engineer, in which to file a written protest setting forth in what respects the Contractor differs from the Engineer's estimate of decreased cost, otherwise the decision of the Engineer to deduct the Engineer's estimate of decreased cost shall be deemed to have been accepted by the Contractor as correct.

In the event the Engineer and the Contractor fail to agree on the cost of a change order which increases the cost of the work, the Engineer will maintain a daily job record containing a detailed summary of all labor, materials and equipment required by the ordered change. At the end of each day's work, the Contractor shall review the Engineer's daily job record comparing with the Contractor's own records, and after agreement is reached, the daily job record shall be signed by both the Engineer and the Contractor and shall become the basis for payment for the changed work. Upon completion of the work under the change order, the Contractor shall submit an invoice listing only those items of labor, materials and equipment that were agreed to by both the Engineer and the Contractor to be in addition to the requirements of the contract, together with allowable markups.

When there is a failure to agree as to cost, no payment for the changed work will be made to the Contractor until all work called for in the change order has been completed, except that progress payments may be made on those portions of the changed work which the Contractor and the Engineer agree as to cost.

3-1.01E Allowable Costs For Changes

The only costs which will be allowed because of changed work and the manner in which these costs shall be computed are set forth in Sections 3-1.01E(1) through 3-1.01E(5) of these General Conditions. Where the term "actual cost" is used in the aforesaid sections, it shall be deemed to mean "estimated cost" where the adjustment in compensation is of a necessity based upon estimated costs.

3-1.01E(1) Labor

The Contractor will be paid an amount based on the actual cost for labor and supervision directly required for the performance of the changed work, including payments, assessment of benefits required by lawful labor union collective bargaining agreements; compensation insurance payments; contributions made to the State pursuant to the Unemployment Insurance Code, and for taxes paid to the Federal Government pursuant to the Social Security Act of August 14, 1935, as amended. No labor cost will be recognized at a rate in excess of the wages prevailing in the locality at the time the work is performed, nor will the use of a labor classification which would increase the cost be permitted unless the Contractor establishes to the complete satisfaction of the Engineer the necessity for payment at a higher rate.

3-1.01E(2) Materials

The Contractor will be paid an amount based on the actual cost of the materials directly required for the performance of the changed work. The cost of materials may include the costs of procurement, transportation and delivery if necessarily incurred. If a cash or trade discount by the actual supplier is available to the Contractor, it shall be credited to the State. If the materials are obtained from a supply or source owned wholly or in part by the Contractor, payment therefor will not exceed the current wholesale price for the materials. If, in the opinion of the Engineer, the cost of materials is excessive, or if the Contractor fails to furnish satisfactory evidence of the cost to the Engineer from the actual supplier, the cost of the materials shall be deemed to be the lowest current wholesale price at which similar materials are available in the quantities required. The Department reserves the right to furnish the materials required by the change order as it deems advisable, and the Contractor shall have no claim for cost or markups on material furnished by the Department.

3-1.01E(3) Equipment

The Contractor will be paid an amount based on the actual cost for the use of equipment directly required and approved by the Engineer in the performance of the changed work. No payment will be made for time while equipment is inoperative due to breakdowns or on days when no work is performed. In addition, the rental time shall include the time required to move the equipment to the work from the nearest available source of the required equipment, and to return it to the source. If the equipment is not moved by its own power, then loading and transportation costs will be paid. Moving time, loading and transportation costs will only be paid if the equipment is used exclusively on the changed work during the time between move in and move out. Individual pieces of equipment having a replacement value of \$500 or less shall be considered to be tools or small equipment, and no payment will be made therefor. For equipment owned, furnished, or rented by the Contractor, no cost therefor shall be recognized in excess of the rental rates established by distributors or equipment rental agencies in the locality where the work is performed.

3-1.01E(4) Markups

When a change order increases the cost of the work, the Contractor may add the following maximum markups to the actual costs of labor, materials, or equipment rental:

- 33 percent for labor;
- 15 percent for materials; and
- 15 percent for equipment rental.

The above markups include full compensation for bonds, profit and overhead.

When a change order decreases the cost of the work, the reduction in cost shall include a 5 percent markup on the estimated cost for furnishing the labor, materials and equipment which would have been used on the work had the change order not been issued.

When a change order involves both added work and deleted work, the markup or markups to be used shall be as follows:

The actual costs of labor, materials, and equipment rental for added and deleted work shall be calculated separately without adding markups. If the difference between the calculated costs for labor results in an increased cost, a markup of 33 percent shall be applied to the increased cost. If the difference between the calculated costs of materials or equipment rental results in an increased cost, a markup of 15 percent shall be applied to the increased costs of materials or equipment rental, as the case may be. If the difference between the calculated costs for labor, materials or equipment rental results in a decreased cost, a markup of 5 percent shall be applied to the decreased costs of labor, materials or equipment rental, as the case may be.

When added or deleted work is performed by an authorized subcontractor, approved in conformance with the provisions in Section 1-1.05, "Required Listing of Proposed Subcontractors," of the Instructions to Bidders, an additional 5 percent will be added to the total cost of the work including all markups specified in this Section 3-1.01E(4). The additional 5 percent markup shall reimburse the Contractor for additional administrative costs, and no other additional payment will be made by reason of performance of the work by a subcontractor.

3-1.01E(5) General Limitation

In no event shall any actual cost for added work be recognized in excess of market values prevailing at the time of the change, unless the Contractor can establish to the satisfaction of the Engineer that the Contractor investigated all possible means of obtaining the added work at prevailing market values and that the excess cost could not be avoided by the Contractor. The Engineer will determine the necessity for incurring the costs enumerated above, and as to whether they are directly required for the performance of the changed work. Lump sum quotations may be accepted at the option of the Engineer. When a change order deletes work from the contract, the computation of the cost thereof shall be the values which prevailed at the time bids for the work were opened.

When work under this Section 3 is performed by forces other than the Contractor's organization, no additional payment will be made by the State by reason of the performance of the work by a subcontractor or other forces, except as provided elsewhere in this Section 3.

SECTION 4 CONTROL OF MATERIALS

4-1.01 MATERIALS

The Contractor shall furnish all materials required to complete the work, except materials that are designated in the special provisions to be furnished by the State and materials furnished by the State in conformance with Section 3, "Changes in the Work," of these General Conditions.

Unless otherwise specified in the special provisions, materials furnished by the Contractor for incorporation into the work shall be new. When the quality or kind of materials, articles, or equipment is not specifically indicated, then the quality or kind thereof shall be similar to those which are indicated.

Materials to be used in the work will be subject to inspection and tests by the Engineer or the Engineer's designated representative. The Engineer may inspect, sample or test materials at the source of supply or other locations, but the inspection, sampling or testing will not be undertaken until the Engineer is assured by the Contractor of the cooperation and assistance of both the Contractor and the supplier of the material. The Contractor shall assure that the Engineer or the Engineer's authorized representative has free access at all times to the material to be inspected, sampled or tested. It is understood that the inspections and tests if made at any point other than the point of incorporation in the work in no way shall be considered as a guaranty of acceptance of the material nor of continued acceptance of material presumed to be similar to that upon which inspections and tests if made, and that inspection and testing performed by the State shall not relieve the Contractor or the Contractor's suppliers of responsibility for quality control.

Articles or materials to be incorporated in the work shall be stored in such a manner as to insure the preservation of their quality and fitness for the work, and to facilitate inspection.

All materials which do not conform to the requirements of the plans and special provisions, as determined by the Engineer, will be rejected whether in place or not. Rejected material shall be removed immediately from the site of the work, unless otherwise permitted by the Engineer. No rejected material, the defects of which have been subsequently corrected, shall be used in the work, unless approval in writing has been given by the Engineer. Upon failure of the Contractor to comply promptly with any order of the Engineer made under these provisions, the Engineer shall have authority to cause the

removal and replacement of rejected material and to deduct the cost thereof from any moneys due or to become due the Contractor.

Manufacturers' warranties, guaranties, instruction sheets and parts lists, which are furnished with certain materials incorporated in the work, shall be delivered to the Engineer before acceptance of the contract.

Unless otherwise designated in the special provisions, materials furnished by the State will be delivered to the job site. Materials furnished by the State that are designated in the special provisions as available at locations other than the job site shall be hauled to the site of the work by the Contractor at his expense, including any necessary loading and unloading that may be involved.

The Contractor will be held responsible for all materials furnished to him, and he shall pay all demurrage and storage charges. State-furnished materials lost or damaged from any cause whatsoever shall be replaced by the Contractor. The Contractor will be liable to the Department for the cost of replacing State-furnished material and those costs may be deducted from any moneys due or to become due the Contractor.

4-1.02 PRODUCT AND REFERENCE STANDARDS

When descriptive catalog designations, including manufacturer's name, product brand name, or model number are referred to in the contract documents, those designations shall be considered as being those found in industry publications in effect on the day the Notice to Contractors for the work is dated.

When standards or test designations are referred to in the contract documents by specific date of issue, they shall be considered a part of the contract. When those references do not bear a date of issue, the edition in effect on the day the Notice to Contractors for the work is dated shall be considered as part of the contract.

4-1.03 SAMPLING AND TESTING OF MATERIALS

Whenever the provisions of Section 4-1.03, "Sampling and Testing of Materials," of the General Conditions refer to tests or testing, it shall mean tests to assure the quality and to determine the acceptability of the materials and work.

Unless otherwise specified, all tests shall be performed in conformance with the methods used by the Department of Transportation and shall be made by the Engineer or his designated representative.

The Department has developed methods for testing the quality of materials and work. These methods are identified by number and are referred to as California Test. Up to five copies of individual California Tests are available at the Division of New Technology, Materials and Research, located at 5900 Folsom Boulevard, (P.O. Box 19128), Sacramento, CA 95819, and will be furnished to interested persons upon request. If a complete set of California Test Methods is desired, it can be purchased from the Department's Office of Business Management, Materiel Operations Branch, 1900 Royal Oaks Drive, Sacramento, CA 95815.

Whenever a reference is made in the special provisions to a California Test by number, it shall mean the California Test in effect on the day the Notice to Contractors for the work is dated.

Whenever the special provisions provide an option between 2 or more tests, the Engineer will determine the test method to be used.

Whenever a specification, manual, or test designation provides for test reports (such as certified mill test reports) from the manufacturer, copies of those reports, identified as to the lot of material, shall be furnished to the Engineer. The manufacturer's test reports shall supplement the inspection, sampling and testing provisions of this Section 4-1.03 and shall not constitute a waiver of the State's right to inspect. When material which cannot be identified with specific test reports is proposed for use, the Engineer may, at his discretion, select random samples from the lot for testing. Testing specimens from the random samples, including those required for retest, shall be prepared in conformance with the referenced specification and furnished by the Contractor at his expense. The number of samples and test specimens shall be entirely at the discretion of the Engineer.

When requested by the Engineer, the Contractor shall furnish, without charge, samples of all materials entering into the work, and no material shall be used prior to approval by the Engineer, except as provided in Section 4-1.04, "Certificates of Compliance," of these General Conditions.

The Engineer will deduct the costs for testing of materials and work found to be unacceptable, as determined by the tests performed by the Department, and the costs for testing of material sources identified by the Contractor which are not used for the work, from moneys due or to become due to the Contractor. The amount deducted will be determined by the Engineer.

4-1.035 TESTING BY CONTRACTOR

The Contractor shall be responsible for controlling the quality of the material entering the work and of the work performed, and shall perform testing as necessary to ensure quality control. The test methods used for quality control testing by the Contractor shall be as determined by the Contractor. The results of those quality control tests shall be made available to the Engineer upon request. Contractor performed quality control tests are for the Contractor's use in controlling the work and will not be accepted for use as acceptance tests.

4-1.04 CERTIFICATES OF COMPLIANCE

A Certificate of Compliance shall be furnished prior to the use of any materials for which the special provisions require that a Certificate of Compliance be furnished. In addition, the Engineer may permit the use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance. The certificate shall be signed by the manufacturer of the material or the manufacturer of assembled materials and shall state that the materials involved comply in all respects with the requirements of the special provisions. A Certificate of Compliance shall be furnished with each lot of such materials delivered to the work and the lot so certified shall be clearly identified in the certificate.

Materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the work which conforms to the requirements of the plans and special provisions and any material not conforming to those requirements will be subject to rejection whether in place or not.

The Department reserves the right to refuse to permit the use of material on the basis of a Certificate of Compliance.

The form of the Certificate of Compliance and its disposition shall be as directed by the Engineer.

SECTION 5

LEGAL RELATIONS AND RESPONSIBILITIES

5-1.01 LAWS TO BE OBSERVED

Comply with laws, orders, decrees, and permits. Indemnify and defend the State against any claim or liability arising from the violation of a law, order, decree, or permit by you or your employees. Immediately report to the Engineer in writing a discrepancy or inconsistency between the contract and a law, order, decree, or permit.

5-1.01A Hours of Labor

Eight hours labor constitutes a legal day's work. The Contractor or any subcontractor under the Contractor shall forfeit, as a penalty to the State of California, \$25 for each worker employed in the execution of the contract by the respective Contractor or subcontractor for each calendar day during which that worker is required or permitted to work more than 8 hours in any one calendar day and 40 hours in any one calendar week in violation of the provisions of the Labor Code, and in particular, Section 1810 to Section 1815, thereof, inclusive, except that work performed by employees of Contractors in excess of 8 hours per day, and 40 hours during any one week, shall be permitted upon compensation for all hours worked in excess of 8 hours per day at not less than one and one-half times the basic rate of pay, as provided in Section 1815 thereof.

5-1.01B Labor Nondiscrimination

Attention is directed to Section 1735 of the Labor Code, which reads as follows:

"No discrimination shall be made in the employment of persons upon public works because of the race, religious creed, color, national origin, ancestry, physical handicap, medical condition, marital status, or sex of such persons, except as provided in Section 12940 of the Government Code and every contractor for public works violating this section is subject to all the penalties imposed for a violation of this chapter."

Attention is directed to the following "Nondiscrimination Clause" that is required by Chapter 5 of Division 4 of Title 2, California Code of Regulations:

NONDISCRIMINATION CLAUSE

1. During the performance of this contract, contractor and its subcontractors shall not unlawfully discriminate against any employee or applicant for employment because of race, religion, color, national origin, ancestry, physical handicap, medical condition, marital status, age (over 40) or sex. Contractors and subcontractors shall ensure that the evaluation and treatment of their employees and applicants for employment are free of such discrimination. Contractors and subcontractors shall comply with the provisions of the Fair Employment and Housing Act (Gov. Code, Section 12990 et seq.) and the applicable regulations promulgated thereunder (California Code of Regulations, Title 2, Section 7285.0 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code, Section 12990, set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulations are incorporated into this contract by reference and made a part hereof as if set forth in full. Contractor and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.
2. This Contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the contract.

STANDARD CALIFORNIA NONDISCRIMINATION CONSTRUCTION CONTRACT SPECIFICATIONS (GOVERNMENT CODE, SECTION 12990)

These specifications are applicable to all nonexempt State contracts and subcontracts, and to the "Standard California Nondiscrimination Construction Contract Specifications" set forth herein. The specifications are applicable to all nonexempt State construction contracts and subcontracts of \$5,000 or more.

1. As used in the specifications:
 - a. "Administrator" means Administrator, Office of Compliance Programs, California Department of Fair Employment and Housing, or any person to whom the Administrator delegates authority;
 - b. "Minority" includes:
 - (i) Black (all persons having primary origins in any of the black racial groups of Africa, but not of Hispanic origin);
 - (ii) Hispanic (all persons of primary culture or origin in Mexico, Puerto Rico, Cuba, Central or South America or other Spanish derived culture or origin regardless of race);
 - (iii) Asian/Pacific Islander (all persons having primary origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent or the Pacific Islands); and
 - (iv) American Indian/Alaskan Native (all persons having primary origins in any of the original peoples of North America and who maintain culture identification through tribal affiliation or community recognition).
2. Whenever the contractor or any subcontractor subcontracts a portion of the work, it shall physically include in each subcontract of \$5,000 or more the nondiscrimination clause in this contract directly or through incorporation by reference. Any subcontract for work involving a construction trade shall also include the Standard California Construction Contract Specifications, either directly or through incorporation by reference.
3. The contractor shall implement the specific nondiscrimination standards provided in paragraphs 6(a) through (e) of these specifications.
4. 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, Government Code, Section 12990, or the regulations promulgated pursuant thereto.
5. In order for the nonworking training hours of apprentices and trainees to be counted, 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 or the California Department of Industrial Relations.

6. The contractor shall take specific actions to implement its nondiscrimination program. 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 must be able to demonstrate fully its efforts under Steps a. through e. below:
 - a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and at 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 obligations to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
 - b. Provide written notification within seven days to the director of DFEH 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.
 - c. Disseminate the Contractor's equal employment opportunity policy by providing notice of the policy to unions and training, recruitment and outreach programs and requesting their cooperation in assisting the Contractor to meet its obligations; and by posting the company policy on bulletin boards accessible to all employees at each location where construction work is performed.
 - d. Ensure all personnel making management and employment decisions regarding hiring, assignment, layoff, termination, conditions of work, training, rates of pay or other employment decisions, including all supervisory personnel, superintendents, general foremen, on-site foremen, etc., are aware of the Contractor's equal employment opportunity policy and obligations, and discharge their responsibilities accordingly.
 - e. 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 equal employment opportunity policy and the Contractor's obligations under these specifications are being carried out.
7. Contractors are encouraged to participate in voluntary associations which assist in fulfilling their equal employment opportunity obligations. 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 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, 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.
8. The Contractor is required to provide equal employment opportunity 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 Fair Employment and Housing Act (Gov. Code, Section 12990 et seq.) if a particular group is employed in a substantially disparate manner.
9. Establishment and implementation of a bona fide affirmative action plan pursuant to Section 8104 (b) of this Chapter shall create a rebuttal presumption that a contractor is in compliance with the requirements of Section 12990 of the Government Code and its implementing regulations.
10. The Contractor shall not use the nondiscrimination standards to discriminate against any person because of race, color, religion, sex, national origin, ancestry, physical handicap, medical condition, marital status or age over 40.
11. The Contractor shall not enter into any subcontract with any person or firm decertified from state contracts pursuant to Government Code Section 12990.
12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and the nondiscrimination clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Government Code Section 12990 and its implementing regulations by the awarding agency. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Government Code Section 12990.

13. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company equal employment opportunity policy is being carried out, to submit reports relating to the provisions hereof as may be required by OCP 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 any easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

NOTE: Authority cited: Sections 12935(a) and 12990(d), Government Code. Reference: Section 12990, Government Code.

5-1.01C Prevailing Wage

The Contractor and any subcontractor under the Contractor shall comply with Labor Code Sections 1774 and 1775. Pursuant to Section 1775, the Contractor and any subcontractor under the Contractor shall forfeit to the State or political subdivision on whose behalf the contract is made or awarded a penalty of not more than fifty dollars (\$50) for each calendar day, or portion thereof, for each worker paid less than the prevailing rates as determined by the Director of Industrial Relations for the work or craft in which the worker is employed for any public work done under the contract by the Contractor or by any subcontractor under the Contractor in violation of the provisions of the Labor Code and in particular, Labor Code Sections 1770 to 1780, inclusive. The amount of this forfeiture shall be determined by the Labor Commissioner and shall be based on consideration of the mistake, inadvertence, or neglect of the Contractor or subcontractor in failing to pay the correct rate of prevailing wages, or the previous record of the Contractor or subcontractor in meeting their respective prevailing wage obligations, or the willful failure by the Contractor or subcontractor to pay the correct rates of prevailing wages. A mistake, inadvertence, or neglect in failing to pay the correct rate of prevailing wages is not excusable if the Contractor or subcontractor had knowledge of their obligations under the Labor Code. In addition to the penalty and pursuant to Labor Code Section 1775, the difference between the prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the prevailing wage rate shall be paid to each worker by the Contractor or subcontractor. If a worker employed by a subcontractor on a public works project is not paid the general prevailing per diem wages by the subcontractor, the prime contractor of the project is not liable for the penalties described above unless the prime contractor had knowledge of that failure of the subcontractor to pay the specified prevailing rate of wages to those workers or unless the prime contractor fails to comply with all of the following requirements:

1. The contract executed between the contractor and the subcontractor for the performance of work on the public works project shall include a copy of the provisions of Sections 1771, 1775, 1776, 1777.5, 1813, and 1815 of the Labor Code.
2. The contractor shall monitor the payment of the specified general prevailing rate of per diem wages by the subcontractor to the employees, by periodic review of the certified payroll records of the subcontractor.
3. Upon becoming aware of the subcontractor's failure to pay the specified prevailing rate of wages to the subcontractor's workers, the Contractor must diligently take corrective action to stop or rectify the failure, including withholding sufficient funds due the subcontractor for work performed on the public works project.
4. Prior to making final payment to the subcontractor for work performed on the public works project, the contractor shall obtain an affidavit signed under penalty of perjury from the subcontractor that the subcontractor has paid the specified general prevailing rate of per diem wages to the subcontractor's employees on the public works project and any amounts due pursuant to Section 1813 of the Labor Code.

Pursuant to Section 1775 of the Labor Code, the Division of Labor Standards Enforcement must notify the Contractor on a public works project within 15 days of the receipt by the Division of Labor Standards Enforcement of a complaint of the failure of a subcontractor on that public works project to pay workers the general prevailing rate of per diem wages. If the Division of Labor Standards Enforcement determines that employees of a subcontractor were not paid the general prevailing rate of per diem wages and if the Department did not withhold sufficient money under the contract to pay those employees the balance of wages owed under the general prevailing rate of per diem wages, the Contractor must withhold an amount of moneys due the subcontractor sufficient to pay those employees the general prevailing rate of per diem wages if requested by the Division of Labor Standards Enforcement. The Contractor must pay any money withheld from and owed to a subcontractor upon receipt of notification by the Division of Labor Standards Enforcement that the wage complaint has been

resolved. If notice of the resolution of the wage complaint has not been received by the Contractor within 180 days of the filing of a valid notice of completion or acceptance of the public works project, whichever occurs later, the Contractor must pay all moneys withheld from the subcontractor to the Department. The Department withholds these moneys pending the final decision of an enforcement action.

Pursuant to the provisions of Section 1773 of the Labor Code, the Department has obtained the general prevailing rate of wages (which rate includes employer payments for health and welfare, pension, vacation, travel time, and subsistence pay as provided for in Section 1773.8 of the Labor Code, apprenticeship or other training programs authorized by Section 3093 of the Labor Code, and similar purposes) applicable to the work to be done, for straight time, overtime, Saturday, Sunday and holiday work. The holiday wage rate listed shall be applicable to all holidays recognized in the collective bargaining agreement of the particular craft, classification or type of workmen concerned. The general prevailing wage rates and any applicable changes to these wage rates are available at the Labor Compliance Office at the offices of the District Director of Transportation for the district in which the work is situated. For work situated in District 9, the wage rates are available at the Labor Compliance Office at the offices of the District Director of Transportation for District 6, located at Fresno. General prevailing wage rates are also available from the California Department of Industrial Relations' internet web site at: <http://www.dir.ca.gov>.

The wage rates determined by the Director of Industrial Relations for the project refer to expiration dates. Prevailing wage determinations with a single asterisk after the expiration date are in effect on the date of advertisement for bids and are good for the life of the contract. Prevailing wage determinations with double asterisks after the expiration date indicate that the wage rate to be paid for work performed after this date has been determined. If work is to extend past this date, the new rate shall be paid and incorporated in the contract. The Contractor shall contact the Department of Industrial Relations as indicated in the wage rate determinations to obtain predetermined wage changes.

Pursuant to Section 1773.2 of the Labor Code, general prevailing wage rates shall be posted by the Contractor at a prominent place at the site of the work.

Changes in general prevailing wage determinations which conform to Labor Code Section 1773.6 and Title 8 California Code of Regulations Section 16204 shall apply to the project when issued by the Director of Industrial Relations at least 10 days prior to the date of the Notice to Contractors for the project.

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

5-1.01D Travel And Subsistence Payments

Attention is directed to the requirements in Section 1773.8 of the Labor Code. The Contractor shall make travel and subsistence payments to each workman, needed to execute the work, in conformance with the requirements in Labor Code Section 1773.8.

5-1.01E Payroll Records

Attention is directed to the provisions of Labor Code Section 1776, a portion of which is quoted below. Regulations implementing Labor Code Section 1776 are located in Sections 16016 through 16019 and Sections 16207.10 through 16207.19 of Title 8, California Code of Regulations.

"1776. (a) Each contractor and subcontractor shall keep accurate payroll records, 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, worker, or other employee employed by him or her in connection with the public work. Each payroll record shall contain or be verified by a written declaration that it is made under penalty of perjury, stating both of the following:

- (1) The information contained in the payroll record is true and correct.
- (2) The employer has complied with the requirements of Sections 1771, 1811, and 1815 for any work performed by his or her employees on the public works project.

"(b) The payroll records enumerated under subdivision (a) shall be certified and shall be available for inspection at all reasonable hours at the principal office of the contractor on the following basis:

- (1) A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request.
- (2) A certified copy of all payroll records enumerated in subdivision (a) shall be made available for inspection or furnished upon request to a representative of the body awarding the contract, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations.
- (3) A certified copy of all payroll records enumerated in subdivision (a) shall be made available upon request by the public for inspection or for copies thereof. However, a request by the public shall be made through either the body awarding the contract, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested payroll records have not been provided pursuant to paragraph (2), the requesting party shall, prior to being provided the records, reimburse the costs of preparation by the contractor, subcontractors, and the entity through which the request was made. The public shall not be given access to the records at the principal office of the contractor.

- "(c) The certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement or shall contain the same information as the forms provided by the division.
- "(d) A contractor or subcontractor shall file a certified copy of the records enumerated in subdivision (a) with the entity that requested the records within 10 days after receipt of a written request.
- "(e) Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the awarding body, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement shall be marked or obliterated in a manner so as to prevent disclosure of an individual's name, address, and social security number. The name and address of the contractor awarded the contract or the subcontractor performing the contract shall not be marked or obliterated.
- "(f) The contractor shall inform the body awarding the contract of the location of the records enumerated under subdivision (a), including the street address, city and county, and shall, within five working days, provide a notice of a change of location and address.
- "(g) The contractor or subcontractor shall have 10 days in which to comply subsequent to receipt of a written notice requesting the records enumerated in subdivision (a). In the event that the contractor or subcontractor fails to comply within the 10-day period, he or she shall, as a penalty to the state or political subdivision on whose behalf the contract is made or awarded, forfeit twenty-five dollars (\$25) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due. A contractor is not subject to a penalty assessment pursuant to this section due to the failure of a subcontractor to comply with this section."

The Department withholds the penalties specified in subdivision (g) of Labor Code § 1776 for noncompliance with the requirements in Section 1776.

A copy of all payrolls shall be submitted weekly to the Engineer. Payrolls shall contain the full name, address and social security number of each employee, the employee's correct classification, rate of pay, daily and weekly number of hours worked, itemized deductions made and actual wages paid. They shall also indicate apprentices and ratio of apprentices to journeymen. The employee's address and social security number need only appear on the first payroll on which that name appears. The payroll shall be accompanied by a "Statement of Compliance" signed by the employer or the employer's agent indicating that the payrolls are correct and complete and that the wage rates contained therein are not less than those required by the contract. The "Statement of Compliance" shall be on forms furnished by the Department or on any form with identical wording. The Contractor shall be responsible for the submission of copies of payrolls of all subcontractors.

The Department withholds for delinquent or inadequate payroll records (Labor Code § 1771.5). If the Contractor has not submitted an adequate payroll record by the month's 15th day for the period ending on or before the 1st of that month, the Department withholds 10 percent of the monthly progress estimate, exclusive of mobilization. The Department does not withhold more than \$10,000 or less than \$1,000.

5-1.01F Trench Safety

Attention is directed to the provisions of Section 6705 of the Labor Code concerning trench excavation safety plans.

The Construction Safety Orders of the Division of Occupational Safety and Health shall apply to all excavations. For all excavations 5 feet (1.5 m) or more in depth, the Contractor shall submit to the Engineer a detailed plan showing the design and details of the protective systems to be provided for worker protection from the hazard of caving ground during excavation. The detailed plan shall include any tabulated data and any design calculations used in the preparation of the plan. Excavation shall not begin until the detailed plan has been reviewed and approved by the Engineer.

Detailed plans of protective systems for which the Construction Safety Orders require design by a registered professional engineer shall be prepared and signed by an engineer who is registered as a Civil Engineer in the State of California, and shall include the soil classification, soil properties, soil design calculations that demonstrate adequate stability of the protective system, and any other design calculations used in the preparation of the plan.

No plan shall allow the use of a protective system less effective than that required by the Construction Safety Orders.

If the detailed plan includes designs of protective systems developed only from the allowable configurations and slopes, or Appendices, contained in the Construction Safety Orders, the plan shall be submitted at least 5 days before the Contractor intends to begin excavation. If the detailed plan includes designs of protective systems developed from tabulated data, or designs for which design by a registered professional engineer is required, the plan shall be submitted at least 3 weeks before the Contractor intends to begin excavation.

In addition to these provisions detailed plans of the protective systems for excavations on or affecting railroad property will be reviewed for adequacy of protection provided for railroad facilities, property, and traffic. These plans for excavations on or affecting railroad property shall be submitted at least 9 weeks before the Contractor intends to begin excavation requiring the protective systems. Approval by the Engineer of the detailed plans for the protective systems will be contingent upon the plans being satisfactory to the railroad company involved.

5-1.01G Apprentices

Attention is directed to Sections 1777.5, 1777.6 and 1777.7 of the California Labor Code and Title 8, California Code of Regulations Section 200 et seq. To ensure compliance and complete understanding of the law regarding apprentices, and specifically the required ratio thereunder, each contractor or subcontractor should, where some question exists, contact the Division of Apprenticeship Standards, 455 Golden Gate Avenue, San Francisco, CA 94102, or one of its branch offices prior to commencement of work on the public works contract. Responsibility for compliance with this section lies with the prime Contractor.

It is State policy to encourage the employment and training of apprentices on public works contracts as may be permitted under local apprenticeship standards.

5-1.01H Fair Labor Standards Act

The attention of bidders is invited to the fact that the State of California, Department of Transportation, has been advised by the Wage and Hour Division, U.S. Department of Labor, that contractors engaged in construction work are required to meet the provisions of the Fair Labor Standards Act of 1938 and as amended (52 Stat. 1060).

5-1.01I (Blank)

5-1.01J Air Pollution Control

The Contractor shall comply with all air pollution control rules, regulations, ordinances and statutes which apply to any work performed pursuant to the contract, including any air pollution control rules, regulations, ordinances and statutes, specified in Section 11017 of the Government Code.

Unless otherwise provided in the special provisions, material to be disposed of shall not be burned, either inside or outside the premises.

5-1.01K Use Of Pesticides

The Contractor shall comply with all rules and regulations of the Department of Food and Agriculture, the Department of Health, the Department of Industrial Relations and all other agencies which govern the use of pesticides required in the performance of the work on the contract.

Pesticides shall include but shall not be limited to herbicides, insecticides, fungicides, rodenticides, germicides, nematocides, bactericides, inhibitors, fumigants, defoliants, desiccants, soil sterilants, and repellents.

Any substance or mixture of substances intended for preventing, repelling, mitigating, or destroying weeds, insects, diseases, rodents, or nematodes and any substance or mixture of substances intended for use as a plant regulator, defoliant or desiccant shall be considered a pesticide.

5-1.01L Sound Control Requirements

The Contractor shall comply with all local sound control and noise level rules, regulations and ordinances which apply to any work performed pursuant to the contract.

Each internal combustion engine, used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without the muffler.

5-1.01M Environmental Clearances

The Department will obtain all environmental clearances and authorizations necessary for the project as set forth in the plans and specifications. The Contractor shall comply with the provisions, including giving notices during construction when required, of these authorizations. In the event the obtaining of these authorizations delays completion of all or any portion of the work, an extension of time determined pursuant to the provisions in Section 6-1.08, "Liquidated Damages," of these General Conditions will be granted and the Contractor shall not be entitled to any additional compensation because of the delays.

5-1.01N Permits And Licenses

The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work.

The Environmental Quality Act (Public Resources Code, Sections 21000 to 21176, inclusive) may be applicable to permits, licenses and other authorizations which the Contractor must obtain from local agencies in connection with performing the work of the contract. The Contractor shall comply with the provisions of those statutes in obtaining the permits, licenses and other authorizations and they shall be obtained in sufficient time to prevent delays to the work.

In the event that the Department has obtained permits, licenses or other authorizations, applicable to the work, in conformance with the requirements in the Environmental Quality Act, the Contractor shall comply with the provisions of those permits, licenses and other authorizations.

5-1.01O Assignment Of Antitrust Actions

The Contractor's attention is directed to the following requirements in Public Contract Code 7103.5 and Government Code Sections 4553 and 4554, which shall be applicable to the Contractor and the Contractor's subcontractors:

"In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the contractor or subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the contractor, without further acknowledgement by the parties."

"If an awarding body or public purchasing body receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under this chapter, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

"Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under this part if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action."

5-1.01P Safety And Health Provisions

The Contractor shall conform to all applicable occupational safety and health standards, rules, regulations and orders established by the State of California.

Working areas utilized by the Contractor to perform work during the hours of darkness, shall be lighted to conform to the minimum illumination intensities established by California Division of Occupational Safety and Health Construction Safety Orders.

All lighting fixtures shall be mounted and directed in a manner precluding glare to approaching traffic.

5-1.01Q Suits To Recover Penalties And Forfeitures

Attention is directed to Sections 1730 to 1733, inclusive, of the Labor Code concerning suits to recover amounts withheld from payment for failure to comply with requirements of the Labor Code or contract provisions based on those laws.

Those sections provide that a suit on the contract for alleged breach thereof in not making the payment is the exclusive remedy of the Contractor or the Contractor's assignees with reference to amounts withheld for those penalties or forfeitures; and that the suit must be commenced and actual notice thereof received by the awarding authority prior to 90 days after completion of the contract and the formal acceptance of the job.

Submission of a claim under Section 7-1.07, "Final Payment and Claims," of these General Conditions for the amounts withheld from payment for those penalties and forfeitures is not a prerequisite for those suits and these claims will not be considered.

5-1.01R Water Pollution

The Contractor shall exercise every reasonable precaution to protect streams, lakes, reservoirs, bays, and coastal waters from pollution with fuels, oils, bitumens, calcium chloride and other harmful materials and shall conduct and schedule operations so as to avoid or minimize muddying and silting of streams, lakes, reservoirs, bays and coastal waters. Care shall be exercised to preserve roadside vegetation beyond the limits of construction.

Water pollution control work is intended to provide prevention, control, and abatement of water pollution to streams, waterways, and other bodies of water, and shall consist of constructing those facilities which may be shown on the plans, specified herein or in the special provisions, or directed by the Engineer.

In order to provide effective and continuous control of water pollution it may be necessary for the Contractor to perform the contract work in small or multiple units, on an out of phase schedule, and with modified construction procedures. The Contractor shall provide temporary water pollution control measures, including but not limited to, dikes, basins, ditches, and applying straw and seed, which become necessary as a result of the Contractor's operations. The Contractor shall coordinate water pollution control work with all other work done on the contract.

Before starting any work on the project, the Contractor shall submit, for acceptance by the Engineer, a program to control water pollution effectively during construction of the project. The program shall show the schedule for the erosion control work included in the contract and for all water pollution control measures which the Contractor proposes to take in connection with construction of the project to minimize the effects of the operations upon adjacent streams and other bodies of water. The Contractor shall not perform any clearing and grubbing or earthwork on the project, other than that specifically authorized in writing by the Engineer, until the program has been accepted.

If the measures being taken by the Contractor are inadequate to control water pollution effectively, the Engineer may direct the Contractor to revise the operations and the water pollution control program. The directions will be in writing and will specify the items of work for which the Contractor's water pollution control measures are inadequate. No further work shall be performed on those items until the water pollution control measures are adequate and, if also required, a revised water pollution control program has been accepted.

The Engineer will notify the Contractor of the acceptance or rejection of any submitted or revised water pollution control program in not more than 5 working days.

The State will not be liable to the Contractor for failure to accept all or any portion of an originally submitted or revised water pollution control program, nor for any delays to the work due to the Contractor's failure to submit an acceptable water pollution control program.

The Contractor may request the Engineer to waive the requirement for submission of a written program for control of water pollution when the nature of the Contractor's operation is such that erosion is not likely to occur. Waiver of this requirement will not relieve the Contractor from responsibility for compliance with the other provisions of this section. Waiver of the requirement for a written program for control of water pollution will not preclude requiring submittal of a written program at a later time if the Engineer deems it necessary because of the effect of the Contractor's operations.

Unless otherwise approved by the Engineer in writing, the Contractor shall not expose a total area of erodible earth material, which may cause water pollution, exceeding 750,000 ft² (70 000 m²) for each separate location, operation, or spread of equipment before either temporary or permanent erosion control measures are accomplished.

Where erosion which will cause water pollution is probable due to the nature of the material or the season of the year, the Contractor's operations shall be so scheduled that permanent erosion control features will be installed concurrently with or immediately following grading operations.

Nothing in the terms of the contract nor in the provisions in this Section 5-1.01R shall relieve the Contractor of the responsibility for compliance with Sections 5650 and 12015 of the Fish and Game Code, or other applicable statutes relating to prevention or abatement of water pollution.

When borrow material is obtained from other than commercially operated sources, erosion of the borrow site during and after completion of the work shall not result in water pollution. The material source shall be finished, where practicable, so that water will not collect or stand therein.

The requirements of this section shall apply to all work performed under the contract and to all non-commercially operated borrow or disposal sites used for the project.

The Contractor shall also conform to the following provisions:

1. Where working areas encroach on live streams, barriers adequate to prevent the flow of muddy water into streams shall be constructed and maintained between working areas and streams, and during construction of the barriers, muddying of streams shall be held to a minimum.
2. Removal of material from beneath a flowing stream shall not be commenced until adequate means, such as a bypass channel, are provided to carry the stream free from mud or silt around the removal operations.
3. Should the Contractor's operations require transportation of materials across live streams, the operations shall be conducted without muddying the stream. Mechanized equipment shall not be operated in the stream channels of the live streams except as may be necessary to construct crossings or barriers and fills at channel changes.
4. Water containing mud or silt from aggregate washing or other operations shall be treated by filtration, or retention in a settling pond, or ponds, adequate to prevent muddy water from entering live streams.
5. Oily or greasy substances originating from the Contractor's operations shall not be allowed to enter or be placed where they will later enter a live stream.
6. Portland cement or fresh portland cement concrete shall not be allowed to enter flowing water of streams.
7. When operations are completed, the flow of streams shall be returned as nearly as possible to a meandering thread without creating possible future bank erosion, and settling pond sites shall be graded so they will drain and will blend in with the surrounding terrain.
8. Material derived from roadway work shall not be deposited in a live stream channel where it could be washed away by high stream flows.
9. Where there is possible migration of anadromous fish in streams affected by construction on the project, the Contractor shall conduct work operations so as to allow free passage of the migratory fish.

Compliance with the requirements of this section shall in no way relieve the Contractor from the responsibility to comply with the other provisions of the contract, in particular the responsibility for damage and for preservation of property.

5-1.01S REMOVAL OF ASBESTOS AND HAZARDOUS SUBSTANCES

When the presence of asbestos or hazardous substances are not shown on the plans or indicated in the specifications and the Contractor encounters materials which the Contractor reasonably believes to be asbestos or a hazardous substance as defined in Section 25914.1 of the Health and Safety Code, and the asbestos or hazardous substance has not been rendered harmless, the Contractor may continue work in unaffected areas reasonably believed to be safe. The Contractor shall immediately cease work in the affected area and report the condition to the Engineer in writing.

In conformance with Section 25914.1 of the Health and Safety Code, removal of asbestos or hazardous substances including exploratory work to identify and determine the extent of the asbestos or hazardous substance will be performed by separate contract.

If performance of the Contractor's current controlling operation is delayed in the area, and the delay could not be avoided by the judicious handling of forces, equipment, and plant, an extension of time determined in conformance with the provisions in Section 6-1.08, "Liquidated Damages," of the General Conditions will be granted. Compensation for the delay will be made only for the Contractor's actual losses due to idle time of equipment, necessary payments for idle time of workers, and cost of extra moving of equipment, in conformance with the provisions in Section 3-1.01E, "Allowable Costs for Changes," of the General Conditions, except that no markups will be added.

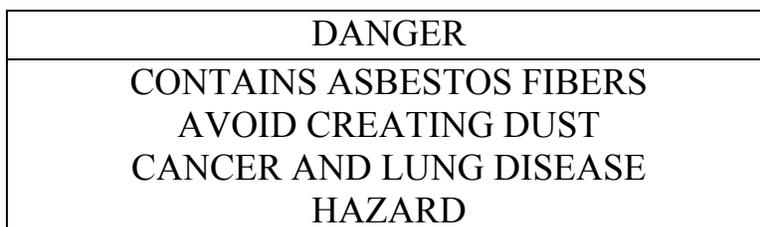
5-1.01T SOLID WASTE DISPOSAL AND RECYCLING REPORT

This work shall consist of reporting disposal and recycling of construction solid waste, as specified in these special provisions. For the purposes of this section, solid waste includes construction and demolition waste debris, but not hazardous waste.

Annually by the fifteenth day of January, the Contractor shall complete and certify Form CEM-4401, "Solid Waste Disposal and Recycling Report," which quantifies solid waste generated by the work performed and disposed of in landfills or recycled during the previous calendar year. The amount and type of solid waste disposed of or recycled shall be reported in either tons (tonne) or cubic feet (cubic meter.) The Contractor shall also complete and certify Form CEM-4401 within 5 days following contract acceptance.

The contractor shall submit a waste shipment record (WSR) for disposal of materials containing asbestos that is not classified as a hazardous waste..

Properly label containers as shown:



Form CEM-4401, "Solid Waste Disposal and Recycling Report" can be downloaded at:

<http://www.dot.ca.gov/hq/construc/manual2001>

If the Contractor has not submitted Form CEM-4401, by the dates specified above, the Department will withhold the amount of \$10,000 for each missing or incomplete report. The moneys withheld will be released for payment on the next monthly estimate for partial payment following the date that a complete and acceptable Form CEM-4401 is submitted to the Engineer. Upon completion of all contract work and submittal of the final Form CEM-4401, remaining withheld funds associated with this section, "Solid Waste Disposal and Recycling Report," will be released for payment. Withheld funds in conformance with this section shall be in addition to other moneys withheld provided for in the contract. No interest will be due the Contractor on withheld amounts.

5-1.01U ARCHAEOLOGICAL DISCOVERIES

If archaeological materials, including but not limited to human skeletal material and disarticulated human bone, are discovered at the job site, protect and leave undisturbed and in place archaeological materials in accordance with the following codes and these special provisions:

1. California Public Resources Code, Division 5, Chapter 1.7 § 5097.5
2. California Public Resources Code, Division 5, Chapter 1.75 § 5097.98 and § 5097.99
3. California Administrative Code, Title 14 § 4308
4. California Penal Code, Part 1, Title 14 § 622-1/2
5. California Health and Safety Code, Division 7, Part 1, Chapter 2, § 7050.5

Archaeological materials are the physical remains of past human activity and include historic-period archaeological materials and prehistoric Native American archaeological materials. Nonhuman fossils are not considered to be archaeological except when showing direct evidence of human use or alteration or when found in direct physical association with archaeological materials as described in these special provisions.

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Historic-period archaeological materials include cultural remains beginning with initial European contact in California, but at least 50 years old. Historical archaeological materials include:

1. Trash deposits or clearly defined disposal pits containing tin cans, bottles, ceramic dishes, or other refuse indicating previous occupation or use of the site
2. Structural remains of stone, brick, concrete, wood, or other building material found above or below ground or
3. Human skeletal remains from the historic period, with or without coffins or caskets, including any associated grave goods

Prehistoric Native American archaeological materials include:

1. Human skeletal remains or associated burial goods such as beads or ornaments
2. Evidence of tool making or hunting such as arrowheads and associated chipping debris of fine-grained materials such as obsidian, chert, or basalt
3. Evidence of plant processing such as pestles, grinding slabs, or stone bowls
4. Evidence of habitation such as cooking pits, stone hearths, packed or burnt earth floors or
5. Remains from food processing such as concentrations of discarded or burnt animal bone, shellfish remains, or burnt rocks used in cooking

Immediately upon discovery of archaeological materials, stop all work within a 60-foot (18 m) radius of the archaeological materials and immediately notify the Engineer. Archaeological materials found during construction are the property of the State. Do not resume work within the 60-foot (18 m) radius of the find until the Engineer gives you written approval. If, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of an archeological find or investigation or recovery of archeological materials, you will be compensated for resulting losses and an extension of time will be granted.

The Department may use other forces to investigate and recover archaeological materials from the location of the find. When ordered by the Engineer furnish labor, material, tools and equipment, to secure the location of the find, and assist in the investigation or recovery of archaeological materials.

5-1.02 PROTECTION AND USE OF PROPERTY

The Contractor shall be responsible for and provide and maintain all proper temporary walks, roads, guards, railings, lights, warning signs, and take precaution at all times to avoid injury or damage to any person or any property, and upon completion of the work, or at other times as directed, restore premises and adjacent property to a proper condition.

The Contractor shall protect adjoining property and nearby buildings, including State buildings, State roads, and public streets or roads, from dust, dirt, debris, or other nuisance arising out of the Contractor's operations or storage practices, and, if ordered by the Engineer, the Contractor shall provide and install suitable safeguards, approved by the Engineer, to protect objects from damage. If any objects are injured or damaged by reason of the Contractor's operations, they shall be replaced or restored at the Contractor's expense. The facilities shall be replaced or restored to a condition as good as when the Contractor entered upon the work, or as good as required by the specifications accompanying the contract, if any of the objects are a part of the work being performed under the contract.

If the Contractor damages any buildings, roads or other property which belong to the State, or any department or agency thereof, then the Engineer, at his option, may retain from the money due under the contract an amount sufficient to insure repair of the damage.

The Engineer may make or cause to be made those temporary repairs that are necessary to restore to service any damaged highway facility. The cost of the repairs must be borne by the Contractor and will be deducted.

The fact that any underground facility is not shown upon the plans shall not relieve the Contractor of the responsibility of protecting underground improvements or facilities. It shall be the Contractor's responsibility, pursuant thereto, to ascertain the location of those underground improvements or facilities, which may be subject to damage by reason of the Contractor's operations.

5-1.03 INDEMNIFICATION AND INSURANCE

- The Contractor's obligations regarding indemnification of the State of California and the requirements for insurance shall conform to the provisions in Section 2-1.04, "Insurance Policies," and Section 5-1.031, "Indemnification," and Section 5-1.032, "Insurance," of this Section 5-1.03.

5-1.031 Indemnification

- The Contractor shall defend, indemnify, and save harmless the State, including its officers, employees, and agents (excluding agents who are design professionals) from any and all claims, demands, causes of action, damages, costs, expenses, actual attorneys' fees, losses or liabilities, in law or in equity (Section 5-1.031 Claims) arising out of or in connection with the Contractor's performance of this contract for:

1. Bodily injury including, but not limited to, bodily injury, sickness or disease, emotional injury or death to persons, including, but not limited to, the public, any employees or agents of the Contractor, the State, or any other contractor; and
2. Damage to property of anyone including loss of use thereof; caused or alleged to be caused in whole or in part by any negligent or otherwise legally actionable act or omission of the Contractor or anyone directly or indirectly employed by the Contractor or anyone for whose acts the Contractor may be liable.

- Except as otherwise provided by law, these requirements apply regardless of the existence or degree of fault of the State. The Contractor is not obligated to indemnify the State for Claims arising from conduct delineated in Civil Code Section 2782 and to Claims arising from any defective or substandard condition of the highway that existed at or before the start of work, unless this condition has been changed by the work or the scope of the work requires the Contractor to maintain existing highway facilities and the Claim arises from the Contractor's failure to maintain. The Contractor's defense and indemnity obligation shall extend to Claims arising after the work is completed and accepted if the Claims are directly related to alleged acts or omissions by the Contractor that occurred during the course of the work. State inspection is not a waiver of full compliance with these requirements.

- The Contractor's obligation to defend and indemnify shall not be excused because of the Contractor's inability to evaluate liability or because the Contractor evaluates liability and determine that the Contractor is not liable. The Contractor shall respond within 30 days to the tender of any Claim for defense and indemnity by the State, unless this time has been extended by the State. If the Contractor fails to accept or reject a tender of defense and indemnity within 30 days, in addition to any other remedy authorized by law, the Department may withhold such funds the State reasonably considers necessary for its defense and indemnity until disposition has been made of the Claim or until the Contractor accepts or rejects the tender of defense, whichever occurs first.

- With respect to third-party claims against the Contractor, the Contractor waives all rights of any type to express or implied indemnity against the State, its officers, employees, or agents (excluding agents who are design professionals).

- Nothing in the Contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these indemnification specifications.

5-1.032 Insurance

5-1.032A General

- Nothing in the contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these insurance specifications.

5-1.032B Casualty Insurance

- The Contractor shall procure and maintain insurance on all of its operations with companies acceptable to the State as follows:

1. The Contractor shall keep all insurance in full force and effect from the beginning of the work through contract acceptance.
2. All insurance shall be with an insurance company with a rating from A.M. Best Financial Strength Rating of A- or better and a Financial Size Category of VII or better.
3. The Contractor shall maintain completed operations coverage with a carrier acceptable to the State through the expiration of the patent deficiency in construction statute of repose set forth in Code of Civil Procedure Section 337.1.

5-1.032C Workers' Compensation and Employer's Liability Insurance

- In accordance with Labor Code Section 1860, the Contractor shall secure the payment of worker's compensation in accordance with Labor Code Section 3700.

- In accordance with Labor Code Section 1861, the Contractor shall submit to the Department the following certification before performing the work:

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

- Contract execution constitutes certification submittal.
- The Contractor shall provide Employer's Liability Insurance in amounts not less than:
 1. \$1 000 000 for each accident for bodily injury by accident
 2. \$1 000 000 policy limit for bodily injury by disease
 3. \$1 000 000 for each employee for bodily injury by disease

- If there is an exposure of injury to the Contractor's employees under the U.S. Longshoremen's and Harbor Workers' Compensation Act, the Jones Act, or under laws, regulations, or statutes applicable to maritime employees, coverage shall be included for such injuries or claims.

5-1.032D Liability Insurance

5-1.032D(1)General

- The Contractor shall carry General Liability and Umbrella or Excess Liability Insurance covering all operations by or on behalf of the Contractor providing insurance for bodily injury liability and property damage liability for the following limits and including coverage for:

1. Premises, operations, and mobile equipment
2. Products and completed operations
3. Broad form property damage (including completed operations)
4. Explosion, collapse, and underground hazards
5. Personal injury
6. Contractual liability

5-1.032D(2) Liability Limits/Additional Insureds

- The limits of liability shall be at least the amounts shown in the following table:

Total Bid	For Each Occurrence ¹	Aggregate for Products/Completed Operation	General Aggregate ²	Umbrella or Excess Liability ³
≤\$1 000 000	\$1 000 000	\$2 000 000	\$2 000 000	\$5 000 000
>\$1 000 000				
≤\$5 000 000	\$1 000 000	\$2 000 000	\$2 000 000	\$10 000 000
>\$5 000 000				
≤\$25 000 000	\$2 000 000	\$2 000 000	\$4 000 000	\$15 000 000
>\$25 000 000	\$2 000 000	\$2 000 000	\$4 000 000	\$25 000 000
1. Combined single limit for bodily injury and property damage. 2. This limit shall apply separately to the Contractor's work under this contract. 3. The umbrella or excess policy shall contain a clause stating that it takes effect (drops down) in the event the primary limits are impaired or exhausted.				

- The Contractor shall not require certified Small Business subcontractors to carry Liability Insurance that exceeds the limits in the table above. Notwithstanding the limits specified herein, at the option of the Contractor, the liability insurance limits for certified Small Business subcontractors of any tier may be less than those limits specified in the table. For Small Business subcontracts, "Total Bid" shall be interpreted as the amount of subcontracted work to a certified Small Business.

- The State, including its officers, directors, agents (excluding agents who are design professionals), and employees, shall be named as additional insureds under the General Liability and Umbrella Liability Policies with respect to liability arising out of or connected with work or operations performed by or on behalf of the Contractor under this contract. Coverage for such additional insureds does not extend to liability:

1. Arising from any defective or substandard condition of the roadway which existed at or before the time the Contractor started work, unless such condition has been changed by the work or the scope of the work requires the Contractor to maintain existing roadway facilities and the claim arises from the Contractor's failure to maintain;
2. For claims occurring after the work is completed and accepted unless these claims are directly related to alleged acts or omissions of the Contractor that occurred during the course of the work; or
3. To the extent prohibited by Insurance Code Section 11580.04

- Additional insured coverage shall be provided by a policy provision or by an endorsement providing coverage at least as broad as Additional Insured (Form B) endorsement form CG 2010, as published by the Insurance Services Office (ISO), or other form designated by the Department.

5-1.032D(3) Contractor's Insurance Policy is Primary

- The policy shall stipulate that the insurance afforded the additional insureds applies as primary insurance. Any other insurance or self-insurance maintained by the State is excess only and shall not be called upon to contribute with this insurance.

5-1.032E Automobile Liability Insurance

- The Contractor shall carry automobile liability insurance, including coverage for all owned, hired, and nonowned automobiles. The primary limits of liability shall be not less than \$1 000 000 combined single limit each accident for bodily injury and property damage. The umbrella or excess liability coverage required under Section 5-1.032D(2) also applies to automobile liability.

5-1.032F Policy Forms, Endorsements, and Certificates

- The Contractor shall provide its General Liability Insurance under Commercial General Liability policy form No. CG0001 as published by the Insurance Services Office (ISO) or under a policy form at least as broad as policy form No. CG0001.

5-1.032G Deductibles

- The State may expressly allow deductible clauses, which it does not consider excessive, overly broad, or harmful to the interests of the State. Regardless of the allowance of exclusions or deductions by the State, the Contractor is responsible for any deductible amount and shall warrant that the coverage provided to the State is in accordance with Section 5-1.032, "Insurance."

5-1.032H Enforcement

- The Department may assure the Contractor's compliance with its insurance obligations. Ten days before an insurance policy lapses or is canceled during the contract period, the Contractor shall submit to the Department evidence of renewal or replacement of the policy.

- If the Contractor fails to maintain any required insurance coverage, the Department may maintain this coverage and withhold or charge the expense to the Contractor or terminate the Contractor's control of the work in accordance with Section 6-1.09, "Termination," of the General Conditions.

- The Contractor is not relieved of its duties and responsibilities to indemnify, defend, and hold harmless the State, its officers, agents, and employees by the Department's acceptance of insurance policies and certificates.

- Minimum insurance coverage amounts do not relieve the Contractor for liability in excess of such coverage, nor do they preclude the State from taking other actions available to it, including the withholding of funds under this contract.

5-1.032I Self-Insurance

- Self-insurance programs and self-insured retentions in insurance policies are subject to separate annual review and approval by the State.

- If the Contractor uses a self-insurance program or self-insured retention, the Contractor shall provide the State with the same protection from liability and defense of suits as would be afforded by first-dollar insurance. Execution of the contract is the Contractor's acknowledgement that the Contractor will be bound by all laws as if the Contractor were an insurer as defined under Insurance Code Section 23 and that the self-insurance program or self-insured retention shall operate as insurance as defined under Insurance Code Section 22.

5-1.04 OCCUPANCY BY THE DEPARTMENT PRIOR TO ACCEPTANCE

The Department reserves the right to occupy all or any part of the project prior to completion of the entire contract, upon written order therefor. In that event, the Contractor will be relieved of responsibility for any injury or damage to that part as results from the Department's occupancy and use by the Department. If the Contractor carries insurance against damage to the premises or against liability to third persons covering the premises so used and occupied by the Department, and if the occupancy results in increased premiums for insurance, the Department will pay to the Contractor the added cost for insurance during the period of occupancy.

This occupancy does not constitute acceptance by the Director either of the complete work or of any portion thereof, nor will it relieve the Contractor of full responsibility for correcting defective work or materials found at any time before the formal written acceptance of the entire contract by the Director or during the full guarantee period after project acceptance, as provided in Section 7-1.09, "Guarantee," of these General Conditions.

5-1.05 CONTRACTOR'S RESPONSIBILITY FOR THE WORK

Except as otherwise provided herein, the Contractor shall have the charge and care of the work and shall bear the risk of injury or damage to any part of the work by the action of the elements or from any other cause whether arising from the execution or from the nonexecution of the work until the acceptance of the contract by the Director. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any cause before its completion and acceptance, and shall bear the expense thereof. In case of suspension of work from any cause whatever, the Contractor shall be responsible for the work and shall also be responsible for all materials, and shall properly store them if necessary, and shall provide suitable drainage and erect temporary structures where necessary.

The Contractor will be relieved of responsibility for any injury or damage to the work caused by the following:

- (1) An earthquake in excess of a magnitude of 3.5 on the Richter Scale or a tidal wave, when the effect of that event has been proclaimed a disaster or state of emergency by the Governor of the State of California or by the President of the United States, or was of such magnitude at the site of the work as to have been sufficient to have caused a proclamation of disaster or state of emergency, had it occurred in a populated area.
- (2) Occupancy and use by the Department or the public prior to the completion of the entire project.
- (3) Acts of the Federal Government or the public enemy.

5-1.06 RESPONSIBILITY FOR UTILITIES

The Contractor shall be responsible for the cost for any and all work, expense or special precautions caused or required by the existence or proximity of utilities encountered in performing the work, including without limitation thereon, repair of any or all damage and all hand or exploratory excavation required. The Contractor is cautioned that the utilities may include communication cables or electrical cables which may be high voltage, and when working or excavating in the vicinity of any cables, or the ducts enclosing cables, the Contractor shall observe any special precautions required and the cost of these special precautions. Suitable warning signs, barricades, and safety devices shall be erected as necessary or required.

However, if during the course of the work the Contractor encounters utility installations which are not shown or indicated on the plans or in the special provisions, or which are found in a location substantially different from that shown, and the utilities are not reasonably apparent from visual examination, then the Contractor shall promptly notify the Engineer in writing. Where necessary for the work of the contract, the Engineer shall issue a written order to the Contractor to make adjustment, rearrangement, repair, removal, alteration, or special handling of the utility, including repair of utility if damaged. The Contractor shall perform the work described in the written order, and compensation therefor will be made in conformance with the provisions in Section 3, "Changes in the Work," of these General Conditions, relating to changes in the work. Except for the items of cost specified in Section 3, "Changes in the Work," of these General Conditions, the Contractor shall receive no compensation for any other cost, damage, delay, interference, or hindrance to him due to the presence of these utilities. If the Contractor fails to give the notice specified above and thereafter acts without instructions from the Engineer, then the Contractor shall be liable for any or all damage to these utilities or other work of the contract

which arises from the Contractor's operations subsequent to discovery thereof, and the Contractor shall repair and make good any damage at the Contractor's expense.

5-1.07 PROPERTY RIGHTS IN MATERIALS

Nothing in the contract shall be construed as vesting in the Contractor any right of property in the materials used after they have been attached or affixed to the work or soil or after partial payment has been made as provided in Section 7-1.05, "Partial Payments," of these General Conditions for material delivered on the ground or stored subject to or under the control of the State and unused. These material shall become the property of the State of California upon being so attached or affixed or upon payment for materials delivered on the ground or stored subject to or under the control of the State and unused, as provided in Section 7-1.05, "Partial Payments," of these General Conditions.

5-1.08 LEGAL ACTIONS AGAINST THE DEPARTMENT

If, pursuant to court order, the Department temporarily suspends performance of all or any portion of the work, an extension of time determined pursuant to the provisions in Section 6-1.08, "Liquidated Damages," of these General Conditions will be granted, and the Contractor shall not be entitled to any additional compensation because of the suspension.

5-1.09 NO PERSONAL LIABILITY

Neither the Director, the Engineer, nor any other officer or authorized employee of the Department of Transportation shall be personally responsible for any liability arising under the contract.

5-1.10 PATENTS

The Contractor shall assume all costs arising from the use of patented materials, equipment, devices, or processes used on or incorporated in the work, and agrees to indemnify and save harmless the State of California, the Director, the Engineer, and their duly authorized representatives, from all suits at law, or actions of every nature for, or on account of the use of any patented materials, equipment, devices, or processes.

5-1.11 PAYMENT OF TAXES

The contract price paid for the work shall include full compensation for all taxes which the Contractor is required to pay, whether imposed by Federal, State or local government, including, without being limited to, Federal excise tax. No tax exemption certificate nor any document designed to exempt the Contractor from payment of any tax will be furnished to the Contractor by the Department, as to any tax on labor, services, materials, transportation, or any other items furnished pursuant to the contract.

5-1.12 COOPERATION

Should construction be under way by State forces or other forces or by other contractors within or adjacent to the limits of the work or should work of any other nature be under way by other forces within or adjacent to those limits, the Contractor shall cooperate with all the other contractors or other forces to the end that any delay, interference or hindrance to their work will be avoided. The right is reserved to perform other or additional work at or near the site at any time, by the use of other forces.

SECTION 6

PROSECUTION AND PROGRESS

6-1.01 SUBLETTING AND SUBCONTRACTING

The Contractor shall be responsible for all work performed under the contract. All persons engaged in the work will be considered as employees of the Contractor. The Contractor shall give personal attention to the fulfillment of the contract and shall keep the work under the Contractor's control. When any subcontractor fails to prosecute a portion of the work in a manner satisfactory to the Engineer, the Contractor shall remove that subcontractor immediately upon written request of the Engineer, and the subcontractor shall not again be employed on the work. Although the sections of the contract may be arranged according to various trades, or general grouping of the work, the Contractor is not obligated to sublet the work in the same manner. The State will not arbitrate disputes among subcontractors or between the Contractor and one or more subcontractors concerning responsibility for performing any part of the work.

Subcontracts shall include provisions that the contract between the State and the Contractor is part of the subcontract, and that all terms and provisions of the contract are incorporated in the subcontract. Subcontracts shall also contain certification by the subcontractor that the subcontractor is experienced in and qualified to do, and knowledgeable about, the subcontracted work. Copies of subcontracts shall be available to the Engineer upon written request, and shall be provided to the Engineer at the time any litigation against the State concerning the project is filed.

Pursuant to the provisions of Section 6109 of the Public Contract Code, the Contractor shall not perform work on a public works project with a subcontractor who is ineligible to perform work on the public works project pursuant to Section 1777.1 or 1777.7 of the Labor Code.

The Contractor shall not substitute any person as subcontractor in place of a subcontractor listed on the Contractor's bid proposal without the written approval of the Engineer. Substitutions must be in conformance with the provisions of the "Subletting and Subcontracting Fair Practices Act" beginning with Section 4100 of the Public Contract Code. Violations of this Act by the Contractor may subject him to penalties which may include cancellation of contract, assessment of 10 percent of the subcontractor's bid, and disciplinary action by the Contractors' State License Board.

6-1.02 ASSIGNMENT

The performance of the contract may not be assigned, except upon the written consent of the Director. Consent will not be given to any proposed assignment which would relieve the original Contractor or the Contractor's surety of their responsibilities under the contract nor will the Director consent to any assignment of a part of the work under the contract.

- If the Contractor assigns the right to receive contract payments, the Department accepts the assignment upon the Engineer's receipt of a notice. Assigned payments remain subject to deductions and withholds described in the contract. The Department may use withheld payments for work completion whether payments are assigned or not.

6-1.03 BEGINNING OF WORK

The Contractor shall begin work within 15 calendar days after receiving notice that the contract has been approved by the Attorney General or the attorney appointed and authorized to represent the Department, and shall diligently prosecute the same to completion within the time limit provided in the special provisions.

The Contractor shall notify the Engineer, in writing, of the Contractor's intent to begin work at least 72 hours before work is begun. The notice shall be delivered to the Office of the District Director of Transportation in the district in which the work is situated and shall specify the date the Contractor intends to start. If the project has more than one location of work, a separate notice shall be given for each location.

Should the Contractor begin work in advance of receiving notice that the contract has been approved as above provided, any work performed by the Contractor in advance of the date of approval shall be considered as having been done by the Contractor at the Contractor's own risk and as a volunteer unless the contract is approved.

The delivery to the State for execution and approval of the contract properly executed on behalf of the Contractor and surety and the minimum 72 hours advance written notice as required above shall constitute the Contractor's authority to enter upon the site of the work and to begin operations, subject to the Contractor's assumption of the risk of the disapproval of the contract, as above provided, and subject also to the following:

- (1) The Contractor shall, on commencing operations, take all precautions required for public safety and shall observe all the provisions in these General Conditions and the special provisions.
- (2) In the event of disapproval, the Contractor shall at the Contractor's expense do that work that is necessary to leave the site in a neat condition to the satisfaction of the Engineer.
- (3) All work done according to the contract prior to its approval, will, when the contract is approved, be considered authorized work and will be paid for as provided in the contract.
- (4) The Contractor shall not be entitled to any additional compensation or an extension of time for any delay, hindrance or interference caused by or attributable to commencement of work prior to the date on which the contract was approved by the Attorney General or the attorney appointed and authorized to represent the Department, except to the extent the delay, hindrance or interference would have been compensable hereunder had work been commenced on the date of the approval and the progress thereof been the same as that actually made.

6-1.04 PROGRESS SCHEDULE

The Contractor shall submit to the Engineer a practicable progress schedule within 15 days of approval of the contract, and within 7 days of the Engineer's written request at any other time.

The Contractor may furnish the schedule on a form of the Contractor's choice or, if requested, the Engineer will furnish a form for the Contractor's use. If the Engineer furnishes a form, the Engineer will also furnish to the Contractor, on request, on or before the last day of each month a copy of the form showing the status of work actually completed during the preceding estimate period.

The schedule shall show the order in which the Contractor proposes to carry out the work, the dates on which the Contractor will start the several salient features of the work, and the contemplated dates for completing those salient features.

The progress schedules submitted shall be consistent in all respects with the time and order of work requirements of the contract.

Subsequent to the time that submittal of a progress schedule is required in conformance with these General Conditions, no progress payment will be made for any work until a satisfactory schedule has been submitted to the Engineer.

6-1.05 SCHEDULE OF VALUES

The Contractor shall submit to the Engineer a schedule of values for each lump sum item. The sum of the items listed in the schedule of values shall equal the contract lump sum prices. Overhead and profit shall not be listed as separate items. The schedule of values shall be approved by the Engineer before any partial payment estimate is prepared.

6-1.06 TEMPORARY SUSPENSION OF WORK

The Engineer shall have the authority to suspend the work wholly or in part, for any time period as the Engineer deems necessary, due to unsuitable weather, or to such other conditions as are considered unfavorable for the suitable prosecution of the work, or for any time period as the Engineer deems necessary due to the failure on the part of the Contractor to carry out orders given, or to perform any provision of the contract.

The Contractor shall immediately comply with the written order of the Engineer to suspend the work wholly or in part. The suspended work shall be resumed when conditions are favorable and methods are corrected, as ordered or approved in writing by the Engineer.

If the Engineer orders a suspension of all of the work or a portion of the work which is the current controlling operation or operations, due to unsuitable weather or to such other conditions as are considered unfavorable to the suitable prosecution of the work, the days on which the suspension is in effect shall not be considered working days as defined in Section 6-1.07, "Time of Completion," of these General Conditions. If a portion of work at the time of the suspension is not a current controlling operation or operations, but subsequently does become the current controlling operation or operations, the determination of working days will be made on the basis of the then current controlling operation or operations.

If a suspension of work is ordered by the Engineer, due to the failure on the part of the Contractor to carry out orders given or to perform any provision of the contract, the days on which the suspension order is in effect shall be considered working days if those days are working days within the meaning of the definition set forth in Section 6-1.07, "Time of Completion," of these General Conditions.

In the event of a suspension of work under any of the conditions set forth in this Section 6-1.06, the suspension of work shall not relieve the Contractor of the Contractor's legal responsibilities as set forth in these General Conditions.

The Contractor shall have no claim for damage or compensation for any delay, interference or hindrance resulting from an ordered temporary suspension of the work.

In addition to the requirements specified above, the following shall apply:

If the performance of all or any portion of the work is suspended or delayed by the Engineer in writing for an unreasonable period of time (not originally anticipated, customary, or inherent to the construction industry) and the Contractor believes that additional compensation or contract time or additional compensation and contract time is due as a result of the suspension or delay, the Contractor shall submit to the Engineer in writing a request for adjustment within 7 calendar days of receipt of the notice to resume work. The request shall set forth the reasons and support for the adjustment.

Upon receipt, the Engineer will evaluate the Contractor's request. If the Engineer agrees that the cost or time or cost and time required for the performance of the contract has increased as a result of the suspension and the suspension was caused by conditions beyond the control of and not the fault of the Contractor, the Contractor's suppliers, or subcontractors at any approved tier, and not caused by weather, the Engineer will make an adjustment (excluding profit) and modify the contract in writing accordingly. The Engineer will notify the Contractor of the Engineer's determination whether or not an adjustment of the contract is warranted.

No contract adjustment will be allowed unless the Contractor has submitted the request for adjustment within the time prescribed.

No contract adjustment will be allowed under the provisions specified in this section to the extent that performance would have been suspended or delayed by any other cause, or for which an adjustment is provided for or excluded under any term or condition of this contract.

6-1.07 TIME OF COMPLETION

The Contractor shall complete all or any designated portion of the work called for under the contract in all parts and requirements within the time set forth in the special provisions.

A working day is defined as any day, except Saturdays, and holidays and days on which the Contractor is specifically required by the special provisions to suspend construction operations, and except days on which the Contractor is prevented by inclement weather or conditions resulting immediately therefrom adverse to the current controlling operation or operations, as determined by the Engineer, from proceeding with at least 75 percent of the normal labor and equipment force engaged on the controlling operation or operations for at least 60 percent of the total daily time being currently spent on the controlling operation or operations.

Should the Contractor prepare to begin work at the regular starting time in the morning of any day on which inclement weather, or the conditions resulting from the weather, or the condition of the work, prevents the work from beginning at the usual starting time and the crew is dismissed as a result thereof and the Contractor does not proceed with at least 75 percent of the normal labor and equipment force engaged in the current controlling operation or operations for at least 60 percent of the total daily time being currently spent on the controlling operation or operations, the Contractor will not be charged for a working day whether or not conditions should change thereafter during that day and the major portion of the day could be considered to be suitable for those construction operations.

The current controlling operation or operations is to be construed to include any feature of the work which, if delayed, will delay the time of completion of the contract.

Determination that a day is a nonworking day by reason of inclement weather or conditions resulting immediately therefrom shall be made and agreed upon during that day by conference between the Engineer and the Contractor. In the event of failure to agree, the Contractor will be allowed 15 days from the issuance of the weekly statement of working days in which to file a written protest setting forth in what respects the Contractor differs from the Engineer, otherwise the decision of the Engineer shall be deemed to have been accepted by the Contractor as correct. The Engineer will furnish the Contractor a weekly statement showing the number of working days charged to the contract for the preceding week, the number of working days of time extensions being considered or approved, the number of working days originally specified for the completion of the contract and the number of working days remaining to complete the contract and the extended date for completion thereof, except when working days are not being charged in conformance with the provisions in Section 6-1.06, "Temporary Suspension of Work," of these General Conditions.

6-1.08 LIQUIDATED DAMAGES

It is agreed by the parties to the contract that in case all the work called for under the contract in all parts and requirements is not finished or completed within the number of working days as set forth in the special provisions, damage will be sustained by the State of California, and that it is and will be impracticable and extremely difficult to ascertain and determine the actual damage which the State will sustain in the event of and by reason of the delay; and it is therefore agreed that the Contractor will pay to the State of California, the sum set forth in the special provisions per day for each and every calendar day's delay in finishing the work in excess of the number of working days prescribed; and the Contractor agrees to pay the liquidated damages herein provided for, and further agrees that the Department may deduct the amount thereof from any moneys due or that may become due the Contractor under the contract.

It is further agreed that in case the work called for under the contract is not finished and completed in all parts and requirements within the number of working days specified, the Director shall have the right to increase the number of working days or not, as the Director may deem best to serve the interest of the State, and if the Director decides to increase the number of working days, the Director shall further have the right to charge to the Contractor, the Contractor's heirs, assigns or sureties and to deduct from the final payment for the work all or any part, as the Director may deem proper, of the actual cost of engineering, inspection, superintendence, and other overhead expenses which are directly chargeable to the contract, and which accrue during the period of the extension, except that cost of final surveys and preparation of final statement shall not be included in the charges.

The Contractor will be granted an extension of time and will not be assessed with liquidated damages or the cost of engineering and inspection for any portion of the delay in completion of the work beyond the time named in the special provisions for the completion of the work caused by acts of God or of the public enemy, fire, floods, tsunamis, earthquakes, epidemics, quarantine restrictions, strikes, labor disputes, shortage of materials and freight embargoes, provided, that the Contractor shall notify the Engineer in writing of the causes of delay within 15 days from the beginning of that delay. The Engineer shall ascertain the facts and the extent of the delay, and the Engineer's findings thereon shall be final and conclusive.

No extension of time will be granted for a delay caused by a shortage of materials unless the Contractor furnishes to the Engineer documentary proof that the Contractor has made every effort to obtain the materials from all known sources within reasonable reach of the work in a diligent and timely manner, and further proof in the form of supplementary progress schedules, as required in Section 6-1.04, "Progress Schedule," of these General Conditions that the inability to obtain the materials when originally planned, did in fact cause a delay in final completion of the entire work which could not be compensated for by revising the sequence of the Contractor's operations. The term "shortage of materials," as used in this section, shall apply only to materials, articles, parts or equipment which are standard items and are to be incorporated in the work. The term "shortage of materials," shall not apply to materials, parts, articles, or equipment which are processed, made, constructed, fabricated or manufactured to meet the specific requirements of the contract. Only the physical shortage of material will be considered under these provisions as a cause for extension of time. Delays in obtaining materials due to priority in filling orders will not constitute a shortage of materials.

If the Contractor is delayed in completion of the work by reason of changes made under Section 3, "Changes in the Work," of these General Conditions or by any act of the Engineer or of the Department, not contemplated by the contract, an extension of time commensurate with the delay in completion of the work thus caused will be granted and the Contractor shall be relieved from any claim for liquidated damages, or engineering and inspection charges or other penalties for the period covered by that extension of time; provided that the Contractor shall notify the Engineer in writing of the causes of delay within 15 days from the beginning of the delay. The Engineer shall ascertain the facts and the extent of the delay, and the Engineer's findings thereon shall be final and conclusive.

Except as provided in Public Contract Code Section 7102, the Contractor shall have no claim for damage or compensation for any delay or hindrance whether or not contemplated by the contract.

It is the intention of the above provisions that the Contractor shall not be relieved of liability for liquidated damages or engineering and inspection charges for any period of delay in completion of the work in excess of that expressly provided for in this Section 6-1.08.

6-1.09 TERMINATION

6-1.09A Termination Of Contract - "Convenience Of State"

The Department reserves the right to terminate the contract at any time if the Director determines that to do so would be in the best interest of the State.

Termination of the contract and the total compensation payable to the Contractor in the event of termination shall be governed by the following:

- (1) The Engineer will issue the Contractor a written notice signed by the Director, specifying that the contract is to be terminated. Upon receipt of that written notice and, except as otherwise directed in writing by the Engineer, the Contractor shall:
 - (a) Stop all work under the contract except that specifically directed to be completed prior to acceptance.
 - (b) Perform work the Engineer deems necessary to secure the project for termination.
 - (c) Remove equipment from the site of the work.
 - (d) Take the required action as is necessary to protect materials from damage.
 - (e) Notify all subcontractors and suppliers that the contract is being terminated and that their contracts or orders are not to be further performed unless otherwise authorized in writing by the Engineer.
 - (f) Provide the Engineer with an inventory list of all materials previously produced, purchased or ordered from suppliers for use in the work and not yet used in the work, including its storage location, and any other information as the Engineer may request.
 - (g) Dispose of materials not yet used in the work as directed by the Engineer. It shall be the Contractor's responsibility to provide the State with good title to all materials purchased by the State hereunder, including materials for which partial payment has been made as provided in Section 7-1.05, "Partial Payments," of these General Conditions and with bills of sale or other documents of title for the materials.

- (h) Subject to the prior written approval of the Engineer, settle all outstanding liabilities and all claims arising out of subcontracts or orders for materials terminated hereunder. To the extent directed by the Engineer, the Contractor shall assign to the Department all the right, title and interest of the Contractor under subcontracts or orders for materials terminated hereunder.
 - (i) Furnish the Engineer with the documentation required to be furnished by the Contractor under the provisions of the contract including, on projects as to which Federal funds are involved, all documentation required under the Federal requirements included in the contract.
 - (j) Take other actions as the Engineer may direct.
- (2) Acceptance of the contract as hereinafter specified shall not relieve the Contractor of responsibility for damage to materials except as follows:

The Contractor's responsibility for damage to materials for which partial payment has been made as provided in Section 7-1.05, "Partial Payments," of these General Conditions and for materials furnished by the State for use in the work and unused shall terminate when the Engineer certifies that the materials have been stored in the manner and at the locations the Engineer has directed.

The Contractor's responsibility for damage to materials purchased by the State subsequent to the issuance of the notice that the contract is to be terminated shall terminate when title and delivery of those materials has been taken by the State.

When the Engineer determines that the Contractor has completed the work under the contract directed to be completed prior to termination and all other work as may have been ordered to secure the project for termination, the Engineer will recommend that the Director formally accept the contract, and immediately upon and after the acceptance by the Director, the Contractor will not be required to perform any further work thereon and shall be relieved of contractual responsibilities for injury to persons or damage to property which occurs after the formal acceptance of the project by the Director.

- (3) The total compensation to be paid to the Contractor shall be determined by the Engineer on the basis of the following:
- (a) The reasonable cost to the Contractor, without profit, for all work performed under the contract, including mobilization, demobilization and work done to secure the project for termination.
When in the opinion of the Engineer the cost of the work is excessively high due to costs incurred to remedy or replace defective or rejected work, the reasonable cost to be allowed will be the estimated reasonable cost of performing that work in compliance with the requirements of the plans and special provisions and the excessive actual cost shall be disallowed.
 - (b) A reasonable allowance for profit on the cost of work performed as determined under Subsection (a), provided the Contractor establishes to the satisfaction of the Engineer that it is reasonably probable that the Contractor would have made a profit had the contract been completed and provided further, that the profit allowed shall in no event exceed 4 percent of the cost.
 - (c) The reasonable cost to the Contractor of handling material returned to the vendor, delivered to the Department or otherwise disposed of as directed by the Engineer.
 - (d) A reasonable allowance for the Contractor's administrative costs in determining the amount payable due to termination of the contract.

All records of the Contractor and subcontractors, necessary to determine compensation in conformance with the provisions of this Section shall be open to inspection or audit by representatives of the Department at all times after issuance of the notice that the contract is to be terminated and for a period of 3 years, and these records shall be retained for that period.

After acceptance of the work by the Director, the Engineer may make payments on the basis of interim estimates pending issuance of the Final Statement, when in the Engineer's opinion the amount thus paid, together with all amounts previously paid or allowed, will not result in total compensation in excess of that to which the Contractor will be entitled. All payments, including payment upon the Final Statement, shall be subject to deduction for prior payments and amounts, if any, to be kept or retained under the provisions of the contract.

The provisions of this Section shall be included in all subcontracts.

6-1.09B Termination Of Control - "Default Of Contractor"

Failure to supply an adequate working force, or material of proper quality, or failure to comply with Section 10262 of the State Contract Act, or in any other respect to prosecute the work with the diligence and force specified by the contract, is grounds for termination of the Contractor's control over the work and for taking over the work by the State. The procedures for termination, completion of the work, and the rights and obligations of the parties are provided for in the State Contract Act (Public Contract Code Sections 10253-10260).

If the Contractor's control of the work is terminated or the Contractor abandons the work and the contract work is completed in conformance with the provisions in Section 10255 of the State Contract Act, any dispute concerning the amount to be paid by the State to the Contractor or the Contractor's surety or to be paid to the State by the Contractor or the Contractor's surety, under the provisions in Section 10258 of the State Contract Act, shall be subject to arbitration in conformance with the provisions in Section 7-1.10, "Arbitration," of these General Conditions. The surety shall be bound by the arbitration award and is entitled to participate in the arbitration proceedings.

SECTION 7

ACCEPTANCE AND PAYMENT

7-1.01 ACCEPTANCE

The contract will be accepted in writing by the Director when the whole shall have been completed in all respects in conformance with the provisions of the contract to the full satisfaction of the Department.

7-1.02 SCOPE OF PAYMENT

The Contractor shall accept the compensation provided in the contract as full payment for furnishing all labor, materials, tools, equipment, and incidentals necessary to the completed work and for performing all work contemplated and embraced under the contract; also for loss or damage arising from the nature of the work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the acceptance by the Director and for all risks of every description connected with the prosecution of the work, also for all expenses incurred in consequence of the suspension or discontinuance of the work as provided in the contract; and for completing the work according to the contract. Neither the payment of any estimate nor of any retained percentage or withhold relieves the Contractor of any obligation to make good any defective work or material.

No compensation will be made in any case for loss of anticipated profits.

7-1.03 NOTICE OF POTENTIAL CLAIM

It is the intention of this section that disputes between the parties arising under and by virtue of the contract be brought to the attention of the Engineer at the earliest possible time in order that the matters may be resolved, if possible, or other appropriate action promptly taken.

Disputes will not be considered unless the Contractor has first complied with specified notice or protest requirements, including Section 3, "Changes in the Work," the notice provisions in Section 2-1.045, "Differing Site Conditions," Section 6-1.07, "Time of Completion," Section 6-1.08, "Liquidated Damages," and Section 5-1.06, "Responsibility for Utilities," of these General Conditions.

For disputes arising under and by virtue of the contract, including an act or failure to act by the Engineer, the Contractor shall provide a signed written initial notice of potential claim to the Engineer within 5 days from the date the dispute first arose. The initial notice of potential claim shall provide the nature and circumstances involved in the dispute which shall remain consistent through the dispute. The initial notice of potential claim shall be submitted on Form CEM-6201A furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Contractor shall assign an exclusive identification number for each dispute, determined by chronological sequencing, based on the date of the dispute.

The exclusive identification number for each dispute shall be used on the following corresponding documents:

1. Initial notice of potential claim
2. Supplemental notice of potential claim
3. Full and final documentation of potential claim
4. Corresponding claim included in the Contractor's written statement of claims

The Contractor shall provide the Engineer the opportunity to examine the site of work within 5 days from the date of the initial notice of potential claim. The Contractor shall proceed with the performance of contract work unless otherwise specified or directed by the Engineer.

Throughout the disputed work, the Contractor shall maintain records that provide a clear distinction between the incurred direct costs of disputed work and that of undisputed work. The Contractor shall allow the Engineer access to the Contractor's project records deemed necessary by the Engineer to evaluate the potential claim within 20 days of the date of the Engineer's written request.

Within 15 days of submitting the initial notice of potential claim, the Contractor shall provide a signed supplemental notice of potential claim to the Engineer that provides the following information:

1. The complete nature and circumstances of the dispute which caused the potential claim
2. The contract provisions that provide the basis of claim
3. The estimated cost of the potential claim, including an itemized breakdown of individual costs and how the estimate was determined
4. A time impact analysis of the project schedule that illustrates the effect on the scheduled completion date due to schedule changes or disruptions where a request for adjustment of contract time is made

The information provided in items 1 and 2 above shall provide the Contractor's complete reasoning for additional compensation or adjustments.

The supplemental notice of potential claim shall be submitted on Form CEM-6201B furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Engineer will evaluate the information presented in the supplemental notice of potential claim and provide a written response to the Contractor within 20 days of its receipt. If the estimated cost or effect on the scheduled completion date changes, the Contractor shall update information in items 3 and 4 above as soon as the change is recognized and submit this information to the Engineer.

Within 30 days of the completion of work related to the potential claim, the Contractor shall provide the full and final documentation of potential claim to the Engineer that provides the following information:

1. A detailed factual narration of events fully describing the nature and circumstances that caused the dispute, including, but not limited to, necessary dates, locations, and items of work affected by the dispute
2. The specific provisions of the contract that support the potential claim and a statement of the reasons these provisions support and provide a basis for entitlement of the potential claim
3. When additional monetary compensation is requested, the exact amount requested calculated in conformance with Section 3, "Changes in the Work," including an itemized breakdown of individual costs. These costs shall be segregated into the following cost categories:
 - 3.1. Labor – A listing of individuals, classifications, regular hours and overtime hours worked, dates worked, and other pertinent information related to the requested reimbursement of labor costs
 - 3.2. Materials – Invoices, purchase orders, location of materials either stored or incorporated into the work, dates materials were transported to the project or incorporated into the work, and other pertinent information related to the requested reimbursement of material costs
 - 3.3. Equipment – Listing of detailed description (make, model, and serial number), hours of use, dates of use and equipment rates. Equipment rates shall be at the applicable State rental rate as listed in the Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rates," in effect when the affected work related to the dispute was performed.
 - 3.4. Other categories as specified by the Contractor or the Engineer
4. When an adjustment of contract time is requested the following information shall be provided:
 - 4.1. The specific dates for which contract time is being requested
 - 4.2. The specific reasons for entitlement to a contract time adjustment

- 4.3. The specific provisions of the contract that provide the basis for the requested contract time adjustment
 - 4.4. A detailed time impact analysis of the project schedule. The time impact analysis shall show the effect of changes or disruptions on the scheduled completion date to demonstrate entitlement to a contract time adjustment.
5. The identification and copies of the Contractor's documents and the substance of oral communications that support the potential claim

The full and final documentation of the potential claim shall be submitted on Form CEM-6201C furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655.

Pertinent information, references, arguments, and data to support the potential claim shall be included in the full and final documentation of potential claim. Information submitted subsequent to the full and final documentation submittal will not be considered. Information required in the full and final documentation of potential claim, as listed in items 1 to 5 above, that is not applicable to the dispute may be exempted as determined by the Engineer. No full and final documentation of potential claim will be considered that does not have the same nature and circumstances, and basis of claim as those specified on the initial and supplemental notices of potential claim.

The Engineer will evaluate the information presented in the full and final documentation of potential claim and provide a written response to the Contractor within 30 days of its receipt unless otherwise specified. The Engineer's receipt of the full and final documentation of potential claim shall be evidenced by postal receipt or the Engineer's written receipt if delivered by hand. If the full and final documentation of potential claim is submitted by the Contractor after acceptance of the work by the Director, the Engineer need not provide a written response.

Provisions in this section shall not apply to those claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate. Administrative disputes are disputes of administrative deductions or withholds, contract item quantities, contract item adjustments, interest payments, protests of contract change orders as provided in Section 3-1.01D, "Failure To Agree To The Cost Of Changes" and protests of the Weekly Statement of Working Days as provided in Section 6-1.07, "Time of Completion." Administrative disputes that occur prior to issuance of the proposed final estimate shall follow applicable requirements of this section. Information listed in the supplemental notice and full and final documentation of potential claim that is not applicable to the administrative dispute may be exempted as determined by the Engineer.

Unless otherwise specified in the special provisions, the Contractor may pursue the administrative claim process pursuant to Section 7-1.07, "Final Payment and Claims," for any potential claim found by the Engineer to be without merit.

Failure of the Contractor to conform to specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract, and is deemed as the Contractor's waiver of the potential claim and a waiver of the right to a corresponding claim for the disputed work in the administrative claim process in conformance with Section 7-1.07, "Final Payment and Claims," and shall operate as a bar to arbitration pursuant to Section 10240.2 of the California Public Contract Code.

7-1.04 STOP NOTICE WITHHOLDS

The Department may withhold payments to cover claims filed under Civ Code § 3179 et seq.

7-1.043 PERFORMANCE FAILURE WITHHOLDS

During each estimate period you fail to comply with a contract part, including submittal of a document as specified, the Department withholds a part of the progress payment. The documents include quality control plans, schedules, traffic control plans, and water pollution control submittals.

For 1 performance failure, the Department withholds 25 percent of the progress payment but does not withhold more than 10 percent of the total bid.

For multiple performance failures, the Department withholds 100 percent of the progress payment but does not withhold more than 10 percent of the total bid.

The Department returns performance-failure withholds in the progress payment following the correction of noncompliance.

7-1.045 PENALTY WITHHOLDS

Penalties include fines and damages that are proposed, assessed, or levied against you or the Department by a governmental agency or citizen lawsuit. Penalties are also payments made or costs incurred in settling alleged permit violations of Federal, State, or local laws, regulations, or requirements. The cost incurred may include the amount spent for mitigation or correcting a violation.

If you or the Department is assessed a penalty, the Department may withhold the penalty amount until the penalty disposition has been resolved. The Department may withhold penalty funds and notify you within 15 days of the withhold. If the penalty amount is less than the amount being withheld from progress payments for retentions, the Department will not withhold the penalty amount.

If the penalty is resolved for less than the amount withheld, the Department pays interest at a rate of 6 percent per year on the excess withhold. If the penalty is not resolved, the withhold becomes a deduction.

Instead of the withhold, you may provide a bond payable to the Department of Transportation equal to the highest estimated liability for any disputed penalties proposed.

7-1.047 PROGRESS WITHHOLDS FOR FEDERAL-AID CONTRACTS

Section 7-1.047, "Progress Withholds for Federal-Aid Contracts," applies to a Federal-aid contract.

The Department withholds 10 percent of a partial payment for noncompliant progress. Noncompliant progress occurs when:

1. Total days to date exceed 75 percent of the revised contract working days
2. Percent of working days elapsed exceeds the percent of value of work completed by more than 15 percent

The Engineer determines the percent of working days elapsed by dividing the total days to date by the revised contract working days and converting the quotient to a percentage.

The Engineer determines the percent of value of work completed by summing payments made to date and the amount due on the current progress estimate, dividing this sum by the current total estimated value of the work, and converting the quotient to a percentage. These amounts are shown on the Progress Payment Voucher.

When the percent of working days elapsed minus the percent of value of work completed is less than or equal to 15 percent, the Department returns the withhold in the next progress payment.

7-1.05 PARTIAL PAYMENTS

The Department, once in each month upon request of the Contractor for partial payments, shall cause an estimate in writing to be made by the Engineer. The estimate shall include the total amount of work done and acceptable materials furnished to the time of the estimate, and the value thereof. The acceptable materials shall include materials that are furnished and delivered to the work site and are not incorporated in the work.

For a non-Federal-aid project, the Department retains 10 percent of the estimated value of the work done and 10 percent of the value of materials estimated to have been furnished and delivered and unused or furnished and stored as part security for the fulfillment of the contract by the Contractor, except that at any time after 20 percent of the work has been completed, if the Engineer finds that satisfactory progress is being made, the Department may reduce the total amount being retained from payment pursuant to the above requirements to 5 percent of the total estimated value of the work and materials and may also reduce the amount retained from any of the remaining partial payments to 5 percent of the estimated value of the work and materials. In addition, on any partial payment made after 95 percent of the work has been completed, the Department may reduce the amount retained from payment pursuant to the requirements of this Section 7-1.05, to such lesser amount as the Department determines is adequate security for the fulfillment of the balance of the work and other requirements of the contract, but in no event is that amount reduced to less than 125 percent of the estimated value of the work yet to be completed as determined by the Engineer. The reduction is made only upon the request of the Contractor and must be approved in writing by the surety on the performance bond and by the surety on the payment bond. The approval of the surety must be submitted to the Disbursing Officer of the Department; the signature of the person executing the approval for the surety must be properly acknowledged and the power of attorney authorizing the person to give that consent must either accompany the document or be on file with the Department. The retentions specified in this paragraph are those defined in Pub Cont Code § 7107(b).

The Department shall pay monthly to the Contractor, while carrying on the work, the balance not retained, as aforesaid, after deducting therefrom all previous payments and all sums to be deducted or withheld under the provisions of the contract. No monthly estimate or payment shall be required to be made when, in the judgment of the Engineer, the work is not proceeding in conformance with the provisions of the contract.

No monthly estimate or payment shall be construed to be an acceptance of any defective work or improper materials.

Attention is directed to the prohibitions and penalties pertaining to unlicensed contractors as provided in Business and Professions Code Sections 7028.15(a) and 7031.

7-1.055 PROMPT PROGRESS PAYMENT TO SUBCONTRACTORS

Attention is directed to the provisions in Sections 10262 and 10262.5 of the Public Contract Code and Section 7108.5 of the Business and Professions Code concerning prompt payment to subcontractors.

7-1.06 RELEASE OF RETAINED FUNDS

The Department releases retained funds if you:

1. Request release of the retention (Pub Cont Code § 10263) in writing
2. Deposit securities equivalent to the funds you want released into escrow with the State Treasurer or with a bank acceptable to the Department
3. Are the beneficial owner of and receive interest on the deposited securities substituted for the retained funds

Alternatively, upon the Contractor's request, the Department will make payment of retentions earned directly to the escrow agent. The Contractor may direct the investment of the payments into securities and the Contractor shall receive the interest earned on the investments upon the same terms provided for securities deposited by the Contractor. Upon satisfactory completion of the contract, the Contractor shall receive from the escrow agent all securities, interest, and payments received by the escrow agent from the Department, pursuant to the terms in Section 10263 of the Public Contract Code.

Alternatively, and subject to the approval of the Department, the payment of retentions earned may be deposited directly with a person licensed under Division 6 (commencing with Section 17000) of the Financial Code as the escrow agent. Upon written request of an escrow agent that has not been approved by the Department under subdivision (c) of Section 10263 of the Public Contract Code, the Department will provide written notice to that escrow agent within 10 business days of receipt of the request indicating the reason or reasons for not approving that escrow agent. The payments will be deposited in a trust account with a Federally chartered bank or savings association within 24 hours of receipt by the escrow agent. The Contractor shall not place any retentions with the escrow agent in excess of the coverage provided to that escrow agent pursuant to subdivision (b) of Section 17314 of the Financial Code. In all respects not inconsistent with subdivision (c) of Section 10263 of the Public Contract Code, the remaining provisions of Section 10263 of the Public Contract Code shall apply to escrow agents acting pursuant to subdivision (c) of Section 10263 of the Public Contract Code.

Securities eligible for investment shall include those listed in Section 16430 of the Government Code, bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by the Contractor and the Department.

The escrow agreement used pursuant to this Section 7-1.06 shall be substantially similar to the "Escrow Agreement for Security Deposits In Lieu of Retention" in Section 10263 of the Public Contract Code, deemed as incorporated herein by reference.

The Contractor shall obtain the written consent of the surety to the agreement.

7-1.07 FINAL PAYMENT AND CLAIMS

After acceptance by the Director, the Engineer makes a proposed final estimate of the total amount payable to the Contractor, including an itemization of the total amount, segregated by contract item quantities, extra work, and other basis for payment, and shows each deduction made or to be made for prior payments and amounts to be deducted, withheld, or retained under the provisions of the contract. Prior estimates and payments are subject to correction in the proposed final estimate. The Contractor must submit written approval of the proposed final estimate or a written statement of claims arising under or by virtue of the contract so that the Engineer receives the written approval or statement of claims no later than close of business of the 30th day after receiving the proposed final estimate. The Contractor's receipt of the proposed final estimate must be evidenced by postal receipt. The Engineer's receipt of the Contractor's written approval or statement of claims must be evidenced by postal receipt or the Engineer's written receipt if delivered by hand.

On the Contractor's approval, or if the Contractor files no claim within the specified period of 30 days, the Engineer will issue a final estimate in writing in conformance with the proposed final estimate submitted to the Contractor, and within 30 days thereafter the State will pay the entire sum so found to be due. That final estimate and payment thereon shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except as otherwise provided in Section 7-1.08, "Clerical Errors."

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If the Contractor within the specified period of 30 days files claims, the Engineer will issue a semifinal estimate in conformance with the proposed final estimate submitted to the Contractor and within 30 days thereafter the State will pay the sum found to be due. The semifinal estimate and corresponding payment shall be conclusive and binding against both parties to the contract on each question relating to the amount of work done and the compensation payable therefor, except insofar as affected by the claims filed within the time and in the manner required hereunder and except as otherwise provided in Section 7-1.08, "Clerical Errors."

Except for claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate, the Contractor shall only provide the following two items of information for each claim:

1. The exclusive identification number that corresponds to the supporting full and final documentation of potential claim
2. The final amount of requested additional compensation

If the final amount of requested additional compensation is different than the amount of requested compensation included in the full and final documentation of potential claim, the Contractor shall provide in the written statement of claims the reasons for the changed amount, the specific provisions of the contract which support the changed amount, and a statement of the reasons the provisions support and provide a basis for the changed amount. If the Contractor's claim fails to provide an exclusive identification number or if there is a disparity in the provided exclusive identification number, the Engineer will notify the Contractor of the omission or disparity. The Contractor shall have 15 days after receiving notification from the Engineer to correct the omission or disparity. If after the 15 days has elapsed, there is still an omission or disparity of the exclusive identification number assigned to the claim, the Engineer will assign the number. No claim will be considered that has any of the following deficiencies:

1. The claim does not have the same nature, circumstances, and basis as the corresponding full and final documentation of potential claim.
2. The claim does not have a corresponding full and final documentation of potential claim.
3. The claim was not included in the written statement of claims.
4. The Contractor did not comply with applicable notice or protest requirements of Sections 3, "Changes in the Work," 2-1.045, "Differing Site Conditions," 6-1.07, "Time of Completion," 6-1.08, "Liquidated Damages," 5-1.06, "Responsibility for Utilities," and 7-1.03, "Notice of Potential Claim" of these General Conditions.

Administrative disputes that occur after issuance of the proposed final estimate shall be included in the Contractor's written statement of claims in sufficient detail to enable the Engineer to ascertain the basis and amounts of those claims.

The Contractor shall keep full and complete records of the costs and additional time incurred for work for which a claim for additional compensation is made. The Engineer or designated claim investigators or auditors shall have access to those records and any other records as may be required by the Engineer to determine the facts or contentions involved in the claims. Failure to permit access to those records shall be sufficient cause for denying the claims.

The written statement of claims submitted by the Contractor shall be accompanied by a notarized certificate containing the following language:

Under the penalty of law for perjury or falsification and with specific reference to the California False Claims Act, Government Code Section 12650 et. seq., the undersigned,

(name) _____ of
(title) _____

(company)

hereby certifies that the claim for the additional compensation and time, if any, made herein for the work on this contract is a true statement of the actual costs incurred and time sought, and is fully documented and supported under the contract between parties.

Dated _____
/s/ _____
Subscribed and sworn before me this _____ day
of _____

(Notary Public)
My Commission
Expires _____

Failure to submit the notarized certificate will be sufficient cause for denying the claim.

Any claim for overhead, in addition to being certified as stated above, shall be supported and accompanied by an audit report of an independent Certified Public Accountant. Omission of a supporting audit report of an independent Certified Public Accountant shall result in denial of the claim and shall operate as a bar to arbitration, as to the claim, in conformance with the requirements in Section 10240.2 of the California Public Contract Code. Any claim for overhead shall be subject to audit by the State at its discretion. The costs of performing an audit examination and submitting the report shall be borne by the Contractor. The Department will deduct an offset amount for field and home office overhead paid on all added work from any claim for overhead as appropriate, as determined by the Department. The value of the added work equals the value of the work completed minus the total bid. The home office overhead offset equals 5 percent of the added work. The field office overhead offset equals 5-1/2 percent of the added work. The Certified Public Accountant's audit examination shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31. The audit examination and report shall determine if the rates of field and home office overhead are:

1. Allowable in conformance with the requirements in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31.
2. Adequately supported by reliable documentation.
3. Related solely to the project under examination.

Costs or expenses incurred by the State in reviewing or auditing claims that are not supported by the Contractor's cost accounting or other records shall be deemed to be damages incurred by the State within the meaning of the California False Claims Act.

If the Engineer determines that a claim requires additional analysis, the Engineer will schedule a board of review meeting. The Contractor shall meet with the review board or person and make a presentation in support of the claim. Attendance by the Contractor at the board of review meeting shall be mandatory.

The District Director of the District that administered the contract will make the final determination of any claims which remain in dispute after completion of claim review by the Engineer or board of review meeting.

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The final determination of claims will be sent to the Contractor by hand delivery or deposit in the U.S. mail. The Engineer will then make and issue the Engineer's final estimate in writing and within 30 days thereafter the State will pay the entire sum, if any, found due thereon. That final estimate shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except as otherwise provided in Section 7-1.08, "Clerical Errors."

Failure of the Contractor to conform to the specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract and shall operate as a bar to arbitration in conformance with the requirements in Section 10240.2 of the California Public Contract Code.

7-1.075 INTEREST ON PAYMENTS

Interest shall be payable on progress payments, payments after acceptance, final statement, ordered changes in the work payments, and claim payments as follows:

1. Unpaid progress payments, payment after acceptance, and final statements shall begin to accrue interest 30 days after the Engineer prepares the payment estimate.
2. Unpaid ordered changes in work bills shall begin to accrue interest 30 days after preparation of the first pay estimate following receipt of a properly submitted and undisputed bill for ordered changes in the work. To be properly submitted, the bill must be submitted within 7 days of the performance of the ordered change in the work and in conformance with the provisions in Section 3, "Changes in the Work," and Section 7-1.05, "Partial Payments," of the General Conditions. An undisputed ordered change in the work bill not submitted within 7 days of performance of the ordered change in the work will begin to accrue interest 30 days after the preparation of the second pay estimate following submittal of the bill.
3. The rate of interest payable for unpaid progress payments, payments after acceptance, final payments, and ordered change in the work payments shall be 10 percent per annum.
4. The rate of interest payable on a claim, protest or dispute ultimately allowed under this contract shall be 6 percent per annum. Interest shall begin to accrue 61 days after the Contractor submits to the Engineer information in sufficient detail to enable the Engineer to ascertain the basis and amount of that claim, protest or dispute.

The rate of interest payable on any award in arbitration shall be 6 percent per annum if allowed under the provisions of Civil Code Section 3289.

7-1.08 CLERICAL ERRORS

Notwithstanding the provisions in Section 7-1.07, "Final Payment And Claims," of these General Conditions, for a period of 3 years after acceptance of the work, all estimates and payments made pursuant to Section 7-1.07, including the final statement and payment, shall be subject to correction and adjustment for clerical errors in the calculations involved in the determination of quantities and payments. The Contractor and the Department agree to pay to the other any sum due under the provisions of this Section 7-1.08, provided, however, if the total sum to be paid is less than \$200, no payment shall be made.

7-1.09 GUARANTEE

The Contractor hereby unconditionally guarantees that the work will be done in conformance with the requirements of the contract, and further guarantees the work of the contract to be and remain free of defects in workmanship and materials for a period of one year from the date of acceptance of the contract, unless a longer guarantee period is required by the special provisions. The Contractor hereby agrees to repair or replace any and all work, together with any other adjacent work which may be displaced in so doing, that may prove to be not in conformance with the requirements of the contract or that may be defective in its workmanship or material within the guarantee period specified, without any expense whatsoever to the Department, ordinary wear and tear and unusual abuse or neglect excepted.

Contract bonds shall remain in full force and effect during the guarantee period.

The Contractor further agrees, that within 10 calendar days after being notified in writing by the Department of any work not in conformance with the requirements of the contract or any defects in the work, the Contractor shall commence and prosecute with due diligence all work necessary to fulfill the terms of this guarantee, and shall complete the work within a reasonable period of time, and, in the event the Contractor fails to comply, the Contractor does hereby authorize the Department to proceed to have the work done at the Contractor's expense and the Contractor shall honor and pay the cost and charges therefor upon demand. The Department shall be entitled to all costs and expenses, including reasonable attorney's fees, necessarily incurred upon the Contractor's refusal to honor and pay the above costs and charges.

7-1.10 ARBITRATION

Sections 10240-10240.13, inclusive of the Public Contract Code provides for the resolution of contract claims by arbitration.

Claims (demands for monetary compensation or damages) arising under or related to performance of the contract shall be resolved by arbitration unless the Department and the Contractor agree in writing, after the claim has arisen, to waive arbitration and to have the claim litigated in a court of competent jurisdiction. Arbitration shall be pursuant to Public Contract Code Sections 10240-10240.13, inclusive, and applicable regulations (see Subchapter 3 [Sections 301-382, inclusive] of Chapter 2 of Title 1 of the California Code of Regulations). The arbitration decision shall be decided under and in conformance with the law of this State, supported by substantial evidence and, in writing, contain the basis for the decision, findings of fact, and conclusions of law.

Arbitration shall be initiated by a Complaint in Arbitration made in compliance with the requirements of those regulations. A Complaint in Arbitration by the Contractor shall be made not later than 90 days after the date of service in person or by mail on the Contractor of the final written decision by the Department on the claim.

**STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION**

SPECIAL PROVISIONS

Annexed to Contract No. 03-2C8434

DIVISION 0 BIDDING AND CONTRACT REQUIREMENTS

0.1 INSTRUCTIONS TO BIDDERS AND GENERAL CONDITIONS

The work embraced herein shall conform to the provisions in the Instructions to Bidders and General Conditions for Building Construction of the Department of Transportation, dated October 2007, a single publication attached hereto and referred to herein as "Instructions to Bidders" and "General Conditions", and the following special provisions.

In case of conflict between the Instructions to Bidders or the General Conditions and these special provisions, the special provisions shall take precedence over and be used in lieu of the conflicting portions.

0.2 PROPOSAL REQUIREMENTS AND CONDITIONS

The bidder's attention is directed to the provisions in Section 1, "Proposal Requirements and Conditions," of the Instructions to Bidders, and these special provisions for the requirements and conditions which the bidder must observe in the preparation of the proposal form and the submission of the bid.

The Bidder's Bond form mentioned in the last paragraph in Section 1-1.08, "Proposal Guaranty," of the Instructions to Bidders will be found following the signature page of the Proposal.

In conformance with Public Contract Code Section 7106, a Noncollusion Affidavit is included in the Proposal. Signing the Proposal shall also constitute signature of the Noncollusion Affidavit.

0.22 DISABLED VETERAN BUSINESS ENTERPRISE (DVBE)

It is the policy of the Department that Disabled Veteran Business Enterprises (DVBEs) shall be provided the opportunity for full participation in the performance of contracts financed solely with state funds. The Contractor shall take all necessary and reasonable steps to ensure that DVBEs have such opportunity to participate in the performance of this contract. The Contractor shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of subcontracts.

It is the bidder's responsibility to make a sufficient portion of the work available to subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DVBE subcontractors and suppliers, so as to assure meeting the goal for DVBE participation or to provide information to establish that, prior to bidding, the bidder made good faith efforts to do so.

Section 999, et seq., of the Military and Veterans Code sets forth requirements for DVBE participation goals, summarized as follows:

1. "Disabled Veteran Business Enterprise" (DVBE) means a business concern certified as a DVBE by the Office of Small Business and DVBE Services, Department of General Services.
2. DVBEs must be certified on the date bids for the project are opened before credit may be allowed toward the DVBE goal. It is the Contractor's responsibility to verify that DVBEs are certified.
3. The disabled veteran business owner must be domiciled in the State of California.
4. A DVBE may participate as a prime contractor, as a subcontractor, as a joint venture partner with a prime or subcontractor, or as a vendor of material or supplies.
5. The DVBE must perform a commercially useful function, that is, be responsible for the execution of a distinct element of the work and carry out its responsibility by actually performing, managing, or supervising the work. An extra participant will not be considered to perform a commercially useful function.

6. Credit for DVBE prime contractors will be 100 percent of the contract price.
7. Credit for participation of a DVBE subcontractor, supplier, or broker will be 100 percent provided such DVBE is performing a commercially useful function.
8. A DVBE broker shall submit the required declarations and federal tax returns at the time of performance.

The Office of Small Business and DVBE Services, Department of General Services, is located at 707 Third Street, West Sacramento, CA 95605. It may be contacted at (800) 559-5529 or (916) 375-4940 or its internet web site at <http://www.pd.dgs.ca.gov/smbus/default.htm> for program information.

Failure to carry out the requirements of Section 999, et seq., of the Military and Veterans Code shall constitute a material breach of this contract and may result in termination of the contract or other remedy the Department deems appropriate.

Section 10115 of the Public Contract Code requires the Department to establish a goal for Disabled Veteran Business Enterprise (DVBE) participation in contracts.

A DVBE joint venture partner must be responsible for specific contract items of work, or portions thereof. The DVBE joint venture partner must share in the ownership, control, management responsibilities, risks, and profits of the joint venture. The DVBE joint venture must submit the joint venture agreement with the Caltrans Bidder DVBE Information form required in Division 0.222, "Submission of DVBE Information," elsewhere in these special provisions.

0.221 DVBE GOAL FOR THIS PROJECT

The Disabled Veteran Business Enterprise (DVBE) participation goal for this project: 3 percent.

0.222 SUBMISSION OF DVBE INFORMATION

The required DVBE information shall be submitted on the "CALTRANS BIDDER - DVBE INFORMATION" form included in the Proposal. If this information is not submitted with the bid, the DVBE information forms shall be removed from the documents prior to submitting the bid.

If the DVBE information is not submitted with the bid, the apparent successful bidder (low bidder), the second low bidder and the third low bidder shall submit the DVBE information to the following address: Department of Transportation, MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, California 95816 so the information is received by the Department no later than 4:00 p.m. on the fourth business day following bid opening. The Department will not accept facsimile submittals of DVBE information. Failure to submit the required DVBE information by the time specified will be grounds for finding the bid or proposal nonresponsive. Other bidders need not submit DVBE information unless requested to do so by the Department.

The bidder's DVBE information shall establish that either it met the goal or that, prior to bidding, it made good faith efforts to meet the goal. Information demonstrating that a good faith effort to meet the DVBE goal has been made by the bidder shall be submitted on the "DVBE INFORMATION GOOD FAITH EFFORTS" form included in the Proposal.

Bidders are cautioned that even though their submittal indicates they will meet the stated DVBE goal, their submittal should also include their good faith efforts information along with their DVBE goal information to protect their eligibility for award of the contract in the event the Department, in its review, finds that the goal has not been met.

The bidder's DVBE information shall include the names of all DVBE firms that will participate, with a complete description of work or supplies to be provided by each and the dollar value of each DVBE transaction. When 100 percent of a contract item of work is not to be performed or furnished by a DVBE, a description of the exact portion of that work to be performed or furnished by that DVBE shall be included in the DVBE information, including the planned location of that work.

A bidder shall be deemed to have made good faith efforts if, within the time specified by the Department, it submits documentary evidence that all of the following actions were taken:

1. Contact was made with the Office of Small Business and DVBE Services, Department of General Services or their web site at <http://www.pd.dgs.ca.gov/smbus/default.htm> to identify Disabled Veteran Business Enterprises.
2. Advertising was published in trade media and media focusing on Disabled Veteran Business Enterprises, unless time limits imposed by the Department do not permit that advertising.
3. Invitations to bid were submitted to potential Disabled Veteran Business Enterprise contractors.
4. Available Disabled Veteran Business Enterprises were considered.

0.23 SMALL BUSINESS AND NON-SMALL BUSINESS SUBCONTRACTOR PREFERENCES

Attention is directed to the Small Business Procurement and Contract Act, Government Code Section 14835, et seq. and to the Small Business regulations at Title 2, California Code of Regulations, Section 1896, et seq.

Bidders, subcontractors, and suppliers who wish to be certified as small businesses under the provisions of those laws and regulations, shall be certified as Small Business by the Office of Small Business and DVBE Services, Department of General Services, 707 Third Street, West Sacramento, CA 95605.

Attention is directed to "Award and Execution of Contract" of these special provisions.

0.231 SMALL BUSINESS PREFERENCE

To request small business preference, bidders shall fill out and sign the "Request for Small Business Preference and Non-small Business Subcontractor Preference" form in the Proposal and shall attach a copy of their Office of Small Business and DVBE Services small business certification letter to the form. The bidder's signature on the "Request for Small Business Preference" certifies that the bidder is certified as a small business at the time and day of bid opening or has applied for certification and is subsequently certified by the Department of General Services.

0.232 NON-SMALL BUSINESS SUBCONTRACTOR PREFERENCE

To request non-small business subcontractor preference, bidders shall fill out and sign the "Request for Small Business Preference and Non-small Business Subcontractor Preference" form in the Proposal. The bidder's signature certifies that the bidder commits to subcontract at least 25 percent of its bid amount with one or more subcontractors or suppliers that are certified as small businesses.

The bidder shall also fill out the "CALTRANS BIDDER – SMALL BUSINESS SUBCONTRACTOR - INFORMATION" form. If the small business subcontractor information is not submitted with the bid, the form shall be removed from the documents and submitted in the same time and manner specified for DVBE information in "Submission of DVBE Information" of these special provisions. The bidder shall attach a copy of the Office of Small Business and DVBE Services small business certification letter for each listed subcontractor or supplier, to the form. The listed subcontractors and suppliers shall be certified as Small Business at the time and day of bid opening or have applied for certification and are subsequently certified by the Department of General Services. Each listed subcontractors or supplier shall be designated to perform a commercially useful function.

0.24 CALIFORNIA COMPANY PREFERENCE

Attention is directed to "Award and Execution of Contract" of these special provisions.

In conformance with the requirements of Section 6107 of the Public Contract Code, a "California company" will be granted a reciprocal preference for bid comparison purposes as against a nonresident contractor from any state that gives or requires a preference to be given contractors from that state on its public entity construction contracts.

A "California company" means a sole proprietorship, partnership, joint venture, corporation, or other business entity that was a licensed California contractor on the date when bids for the public contract were opened and meets one of the following:

1. Has its principal place of business in California.
2. Has its principal place of business in a state in which there is no local contractor preference on construction contracts.
3. Has its principal place of business in a state in which there is a local contractor construction preference and the Contractor has paid not less than \$5000 in sales or use taxes to California for construction related activity for each of the five years immediately preceding the submission of the bid.

To carry out the "California company" reciprocal preference requirements of Section 6107 of the Public Contract Code, all bidders shall fill out and sign the "California Company Preference" form in the Proposal. The bidder's signature on the "California Company Preference" form certifies, under penalty of perjury, that the bidder is or is not a "California company" and if not, the amount of the preference applied by the state of the nonresident Contractor.

A nonresident Contractor shall disclose any and all bid preferences provided to the nonresident Contractor by the state or country in which the nonresident Contractor has its principal place of business.

Proposals without the California Company Preference form filled out and signed may be rejected.

0.3 AWARD AND EXECUTION OF CONTRACT

The bidder's attention is directed to the provisions in Section 2, "Award and Execution of Contract," of the Instructions to Bidders and these special provisions for the requirements and conditions concerning award and execution of contract.

Requests for relief of bid and bid protests are to be delivered to the following address: Department of Transportation, MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816 or by facsimile to the Office Engineer at (916) 227-6282.

The award of the contract, if made, will be to the lowest responsible bidder whose proposal complies with all the requirements prescribed and who has met the goal for DVBE participation or has demonstrated, to the satisfaction of the Department, good faith efforts to do so.

The contract shall be executed by the successful bidder and shall be returned, together with the contract bonds and the documents identified in Section 2-1.04, "Insurance Policies," of the Instructions to bidders, to the Department so that it is received within 10 business days after the bidder has received the contract for execution. Failure to do so shall be just cause for forfeiture of the proposal guaranty. The executed contract documents shall be delivered to the following address: Department of Transportation MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816.

A "Payee Data Record" form will be included in the contract documents to be executed by the successful bidder. The purpose of the form is to facilitate the collection of taxpayer identification data. The form shall be completed and returned to the Department by the successful bidder with the executed contract, contract bonds and the documents identified in Section 2-1.04, "Insurance Policies," of the Instructions to bidders. For the purposes of the form, payee shall be deemed to mean the successful bidder. The form is not to be completed for subcontractors or suppliers. Failure to complete and return the "Payee Data Record" form to the Department as provided herein will result in the retention of 20 percent of payments due the Contractor and penalties of up to \$20,000. This retention of payments for failure to complete the "Payee Data Record" form is in addition to any other retention of payments due the Contractor.

Attention is also directed to "Small Business and Non-Small Business Subcontractor Preferences" of these special provisions.

A bidder who is certified as a Small Business by the Office of Small Business and DVBE Services, Department of General Services, will be allowed a preference in the award of this contract under the following conditions:

1. The bidder filled out and signed the "Request for Small Business Preference and Non-Small Business Subcontractor Preference" form, requesting Small Business preference, and attached a copy of its Office of Small Business and DVBE Services small business certification letter to the form; and
2. The apparent low bidder is not certified as a Small Business.

A bidder who is not certified as a Small Business by the Office of Small Business and DVBE Services, Department of General Services, will be allowed a preference in the award of this contract under the following conditions:

1. The bidder filled out and signed the "Request for Small Business Preference and Non-Small Business Subcontractor Preference" form, requesting Non-Small Business Subcontractor preference and notifying the Department that it commits to subcontract at least 25 percent of its bid amount with one or more Small Businesses, and submitted the "CALTRANS BIDDER – SMALL BUSINESS SUBCONTRACTOR – INFORMATION" form listing the subcontractors and suppliers it commits to subcontract with; and
2. The apparent low bidder is not certified as a Small Business, and has not filled out and signed the "Request for Small Business Preference and Non-Small Business Subcontractor Preference."

The Small Business preference will be a reduction in the bid submitted by the Small Business contractor, for bid comparison purposes, by an amount equal to 5 percent of the amount bid by the apparent low bidder, the amount not to exceed \$50,000. If this reduction results in the Small Business contractor becoming the low bidder, or in a precise tie with a Non-Small Business apparent low bidder, then the contract will be awarded to the Small Business contractor on the basis of the actual bid of the Small Business contractor notwithstanding the reduced bid price used for bid comparison purposes.

The Non-Small Business Subcontractor preference will be a reduction in the bid submitted by the Non-Small Business contractor requesting the preference, for bid comparison purposes, by an amount equal to 5 percent of the amount bid by the apparent low bidder, the amount not to exceed \$50,000. If this reduction results in the Non-Small Business contractor requesting the preference becoming the low bidder, or in a precise tie with a Non-Small Business apparent low bidder not requesting the preference, then the contract will be awarded to the Non-Small Business contractor requesting the preference on the basis of its actual bid notwithstanding the reduced bid price used for bid comparison purposes. Application of the Non-Small Business Subcontractor preference shall not result in the displacement of a Small Business in winning the award.

Attention is also directed to "California Company Preference" of these special provisions.

The amount of the California company reciprocal preference shall be equal to the amount of the preference applied by the state of the nonresident contractor with the lowest responsive bid, except where the "California company" is eligible for a California Small Business Preference or a California Non-Small Business Subcontractor Preference, in which case the preference applied shall be the greater of the two, but not both.

If the bidder submitting the lowest responsive bid is not a "California company" and with the benefit of the reciprocal preference, a "California company's" responsive bid is equal to or less than the original lowest responsive bid, the "California company" will be awarded the contract at its submitted bid price except as provided below.

Small Business bidders shall have precedence over Non-Small Business bidders in that the application of the "California company" preference for which Non-Small Business bidders may be eligible shall not result in the denial of the award to a Small Business bidder.

DVBE bidders shall have precedence over Non-DVBE bidders in that in the event the application of the Small Business preference to more than one bidder results in a precise tie in the bid amounts used for comparison purposes, the award shall go to the DVBE that is also a small business. This precedence shall not apply to the application of the California company reciprocal preference.

0.4 BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES

The first working day is the fifteenth day after contract approval.

The work shall be diligently prosecuted to completion before the expiration of 375 WORKING DAYS.

The Contractor shall pay to the State of California the sum of \$6000 per day for each day's delay in finishing the work in excess of the number of working days specified above.

A working day is everyday except holidays, excluding Sunday.

0.5 GENERAL - MISCELLANEOUS

0.575 PARTNERING

The State will promote the formation of a "Partnering" relationship with the Contractor in order to effectively complete the contract to the benefit of both parties. The purpose of this relationship is to maintain a cooperative communication and to mutually resolve conflicts at the lowest responsible management level.

The Contractor may request the formation of a "Partnering" relationship by submitting a request in writing to the Engineer after approval of the contract. If the Contractor's request for "Partnering" is approved by the Engineer, scheduling of a "Partnering Workshop," selecting the "Partnering" facilitator and workshop site, and other administrative details shall be as agreed to by both parties. If agreed to by the parties, additional "Partnering Workshops" will be conducted as needed throughout the life of the contract.

The costs involved in providing the "Partnering Workshop" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Partnering Workshop" facilitator and workshop site in conformance with the provisions in Section 3-1.01E(4), "Markups," of the General Conditions, and paying to the Contractor the sum of that cost, except no markups will be allowed. Itemization of labor, material and equipment rental costs is not required.

All other costs associated with "Partnering Workshops" will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

The establishment of a "Partnering" relationship will not change or modify the terms and conditions of the contract and will not relieve either party of the legal requirements of the contract.

0.576 DISPUTE REVIEW BOARD

GENERAL

To assist in the resolution of disputes or potential claims arising out of the work of this project, a Dispute Review Board, hereinafter referred to as the "DRB," shall be established by the Engineer and Contractor cooperatively upon approval of the contract. The DRB is intended to assist the contract administrative claims resolution process as specified in the provisions in Section 7-1.03, "Notice of Potential Claim," and Section 7-1.07, "Final Payment and Claims," of the General Conditions and these special provisions. The DRB shall not serve as a substitute for provisions in the specifications in regard to filing potential claims. The requirements and procedures established in this section shall be a prerequisite to filing a claim, filing for arbitration, or filing for litigation prior or subsequent to project completion.

The DRB shall be utilized when dispute or potential claim resolution at the project level is unsuccessful. The DRB shall function as specified herein until the day of acceptance of the contract, at which time the work of the DRB will cease except for completion of unfinished reports. No DRB dispute meetings shall take place later than 30 days prior to acceptance of contract. After acceptance of contract, disputes or potential claims which have followed the dispute resolution processes of the General Conditions and these special provisions, but have not been resolved, shall be stated or restated by the Contractor, in response to the Proposed Final Estimate within the time limits provided in Section 7-1.07, "Final Payment and Claims," of the General Conditions. The State will review those claims in conformance with the provisions in Section 7-1.07 of the General Conditions. Following the adherence to and completion of the contractual administrative claims procedure, the Contractor may file for arbitration in conformance with the provisions in Section 7-1.10, "Arbitration," of the General Conditions and these special provisions.

Disputes, as used in this section, shall include differences of opinion, properly noticed as provided hereinafter, between the State and Contractor on matters related to the work and other subjects considered by the State or Contractor, or by both, to be of concern to the DRB on this project, except matters relating to Contractor, subcontractor or supplier potential claims not actionable against the Department as specified in these special provisions or quantification of disputes for overhead type expenses or costs. Disputes for overhead type expenses or costs shall conform to the requirements of Section 7-1.07, "Final Payment and Claims," of the General Conditions. Whenever the term "dispute" or "disputes" is used herein, it shall be deemed to include potential claims as well as disputes.

The DRB shall serve as an advisory body to assist in the resolution of disputes between the State and the Contractor, hereinafter referred to as the "parties." The DRB shall consider disputes referred to it, and furnish written reports containing findings and recommendations pertaining to those disputes, to the parties to aid in resolution of the differences between them. DRB findings and recommendations are not binding on the parties.

SELECTION PROCESS, DISCLOSURE AND APPOINTMENTS

The DRB shall consist of one member selected by the State and approved by the Contractor, one member selected by the Contractor and approved by the State, and a third member selected by the first 2 members and approved by both the State and the Contractor. The third member shall act as the DRB Chairperson.

DRB members shall be especially knowledgeable in the type of construction and contract documents potentially anticipated by the contract. DRB members shall discharge their responsibilities impartially as an independent body, considering the facts and circumstances related to the matters under consideration, pertinent provisions of the contract and applicable laws and regulations.

The State and the Contractor shall nominate and approve DRB members in conformance with the terms and conditions of the Dispute Review Board Agreement and these special provisions, within 45 days of the approval of the contract. Each party shall provide written notification to the other of the name of their selected DRB nominee along with the prospective member's complete written disclosure statement.

Disclosure statements shall include a resume of the prospective member's experience and a declaration statement describing past, present, anticipated, and planned relationships, including indirect relationships through the prospective member's primary or full-time employer, to this project and with the parties involved in this construction contract, including but not limited to, relevant subcontractors or suppliers to the parties, parties' principals, or parties' counsel. DRB members shall also include a full disclosure of close professional or personal relationships with all key members of the contract. Objections to nominees must be based on a specific breach or violation of nominee responsibilities or on nominee qualifications under these provisions unless otherwise specified. The Contractor or the State may, on a one-time basis, object to the other's nominee without specifying a reason and this person will not be selected for the DRB. Another person shall then be nominated within 15 days.

The first duty of the State and Contractor selected members of the DRB shall be to select and recommend a prospective third DRB member to the parties for final selection and approval. The first 2 DRB members shall proceed with the selection of the third DRB member immediately upon receiving written notification from the State of their selection, and shall provide their recommendation simultaneously to the parties within 15 days of the notification.

The first 2 DRB members shall select a third DRB member subject to mutual approval of the parties or may mutually concur on a list of potentially acceptable third DRB members and submit the list to the parties for final selection and approval of the third member. The goal in the selection of the third member is to complement the professional experience of the first 2 members and to provide leadership for the DRB's activities.

The third prospective DRB member shall supply a full disclosure statement to the first 2 DRB members and to the parties prior to appointment.

An impasse shall be considered to have been reached if the parties are unable to approve a third member within 15 days of receipt of the recommendation of the first 2 DRB members, or if the first 2 DRB members are unable to agree upon a recommendation within their 15 day time limit. In the event of an impasse in selection of third DRB member the State and the Contractor shall each propose 3 candidates for the third DRB member position. The parties shall select the candidates proposed under this paragraph from the current list of arbitrators certified by the Public Works Contract Arbitration Committee created by Article 7.2 (commencing with Section 10245) of the State Contract Act. The first 2 DRB members shall then select one of the 6 proposed candidates in a blind draw.

No DRB member shall have prior direct involvement in this contract. No member shall have a financial interest in this contract or the parties thereto, within a period of 6 months prior to award of this contract or during the contract, except as follows:

- A. Compensation for services on this DRB.
- B. Ownership interest in a party or parties, documented by the prospective DRB member, that has been reviewed and determined in writing by the State to be sufficiently insignificant to render the prospective member acceptable to the State.
- C. Service as a member of other Dispute Review Boards on other contracts.
- D. Retirement payments or pensions received from a party that are not tied to, dependent on or affected by the net worth of the party.
- E. The above provisions apply to parties having a financial interest in this contract, including but not limited to contractors, subcontractors, suppliers, consultants, and legal and business services.

The Contractor or the State may reject any of the 3 DRB members who fail to fully comply at all times with all required employment and financial disclosure conditions of DRB membership as described in the Dispute Review Board Agreement and as specified herein. A copy of the Dispute Review Board Agreement is included in this section.

The Contractor, the State, and the 3 members of the DRB shall complete and adhere to the Dispute Review Board Agreement in administration of this DRB within 15 days of the parties' concurrence in the selection of the third member. No DRB meeting shall take place until the Dispute Review Board Agreement has been signed by all parties. The State authorizes the Engineer to execute and administer the terms of the Agreement. The person(s) designated by the Contractor as authorized to execute contract change orders shall be authorized to execute and administer the terms of this agreement, or to delegate the authority in writing. The operation of the DRB shall be in conformance with the terms of the Dispute Review Board Agreement.

COMPENSATION

The State and the Contractor shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of \$1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of \$700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time, (such as time spent evaluating and preparing recommendations on specific issues presented to the DRB), has been specifically agreed to in advance by the State and Contractor. Time away from the project, which has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of \$125 per hour. The agreed amount of \$125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the Department, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The State will provide, at no cost to the Contractor, administrative services such as conference facilities and secretarial services to the DRB. These special provisions and the Dispute Review Board Agreement state the provisions for compensation and expenses of the DRB. DRB members shall be compensated at the same daily and hourly rate. The Contractor shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The State will reimburse the Contractor for the State's share of the costs. There will be no markups applied to expenses connected with the DRB, either by the DRB members or by the Contractor when requesting payment of the State's share of DRB expenses. Regardless of the DRB recommendation, neither party shall be entitled to reimbursement of DRB costs from the other party.

REPLACEMENT OF DRB MEMBERS

Service of a DRB member may be terminated at any time with not less than 15 days notice as follows:

- A. The State may terminate service of the State appointed member.
- B. The Contractor may terminate service of the Contractor appointed member.
- C. Upon the written recommendation of the State and Contractor appointed members for the removal of the third member.
- D. Upon resignation of a member.
- E. The State or Contractor may terminate the service of any member who fails to fully comply with all required employment and financial disclosure conditions of DRB membership.

When a member of the DRB is replaced, the replacement member shall be appointed in the same manner as the replaced member was appointed. The appointment of a replacement DRB member will begin promptly upon determination of the need for replacement and shall be completed within 15 days. Changes in either of the DRB members chosen by the 2 parties will not require re-selection of the third member, unless both parties agree to such re-selection in writing. The Dispute Review Board Agreement shall be amended to reflect the change of a DRB member.

OPERATION

The following procedure shall be used for dispute resolution:

- A. If the Contractor objects to any decision, act or order of the Engineer, the Contractor shall give written notice of potential claim in conformance with the provisions in Section 7-1.03, "Notice of Potential Claim," of the General Conditions and these special provisions, including the provision of applicable cost documentation; or file written protests or notices in conformance with the provisions in the General Conditions and these special provisions.
- B. The Engineer will respond, in writing, to the Contractor's written supplemental notice of potential claim within 20 days of receipt of the notice.
- C. Within 15 days after receipt of the Engineer's written response, the Contractor shall, if the Contractor still objects, file a written reply with the Engineer, stating clearly and in detail the basis of the objection.
- D. Following an objection to the Engineer's written response, the Contractor shall refer the dispute to the DRB if the Contractor wishes to further pursue the objection to the Engineer's decision. The Contractor shall make the referral in writing to the DRB, simultaneously copied to the State, within 21 days after receipt of the written response from the Engineer. The written dispute referral shall describe the disputed matter in individual discrete segments so that it will be clear to both parties and the DRB what discrete elements of the dispute have been resolved, and which remain unresolved, and shall include an estimate of the cost of the affected work and impacts, if any, on project completion.
- E. By failing to submit the written notice of referral to the DRB, within 21 days after receipt of the Engineer's written response to the supplemental notice of potential claim, the Contractor waives future claims and arbitration on the matter in contention.
- F. The Contractor and the State shall each be afforded an opportunity to be present and to be heard by the DRB, and to offer evidence. Either party furnishing written evidence or documentation to the DRB must furnish copies of such information to the other party a minimum of 15 days prior to the date the DRB is scheduled to convene the meeting for the dispute. Either party shall produce such additional evidence as the DRB may deem necessary to reach an understanding and a determination of the dispute. The party furnishing additional evidence shall furnish copies of such additional evidence to the other party at the same time the evidence is provided to the DRB. The DRB shall not consider evidence not furnished in conformance with the terms specified herein.
- G. Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral unless otherwise agreed to by all parties. The DRB shall determine the time and location of the DRB dispute meeting, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of a timely hearing of the dispute.
- H. There shall be no participation of either party's attorneys at DRB dispute meetings.
- I. There shall be no participation of persons who are not directly involved in the contract or who do not have direct knowledge of the dispute, including but not limited to consultants, except for expert testimony allowed at the discretion of the DRB and with approval prior to the dispute meeting by both parties.

- J. The DRB shall furnish a report, containing findings and recommendations as described in the Dispute Review Board Agreement, in writing to both the State and the Contractor. The DRB may request clarifying information of either party within 10 days after the DRB dispute meeting. Requested information shall be submitted to the DRB within 10 days of the DRB request. The DRB shall complete its report, including minority opinion, if any, and submit it to the parties within 30 days of the DRB dispute meeting, except that time extensions may be granted at the request of the DRB with the written concurrence of both parties. The report shall include the facts and circumstances related to the matters under consideration, pertinent provisions of the contract, applicable laws and regulations, and actual costs and time incurred as shown on the Contractor's cost accounting records. The DRB shall make recommendations on the merit of the dispute and, if appropriate, recommend guidelines for determining compensation.
- K. Within 30 days after receiving the DRB's report, both the State and the Contractor shall respond to the DRB in writing signifying that the dispute is either resolved or remains unresolved. Failure to provide the written response within the time specified, or a written rejection of the DRB's recommendation or response to a request for reconsideration presented in the report by either party, shall conclusively indicate that the party(s) failing to respond accepts the DRB recommendation. Immediately after responses have been received from both parties, the DRB shall provide copies of both responses to the parties simultaneously. Either party may request clarification of elements of the DRB's report from the DRB prior to responding to the report. The DRB shall consider any clarification request only if submitted within 10 days of receipt of the DRB's report, and if submitted simultaneously in writing to both the DRB and the other party. Each party may submit only one request for clarification for any individual DRB report. The DRB shall respond, in writing, to requests for clarification within 10 days of receipt of such requests.
- L. The DRB's recommendations, stated in the DRB's reports, are not binding on either party. Either party may seek a reconsideration of a recommendation of the DRB. The DRB shall only grant a reconsideration based upon submission of new evidence and if the request is submitted within the 30-day time limit specified for response to the DRB's written report. Each party may submit only one request for reconsideration regarding an individual DRB recommendation.
- M. If the State and the Contractor are able to resolve their dispute with the aid of the DRB's report, the State and Contractor shall promptly accept and implement the recommendations of the DRB. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.
- N. The State or the Contractor shall not call DRB members who served on the DRB for this contract as witnesses in arbitration proceedings which may arise from this contract, and all documents created by the DRB shall be inadmissible as evidence in subsequent arbitration proceedings, except the DRB's final written reports on each issue brought before it.
- O. The State and Contractor shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.
- P. The DRB members shall have no claim against the State or the Contractor, or both, from claimed harm arising out of the parties' evaluations of the DRB's report.

DISPUTES INVOLVING SUBCONTRACTOR POTENTIAL CLAIMS

For purposes of this section, a "subcontractor potential claim" shall include any potential claim by a subcontractor (including also any pass through potential claims by a lower tier subcontractor or supplier) against the Contractor that is actionable by the Contractor against the Department which arises from the work, services, or materials provided or to be provided in connection with the contract. If the Contractor determines to pursue a dispute against the Department that includes a subcontractor potential claim, the dispute shall be processed and resolved in conformance with these special provisions and in conformance with the following:

- A. The Contractor shall identify clearly in submissions pursuant to this section, that portion of the dispute that involves a subcontractor potential claim or potential claims.
- B. The Contractor shall include, as part of its submission pursuant to Step D above, a certification (False Claims Act Certification) by the subcontractor's or supplier's officer, partner, or authorized representative with authority to bind the subcontractor and with direct knowledge of the facts underlying the subcontractor potential claim. The Contractor shall submit a certification that the subcontractor potential claim is acknowledged and forwarded by the Contractor. The form for these certifications is available from the Engineer.

- C. At DRB dispute meetings involving one or more subcontractor potential claims, the Contractor shall require that each subcontractor involved in the dispute have present an authorized representative with actual knowledge of the facts underlying the subcontractor potential claim to assist in presenting the subcontractor potential claim and to answer questions raised by the DRB members or the Department's representatives.
- D. Failure by the Contractor to declare a subcontractor potential claim on behalf of its subcontractor (including lower tier subcontractors' and suppliers' pass through potential claims) at the time of submission of the Contractor's potential claims, as provided hereunder, shall constitute a release of the State by the Contractor of such subcontractor potential claim.
- E. The Contractor shall include in all subcontracts under this contract that subcontractors and suppliers of any tier (a) agree to submit subcontractor potential claims to the Contractor in a proper form and in sufficient time to allow processing by the Contractor in conformance with the Dispute Review Board resolution specifications; (b) agree to be bound by the terms of the Dispute Review Board provisions to the extent applicable to subcontractor potential claims; (c) agree that, to the extent a subcontractor potential claim is involved, completion of all steps required under these Dispute Review Board special provisions shall be a condition precedent to pursuit by the subcontractor of other remedies permitted by law, including without limitation of a lawsuit against the Contractor; and (d) agree that the existence of a dispute resolution process for disputes involving subcontractor potential claims shall not be deemed to create any claim, right, or cause of action by any subcontractor or supplier against the Department.

Notwithstanding the foregoing, this Dispute Review Board special provision shall not apply to, and the DRB shall not have the authority to consider, subcontractor potential claims between the subcontractor(s) or supplier(s) and the Contractor that are not actionable by the Contractor against the Department.

RETENTION

Failure of the Contractor to nominate and approve DRB members in conformance with the terms and conditions of the Dispute Review Board Agreement and these special provisions shall result in the retention of 25 percent of the estimated value of all work performed during each estimate period in which the Contractor fails to comply with the requirements of this section as determined by the Engineer. DRB retentions will be released for payment on the next monthly estimate for partial payment following the date that the Contractor has nominated and approved DRB members and no interest will be due the Contractor.

DISPUTE REVIEW BOARD AGREEMENT

A copy of the "Dispute Review Board Agreement" to be executed by the Contractor, State and the 3 DRB members after approval of the contract follows:

Form 6202 Rev (09/01/02)

DISPUTE REVIEW BOARD AGREEMENT

(Contract Identification)

Contract No. _____

THIS DISPUTE REVIEW BOARD AGREEMENT, hereinafter called "AGREEMENT", made and entered into this _____ day of _____, _____, between the State of California, acting through the California Department of Transportation and the Director of Transportation, hereinafter called the "STATE," _____ hereinafter called the "CONTRACTOR," and the Dispute Review Board, hereinafter called the "DRB" consisting of the following members:

_____,
(Contractor Appointee)

_____,
(State Appointee)

and _____
(Third Person)

WITNESSETH, that

WHEREAS, the STATE and the CONTRACTOR, hereinafter called the "parties," are now engaged in the construction on the State Highway project referenced above; and

WHEREAS, the special provisions for the above referenced contract provides for the establishment and operation of the DRB to assist in resolving disputes; and

WHEREAS, the DRB is composed of three members, one selected by the STATE, one selected by the CONTRACTOR, and the third member selected by the other two members and approved by the parties;

NOW THEREFORE, in consideration of the terms, conditions, covenants, and performance contained herein, or attached and incorporated and made a part hereof, the STATE, the CONTRACTOR, and the DRB members hereto agree as follows:

SECTION I DESCRIPTION OF WORK

To assist in the resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRB. The intent of the DRB is to fairly and impartially consider disputes placed before it and provide written recommendations for resolution of these disputes to both parties. The members of this DRB shall perform the services necessary to participate in the DRB's actions as designated in Section II, Scope of Work.

SECTION II SCOPE OF WORK

The scope of work of the DRB includes, but is not limited to, the following:

A. OBJECTIVE

The principal objective of the DRB is to assist in the timely resolution of disputes between the parties arising from performance of this contract. It is not intended for either party to default on their normal responsibility to amicably and fairly settle their differences by indiscriminately assigning them to the DRB. It is intended that the mere existence of the DRB will encourage the parties to resolve disputes without resorting to this review procedure. But when a dispute that is serious enough to warrant the DRB's review does develop, the process for prompt and efficient action will be in place.

B. PROCEDURES

The DRB shall render written reports on disputes between the parties arising from the construction contract. Prior to consideration of a dispute, the DRB shall establish rules and regulations that will govern the conduct of its business and reporting procedures in conformance with the requirements of the contract and the terms of this AGREEMENT. DRB recommendations, resulting from its consideration of a dispute, shall be furnished in writing to both parties. The recommendations shall be based on facts and circumstances involved in the dispute, pertinent contract provisions, applicable laws and regulations. The recommendations shall find one responsible party in a dispute; shared or "jury" determinations shall not be rendered. The DRB shall make recommendations on the merit of the dispute, and if appropriate, recommend guidelines for determining compensation. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.

The DRB shall refrain from officially giving advice or consulting services to anyone involved in the contract. The individual members shall act in a completely independent manner and while serving as members of the DRB shall have no consulting business connections with either party or its principals or attorneys or other affiliates (subcontractors, suppliers, etc.) who have a beneficial interest in the contract.

During scheduled meetings of the DRB as well as during dispute meetings, DRB members shall refrain from expressing opinions on the merits of statements on matters under dispute or potential dispute. Opinions of DRB members expressed in private sessions shall be kept strictly confidential. Individual DRB members shall not meet with, or discuss contract issues with individual parties, except as directed by the DRB Chairperson. Such discussions or meetings shall be disclosed to both parties. Other discussions regarding the project between the DRB members and the parties shall be in the presence of all three members and both parties. Individual DRB members shall not undertake independent investigations of any kind pertaining to disputes or potential disputes, except with the knowledge of both parties and as expressly directed by the DRB Chairperson.

C. CONSTRUCTION SITE VISITS, PROGRESS MEETINGS AND FIELD INSPECTIONS

The DRB members shall visit the project site and meet with representatives of the parties to keep abreast of construction activities and to develop familiarity with the work in progress. Scheduled progress meetings shall be held at or near the project site. The DRB shall meet at least once at the start of the project, and at least once every 4 months thereafter. The frequency, exact time, and duration of additional site visits and progress meetings shall be as recommended by the DRB and approved by the parties consistent with the construction activities or matters under consideration and dispute. Each meeting shall consist of a round table discussion and a field inspection of the work being performed on the contract, if necessary. Each meeting shall be attended by representatives of both parties. The agenda shall generally be as follows:

1. Meeting opened by the DRB Chairperson.
2. Remarks by the STATE's representative.
3. A description by the CONTRACTOR's representative of work accomplished since the last meeting; the current schedule status of the work; and a forecast for the coming period.
4. An outline by the CONTRACTOR's representative of potential problems and a description of proposed solutions.
5. An outline by the STATE's representative of the status of the work as the STATE views it.
6. A brief description by the CONTRACTOR's or STATE's representative of potential claims or disputes which have surfaced since the last meeting.
7. A summary by the STATE's representative, the CONTRACTOR's representative, or the DRB of the status of past disputes and potential claims.

The STATE's representative will prepare minutes of all progress meetings and circulate them for revision and approval by all concerned within 10 days of the meeting.

The field inspection shall cover all active segments of the work, the DRB being accompanied by both parties' representatives. The field inspection may be waived upon mutual agreement of the parties.

D. DRB CONSIDERATION AND HANDLING OF DISPUTES

Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral, unless otherwise agreed to by all parties. The DRB shall determine the time and location of DRB dispute meetings, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of speedy resolution of issues. No dispute meetings shall take place later than 30 days prior to acceptance of contract.

Normally, dispute meetings shall be conducted at or near the project site. However, any location that would be more convenient and still provide required facilities and access to necessary documentation shall be satisfactory.

Both parties shall be given the opportunity to present their evidence at these dispute meetings. It is expressly understood that the DRB members are to act impartially and independently in the consideration of the contract provisions, applicable laws and regulations, and the facts and conditions surrounding any dispute presented by either party, and that the recommendations concerning any such dispute are advisory and nonbinding on the parties.

The DRB may request that written documentation and arguments from both parties be sent to each DRB member, through the DRB Chairperson, for review before the dispute meeting begins. A party furnishing written documentation to the DRB shall furnish copies of such information to the other party at the same time that such information is supplied to the DRB.

DRB dispute meetings shall be informal. There shall be no testimony under oath or cross-examination. There shall be no reporting of the procedures by a shorthand reporter or by electronic means. Documents and verbal statements shall be received by the DRB in conformance with acceptance standards established by the DRB. These standards need not comply with prescribed legal laws of evidence.

The third DRB member shall act as Chairperson for dispute meetings and all other DRB activities. The parties shall have a representative at all dispute meetings. Failure to attend a duly noticed dispute meeting by either of the parties shall be conclusively considered by the DRB as indication that the non-attending party considers written submittals as their entire and complete argument. The claimant shall discuss the dispute, followed by the other party. Each party shall then be allowed one or more rebuttals until all aspects of the dispute are thoroughly covered. DRB members shall ask questions, seek clarification, and request further data from either of the parties as may be necessary to assist in making a fully informed recommendation. The DRB may request from either party documents or information that would assist the DRB in making its findings and recommendations including, but not limited to, documents used by the CONTRACTOR in preparing the bid for the project. A refusal by a party to provide information requested by the DRB may be considered by the DRB as an

indication that the requested material would tend to disprove that party's position. In large or complex cases, additional dispute meetings may be necessary in order to consider all the evidence presented by both parties. All involved parties shall maintain the confidentiality of all documents and information, as provided in this AGREEMENT.

During dispute meetings, no DRB member shall express an opinion concerning the merit of any facet of the case. DRB deliberations shall be conducted in private, with interim individual views kept strictly confidential.

After dispute meetings are concluded, the DRB shall meet in private and reach a conclusion supported by 2 or more members. Private sessions of the DRB may be held at a location other than the job site or by electronic conferencing as deemed appropriate, in order to expedite the process.

The DRB's findings and recommendations, along with discussion of reasons therefor, shall then be submitted as a written report to both parties. Recommendations shall be based on the pertinent contract provisions, applicable laws and regulations, and facts and circumstances related to the dispute. The report shall be thorough in discussing the facts considered, the contract language, law or regulation viewed by the DRB as pertinent to the issues, and the DRB's interpretation and philosophy in arriving at its conclusions and recommendations. The DRB's report shall stand on its own, without attachments or appendices. The DRB Chairperson shall furnish a copy of the written recommendation report to the DRB Coordinator, Division of Construction, MS 44, P.O. Box 942874, Sacramento, CA 94274.

With prior written approval of both parties, the DRB may obtain technical services necessary to adequately review the disputes presented, including audit, geotechnical, schedule analysis and other services. The parties' technical staff may supply those services as appropriate. The cost of technical services, as agreed to by the parties, shall be borne equally by the 2 parties as specified in an approved contract change order. The CONTRACTOR will not be entitled to markups for the payments made for these services.

The DRB shall resist submittal of incremental portions of information by either party, in the interest of making a fully informed decision and recommendation.

The DRB shall make every effort to reach a unanimous decision. If this proves impossible, the dissenting member shall prepare a minority opinion, which shall be included in the DRB's report.

Although both parties should place weight upon the DRB's recommendations, they are not binding. Either party may appeal a recommendation to the DRB for reconsideration. However, reconsideration shall only be allowed when there is new evidence to present, and the DRB shall accept only one appeal from each party pertaining to an individual DRB recommendation. The DRB shall hear appeals in conformance with the terms described in the Section entitled "Dispute Review Board" in the special provisions.

E. DRB MEMBER REPLACEMENT

Should the need arise to appoint a replacement DRB member, the replacement DRB member shall be appointed in the same manner as the original DRB members were appointed. The selection of a replacement DRB member shall begin promptly upon notification of the necessity for a replacement and shall be completed within 15 days. This AGREEMENT shall be amended to indicate change in DRB membership.

SECTION III CONTRACTOR RESPONSIBILITIES

The CONTRACTOR shall furnish to each DRB member one copy of pertinent documents that are or may become necessary for the DRB to perform their function. Pertinent documents are written notices of potential claim, responses to those notices, drawings or sketches, calculations, procedures, schedules, estimates, or other documents which are used in the performance of the work or in justifying or substantiating the CONTRACTOR's position. The CONTRACTOR shall also furnish a copy of such pertinent documents to the STATE, in conformance with the terms outlined in the special provisions.

SECTION IV STATE RESPONSIBILITIES

The STATE will furnish the following services and items:

A. CONTRACT RELATED DOCUMENTS

The STATE will furnish to each DRB member one copy of Notice to Contractors and Special provisions, Proposal and Contract, Plans, Instructions to Bidders, General Conditions, change orders, written instructions issued by the STATE to the CONTRACTOR, or other documents pertinent to any dispute that has been referred to the DRB and necessary for the DRB to perform its function.

B. COORDINATION AND SERVICES

The STATE, through the Engineer, will, in cooperation with the CONTRACTOR, coordinate the operations of the DRB. The Engineer will arrange or provide conference facilities at or near the project site and provide secretarial and copying services to the DRB without charge to the CONTRACTOR.

SECTION V TIME FOR BEGINNING AND COMPLETION

Once established, the DRB shall be in operation until the day of acceptance of the contract. The DRB members shall not begin work under the terms of this AGREEMENT until authorized in writing by the STATE.

SECTION VI PAYMENT

A. ALL INCLUSIVE RATE PAYMENT

The STATE and the CONTRACTOR shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of \$1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of \$700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time has been specifically agreed to in advance by the STATE and CONTRACTOR. Time away from the project that has been specifically agreed to in advance by the parties will be compensated at an agreed rate of \$125 per hour. The agreed amount of \$125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the State, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The STATE will provide, at no cost to the CONTRACTOR, administrative services such as conference facilities and secretarial services to the DRB.

B. PAYMENTS

DRB members shall be compensated at the same rate. The CONTRACTOR shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The STATE will reimburse the CONTRACTOR for its share of the costs of the DRB.

The DRB members may submit invoices to the CONTRACTOR for partial payment for work performed and services rendered for their participation in authorized meetings not more often than once per month during the progress of the work. The invoices shall be in a format approved by the parties and accompanied by a general description of activities performed during that billing period. Payment for hourly fees, at the agreed rate, shall not be paid to a DRB member until the amount and extent of those fees are approved by the STATE and CONTRACTOR.

Invoices shall be accompanied by original supporting documents, which the CONTRACTOR shall include with the extra work billing when submitting for reimbursement of the STATE's share of cost from the STATE. The CONTRACTOR will be reimbursed for one-half of approved costs of the DRB. No markups will be added to the CONTRACTOR's payment.

C. INSPECTION OF COSTS RECORDS

The DRB members and the CONTRACTOR shall keep available for inspection by representatives of the STATE and the United States, for a period of 3 years after final payment, the cost records and accounts pertaining to this AGREEMENT. If any litigation, claim, or audit arising out of, in connection with, or related to this contract is initiated before the expiration of the 3-year period, the cost records and accounts shall be retained until such litigation, claim, or audit involving the records is completed.

SECTION VII ASSIGNMENT OF TASKS OF WORK

The DRB members shall not assign the work of this AGREEMENT.

SECTION VIII TERMINATION OF DRB MEMBERS

DRB members may resign from the DRB by providing not less than 15 days written notice of the resignation to the STATE and CONTRACTOR. DRB members may be terminated by their original appointing power or by either party, for failing to fully comply at all times with all required employment and financial disclosure conditions of DRB membership in conformance with the terms of the contract.

SECTION IX LEGAL RELATIONS

The parties hereto mutually understand and agree that the DRB member in the performance of duties on the DRB, is acting in the capacity of an independent agent and not as an employee of either party.

No party to this AGREEMENT shall bear a greater responsibility for damages or personal injury than is normally provided by Federal or State of California Law.

Notwithstanding the provisions of this contract that require the CONTRACTOR to indemnify and hold harmless the STATE, the parties shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.

SECTION X CONFIDENTIALITY

The parties hereto mutually understand and agree that all documents and records provided by the parties in reference to issues brought before the DRB, which documents and records are marked "Confidential - for use by the DRB only," shall be kept in confidence and used only for the purpose of resolution of subject disputes, and for assisting in development of DRB findings and recommendations; that such documents and records will not be utilized or revealed to others, except to officials of the parties who are authorized to act on the subject disputes, for any purposes, during the life of the DRB. Upon termination of this AGREEMENT, said confidential documents and records, and all copies thereof, shall be returned to the parties who furnished them to the DRB. However, the parties understand that such documents shall be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

SECTION XI DISPUTES

Disputes between the parties hereto, including disputes between the DRB members and either party or both parties, arising out of the work or other terms of this AGREEMENT, which cannot be resolved by negotiation and mutual concurrence between the parties, or through the administrative process provided in the contract, shall be resolved by arbitration as provided in Section 7-1.10, "Arbitration," of the General Conditions.

SECTION XII VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION

In the event that any party, including an individual member of the DRB, deems it necessary to institute arbitration proceedings to enforce any right or obligation under this AGREEMENT, the parties hereto agree that such action shall be initiated in the Office of Administrative Hearings of the State of California. The parties hereto agree that all questions shall be resolved by arbitration by application of California law and that the parties to such arbitration shall have the right of appeal from such decisions to the Superior Court in conformance with the laws of the State of California. Venue for the arbitration shall be Sacramento or any other location as agreed to by the parties.

SECTION XIII FEDERAL REVIEW AND REQUIREMENTS

On Federal-Aid contracts, the Federal Highway Administration shall have the right to review the work of the DRB in progress, except for private meetings or deliberations of the DRB.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

SECTION XIV CERTIFICATION OF THE CONTRACTOR, THE DRB MEMBERS, AND THE STATE

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT as of the day and year first above written.

DRB MEMBER

DRB MEMBER

By: _____

By: _____

Title: _____

Title : _____

DRB MEMBER

By : _____

Title : _____

CONTRACTOR

CALIFORNIA STATE DEPARTMENT
OF TRANSPORTATION

By: _____

By: _____

Title: _____

Title: _____

0.581 SUBCONTRACTING

Attention is directed to the provisions in Section 6-1.01, "Subletting and Subcontracting," of the General Conditions and Division 0.2, "Proposal Requirements and Conditions," and Division 0.3, "Award and Execution of Contract," these special provisions.

Pursuant to the provisions in Section 1777.1 of the Labor Code, the Labor Commissioner publishes and distributes a list of contractors ineligible to perform work as a subcontractor on a public works project. This list of debarred contractors is available from the Department of Industrial Relations web site at:

<http://www.dir.ca.gov/DLSE/Debar.html>

Unauthorized substitution of a listed subcontractor may constitute a violation of the "Subletting and Subcontracting Fair Practices Act" and may subject the Contractor to the penalties imposed therein.

The DVBEs listed by the Contractor in response to the provisions in Division 0.222, "Submission of DVBE Information," and Division 0.3, "Award and Execution of Contract," of these special provisions, which are determined by the Department to be certified DVBEs, shall perform the work and supply the materials for which they are listed, unless the Contractor has received prior written authorization to perform the work with other forces or to obtain the materials from other sources.

Unauthorized substitution of a DVBE may also constitute a violation of California Code of Regulations Section 1896.64. The Contractor shall not be entitled to payment for the work or material unless it is performed or supplied by the listed DVBE or by other forces (including those of the Contractor) pursuant to prior written authorization of the Engineer.

The provisions in Division 0.22, "Disabled Veteran Business Enterprise (DVBE)," of these special provisions that DVBEs shall be certified on the date bids are opened does not apply to substitutions after award of the contract.

The Contractor shall maintain records of all subcontracts entered into with certified DVBE subcontractors and records of materials purchased from certified DVBE suppliers. The records shall show the name and business address of each DVBE subcontractor or vendor and the total dollar amount actually paid each DVBE subcontractor or vendor.

The Contractor agrees that the awarding department will have the right to review, obtain and copy all records pertaining to performance of DVBES during the contract. The Contractor agrees to provide the awarding department with any relevant information requested and shall permit access to its premises, upon reasonable notice, during normal business hours for the purpose of interviewing employees and inspecting and copying such books, records, accounts and other material that may be relevant to a matter under investigation for the purpose of determining compliance with Public Contract Code Section 10115 et seq. The Contractor further agrees to maintain such records for a period of three (3) years after final payment under the contract.

0.5811 NON-SMALL BUSINESS SUBCONTRACTING

The Small Business subcontractors listed by the Contractor in response to the provisions in Division 0.232, "Non-small Business Subcontractor Preference," and Division 0.3, "Award and Execution of Contract," these special provision, which are determined by the Department to be certified as Small Business, shall perform the work and supply the materials for which they are listed, unless the Contractor has received prior written authorization to perform the work with other forces or to obtain the materials from other sources.

Unauthorized substitution of a Small Business subcontractor may also constitute a violation of California Code of Regulations Section 1896.10 and may subject the Contractor to the sanctions referenced therein.

The provisions in Division 0.232, "Non-small Business Subcontractor Preference," of these special provisions that Small Business subcontractors shall be certified on the date bids are opened does not apply to substitutions after award of the contract.

The Contractor shall maintain records of all subcontracts entered into with certified Small Business subcontractors and records of materials purchased from certified Small Business suppliers. The records shall show the name and business address of each Small Business subcontractor or vendor and the total dollar amount actually paid each Small Business subcontractor or vendor.

The Contractor agrees that the awarding department will have the right to review, obtain and copy all records pertaining to performance of Small Businesses during the contract. The Contractor agrees to provide the awarding department with any relevant information requested and shall permit access to its premises, upon reasonable notice, during normal business hours for the purpose of interviewing employees and inspecting and copying such books, records, accounts and other material that may be relevant to a matter under investigation for the purpose of determining compliance with California Code of Regulations Section 1896, et seq. The Contractor further agrees to maintain such records for a period of three (3) years after final payment under the contract.

0.591 PAYMENT OF WITHHELD FUNDS

Payment of withheld funds shall conform to Section 7-1.06, "Payment of Withheld Funds," of the General Conditions and these special provisions.

Funds withheld from progress payments to ensure performance of the contract that are eligible for payment into escrow or to an escrow agent pursuant to Section 10263 of the California Public Contract Code do not include funds withheld or deducted from payment due to failure of the Contractor to fulfill a contract requirement.

DIVISION 1. GENERAL REQUIREMENTS

1.01 SCOPE

The building work described herein and as shown on the plans shall conform to the requirements of the General Conditions and these special provisions.

The building work to be done consists, in general, of staged construction to perform fire protection and life safety upgrades, mechanical and electrical system upgrades, accessibility alterations, seismic retrofitting, and such other items or details, not mentioned above, that are required by the plans, General Conditions, or these special provisions shall be performed, placed, constructed or installed in the Main Building of the Transportation Laboratory.

Attention is directed to Section 5-1.01P, "Safety and Health Provisions," of the General Conditions. Work practices and worker health and safety shall conform to the California Division of Occupational Safety and Health Construction Safety Orders Title 8, of the California Code of Regulations including Section 5158, "Other Confined Space Operations."

1.02 ORDER OF WORK

The Contractor shall provide a comprehensive list showing all submittals required by these special provisions.

The Contractor shall submit and obtain approval of the required submittals as specified in Division 15, "Mechanical," and Division 16, "Electrical," of these special provisions.

The Contractor shall order the materials and equipment contained in the required submittals, after the submittals have been approved. Materials and equipment required to do the work shall be on hand before starting the work.

Structural, mechanical, and electrical retrofits shall be completed in the basement prior to construction new hallways.

Attention is directed to "Water Pollution Control" of these special provisions regarding the submittal and approval of the Water Pollution Control Program prior to performing work having potential to cause water pollution.

Attention is directed to "Special Project Procedures" in these special provisions.

Lead particulate is present in the attic space. Lead particulate in the attic space shall be treated under "Lead Abatement" of these special provisions. The Contractor shall clean lead particulate in the attic space by HEPA vacuum and wet wipe. Final clearance testing of the attic as specified under "Lead Abatement" will be performed prior to starting any work in the attic space or opening the attic space for related work in this contract.

Any disturbance, dismantling and disposal of the existing HVAC ducting shall be performed under "Lead Abatement" due to the settled out lead particulates in the registers and ductwork.

Localized lead based paint removal on steel trusses in the attic will be required. Lead based paint on attic trusses shall be removed 150 mm from centerline in all directions.

1.03 WORK STAGES

The work shall be conducted in 3 stages, with each stage complete before beginning the next stage except for the Basement work during stage 1:

Stage 1: Work shall be performed in the Administration Wing and Basement.

Stage 2: Work shall be performed in the West Laboratory Wing and Basement.

Stage 3: Work shall be performed in the East Laboratory Wing.

A schedule showing the sequence, commencement and completion dates, and move-out and in dates for all stages of the work shall be submitted at least 3 weeks prior to beginning work on Stage 1.

1.04 BUILDING OCCUPANCY HOURS

State personnel are scheduled to occupy the buildings during the following days and hours (normal business hours), except when asbestos or lead removal and clean-up work is being performed:

Stage 1:

Laboratory Wings:	M - F, 6:00AM - 6:00PM
Basement Rooms B1 and B2:	M - TH, 6:00AM - 5:00PM
Administration Wing:	Vacant for Construction
Basement (except Rooms B1 and B2):	Vacant for Construction

Stage 2:

West Laboratory Wing:	M - TH, 6:00AM - 5:00PM
Administration Wing:	M - F, 6:00AM - 6:00PM
East Laboratory Wing:	M - F, 6:00AM - 6:00PM
Basement Rooms B1 and B2:	M - TH, 6:00AM - 5:00PM
Basement (except Rooms B1 and B2):	Vacant for Construction

Stage 3:

East Laboratory Wing:	M - TH, 6:00AM - 5:00PM
Administration Wing:	M - F, 6:00AM - 6:00PM
West Laboratory Wing:	M - F, 6:00AM - 6:00PM

Stage 1, 2, & 3:

Structural Material Building:	M - F, 6:00AM - 5:00PM
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State personnel are scheduled to occupy the buildings during the following days and hours (normal business hours), when asbestos or lead removal and clean-up work is being performed:

Stage 1:

Laboratory Wings:	M - TH, 6:00AM - 5:00PM
Basement Rooms B1 and B2:	M - TH, 6:00AM - 5:00PM
Administration Wing:	Vacant for Construction
Basement (except Rooms B1 and B2):	Vacant for Construction

Stage 2:

West Laboratory Wing:	M - TH, 6:00AM - 5:00PM
Administration Wing:	M - TH, 6:00AM - 5:00PM
East Laboratory Wing:	M - TH, 6:00AM - 5:00PM
Basement Rooms B1 and B2:	M - TH, 6:00AM - 5:00PM
Basement (except Rooms B1 and B2):	Vacant for Construction

Stage 3:

East Laboratory Wing:	M - TH, 6:00AM - 5:00PM
Administration Wing:	M - TH, 6:00AM - 5:00PM
West Laboratory Wing:	M - TH, 6:00AM - 5:00PM

No State personnel will be present on established State holidays.

1.05 ALLOWABLE WORKING HOURS

The Contractor will be allowed to perform work, except for asbestos or lead abatement related work, within each Construction Boundary as follows:

Stage 1:

Administration Wing:	Any time
Basement (except Rooms B1 and B2):	Any time
Basement Rooms B1 and B2:	M – TH, 5:00PM - 6:00AM; TH 5:00PM - M 6:00AM

Stage 2:

West Laboratory Wing	
Roofing Work:	Any time
Unoccupied Construction Zone:	Any time
Occupied Construction Zone:	M – TH, 5:00PM - 6:00AM; TH 5:00PM - M 6:00AM
Basement (except Rooms B1 and B2):	Any time
Basement Rooms B1 and B2:	M – TH, 5:00PM - 6:00AM; TH 5:00PM - M 6:00AM

Stage 3:

East Laboratory Wing	
Roofing Work:	Any time
Unoccupied Construction Zone:	Any time
Occupied Construction Zone:	M – TH, 5:00PM - 6:00AM; TH 5:00PM - M 6:00AM

The Contractor will be allowed to perform asbestos or lead removal and clean-up work within each Construction Boundary as follows:

Stage 1:

Administration Wing:	Any time
Basement:	TH 5:00PM - M 6:00AM

Stage 2:

West Laboratory Wing:	TH 5:00PM - M 6:00AM
Basement:	TH 5:00PM - M 6:00AM

Stage 3:

East Laboratory Wing:	TH 5:00PM - M 6:00AM
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The Contractor will be allowed to perform asbestos or lead abatement related work, other than removal and clean-up work, within each Construction Boundary as follows:

Stage 1:

Administration Wing:	Any time
Basement (except Rooms B1 and B2):	Any time
Basement Rooms B1 and B2:	TH 5:00PM - M 6:00AM

Stage 2:

West Laboratory Wing	
Occupied Construction Zone:	TH 5:00PM - M 6:00AM
Unoccupied Construction Zone:	Any time
Basement (except Rooms B1 and B2):	Any time
Basement Rooms B1 and B2:	TH 5:00PM - M 6:00AM

Stage 3:

East Laboratory Wing	
Occupied Construction Zone:	TH 5:00PM - M 6:00AM
Unoccupied Construction Zone:	Any time

Existing Utility Interruptions.--Utilities serving facilities occupied by the State or others shall not be interrupted, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to the following requirements and as specified in these special provisions:

The Engineer shall be notified not less than two weeks in advance of proposed utility interruptions.

Utility interruptions shall not be performed without Engineer’s written permission.

1.06 PROJECT COORDINATION

The Contractor shall coordinate construction operations included in the various sections of the Specifications to provide an efficient and orderly installation of each part of the Work. Construction operations shall be scheduled in the sequence required to obtain the best results where the installation of one part of the Work depends on installation of other components before or after that part. Installation of different components shall be coordinated to provide maximum accessibility for required maintenance, service, testing and repair.

Coordination Plan.--The Contractor shall submit a coordination plan indicating the sequence, function, and relationship of each part of the Work during each stage. The coordination plan shall show the following:

1. Coordination of the Work with related work being done by the Engineer and other contractors operating in the area.
2. Examination of the Contract Plans with the actual field conditions so that the Work will be accommodated in the spaces provided. Space conflicts and interferences shall be resolved before work is commenced.
3. Coordination of the Work so that no interferences or conflicts between trades will occur.
4. Coordination of the Work to ensure efficient and orderly sequence of installation.

Key Personnel Names.--A list of work crew names shall be submitted in order to facilitate entrance and exit to state facilities being monitored by manned security services. The name list shall include first name, last name, home address and phone number, DOB, and driver’s license number. The list of work crew names shall be current at all times.

Project and Pre-installation Meeting.--The Contractor shall conduct project meetings once a week unless otherwise agreed on by the Contractor and the Engineer and shall conduct pre-installation meetings prior to each stage of work. Attendance shall be limited to the Contractor and the Contractor's immediate subordinates, subcontractors where specified, and the Engineer as requested. The Contractor shall keep minutes of the meetings and copies shall be sent to all in attendance.

1.07 SPECIAL PROJECT PROCEDURES

The following special project procedures shall apply to the work at the Transportation Laboratory:

1. The building temperature and humidity level for all Occupied Business Zones and Occupied Construction Zones, including the Structural Materials Building, shall be maintained between 18°C to 27°C and 30% to 35%, respectively, during normal business hours, unless otherwise specified on the following table:

Location	Temperature Range(°C)	Humidity (%)	Duration
Chemistry Lab (Rm 286 and 286-C)	21-25	45-55	
X-Ray Room (Rm 286-D)	21-25	20-80	At all times
Cement Room (286-E)	21-25	45-55	
Paint Room (Rm 286-F)	21-25	45-55	
Supply Room (Rm 305)	21-25	45-55	
Thermo Plastic Lab (Rm 315)	21-25	45-55	
Equipment Room (Rm 318)	21-25	45-55	
Cement Lab (Rm 258)		50-65	
Dry Room (Rm 258-D)	21-25	46-54	At all times
Fog Room (Rm 264-A)	23-25	95-100	At all times
Salt Tank Room (Rm 273-B)		30-35	
Concrete Mixing Room (Rm 270)	22-25	30-35	At all times

2. Offices in the Chemistry Lab (Room 284, 284-A, 284-B and 284C) shall be vacant and accessible during normal business hours.
3. The electrical and mechanical systems or equivalent interim systems for all Occupied Business Zones and Occupied Construction Zones, including the Structural Materials Building, shall be operational during normal business hours.

4. The Contractor shall provide uninterrupted electrical power and water for the following locations at the following times:

Location	Duration
Dry Room (Rm 258-D)	At all times
Fog Room (Rm 264-A)	At all times
Salt Tank Room (Rm 273-B)	Normal Business Hours
Concrete Mixing Room (Rm 270)	At all times

5. The Contractor shall provide and install adequate temporary lighting at locations where pedestrian traffic is designated.
6. Attention is directed to "Electrical Work" in Division 16, "Electrical," of these special provisions regarding temporary power for various equipment during power shutdown.
7. Attention is directed to "Electrical Work" in Division 16, "Electrical," of these special provisions regarding the replacement of the Main Switchboard (MSB).
8. Attention is directed to "Mechanical Work" in Division 15, "Mechanical," of these special provisions regarding the replacement requirements for the chilled water plant and hot water plant equipment.
9. Attention is directed to "Mechanical Work" in Division 15, "Mechanical," and "Electrical Work" in Division 16, "Electrical," of these special provisions regarding providing interim or portable equipment required to keep specified areas operational, full time or part time, and the availability of state furnished power for the Contractor's use.
10. One fume hood shall be operable in Room 286 at all times.

1.08 STATE-FURNISHED MATERIALS

Attention is directed to Section 4-1.01, "Materials," of the General Conditions and these special provisions.

The Contractor shall submit a written request to the Engineer for the delivery of State-furnished materials at least 15 days in advance of the date of their intended use. The request shall state the quantity and type of each material.

The Contractor shall be responsible for all materials furnished to him, and shall pay all demurrage and storage charges. State-furnished materials lost or damaged from any cause whatsoever shall be replaced by the Contractor at his expense. The Contractor shall be liable to the Department for the cost of replacing State-furnished material and such costs may be deducted from any monies due or to become due the Contractor.

All State-furnished materials that are not used in the work shall remain the property of the State and shall be delivered to the Engineer.

The following materials will be furnished free of charge to the Contractor at the site of the work:

Padlock

1.09 AREAS FOR CONTRACTOR'S USE

Areas for Contractor's use shall be as shown on the plans. No additional area is available within the contract limits for the exclusive use of the Contractor. The Contractor shall arrange with the Engineer for additional areas to store equipment and materials within the work area.

1.10 COOPERATION

Attention is directed to Sections 5-1.06, "Responsibility for Utilities," and 5-1.12, "Cooperation," of the General Conditions and these special provisions.

Work by State forces will be in progress within the contract limits during the working period for this contract.

The Contractor shall comply with all security policies and normal business hours of the State concerning the Transportation Laboratory in Sacramento County.

The Contractor shall plan his work to minimize interference with State forces and the public.

1.11 MEASUREMENT AND PAYMENT

The contract lump sum price paid for building work shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the building work, complete in place, as shown on the plans, as specified in the General Conditions and these special provisions, and as directed by the Engineer.

Full compensation for any incidental materials and labor, not shown on the plans or specified, which are necessary to complete the building work shall be considered as included in the contract lump sum price paid for building work and no additional compensation will be allowed therefor.

1.12 SUBMITTALS

Shop drawings, material lists, descriptive data, samples and other submittals specified in these special provisions shall be submitted for approval in accordance with the provisions in Section 2-1.04, "Shop Drawings, Descriptive Data, Samples, and Alternatives," of the General Conditions and these special provisions.

Unless otherwise permitted in writing by the Engineer and except submittals for "Alternatives" in conformance with the provisions of said Section 2-1.04 of the General Conditions, all submittals required by these special provisions shall be submitted within 70 days after the contract has been approved.

Attention is directed to the provisions in Section 2-1.01, "Authority of Engineer," of the General Conditions. The Engineer may request submittals for materials or products where submittals have not been specified in these special provisions, or may request that additional information be included in specified submittals, as necessary to determine the quality or acceptability of such materials or products.

Submittals shall be delivered to the locations indicated in these special provisions. If a specific location is not indicated, the submittal shall be delivered to the Division of Structure Design, Documents Unit, Fourth Floor, Mail Station 9-4/4I, 1801 30th Street, Sacramento, California 95816, telephone (916) 227-8252.

1.13 SCHEDULE OF VALUES

The Contractor shall prepare and submit to the Engineer for approval 2 copies of a Schedule of Values within 15 working days of approval of the contract. The Engineer shall be allowed 15 working days for approval or return for correction of each submittal or resubmittal. Should the Engineer fail to complete the review within the time specified and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 6-1.08, "Liquidated Damages," of the General Conditions.

The Schedule of Values shall cover each lump sum item for building work and shall be accurately divided into sections representing the cost of each separate building or structure. Any site work that is not part of a separate building or structure shall be included under a specific section as General Work and not included in the building or structure cost. Indirect costs and general condition items are to be listed as a separate line item of work. The sections representing each building or structure must be identified as to the building or structure they represent and be broken down to show the corresponding value of each craft, trade or other significant portion of the work. A sub-total for each section shall be provided.

The Schedule of Values shall be approved by the Engineer before any partial payment estimate is prepared.

The sum of the items listed in the Schedule of Values shall equal the contract lump sum price for building work. Overhead and profit shall not be listed as separate items, but shall be appropriately distributed across all line items of cost.

In determining the partial payments to be made to the Contractor, only the following listed materials will be considered for inclusion in the payment as materials furnished but not incorporated in the work:

- A. Air Handlers
- B. Chillers
- C. Motor Control Centers
- D. Hydronic Piping

1.14 PROGRESS SCHEDULE (CRITICAL PATH METHOD)

PART 1.- GENERAL

SUMMARY.--

Scope.--This section shall consist of required procedures, preparation, submittals, reviews, updates, and revisions to the construction schedule.

The Contractor shall submit to the Engineer practicable critical path method (CPM) progress schedules in conformance with these special provisions. Whenever the term "schedule" is used in this section it shall mean CPM progress schedule.

DEFINITIONS.—

The following definitions shall apply to this section:

ACTIVITY.--A discrete part, task, event or other project element on a schedule that can be identified for planning, scheduling, monitoring and controlling the project. Activities must include a description of the task, start date, finish date, duration and one or more logic ties.

BASELINE SCHEDULE.--The initial schedule representing the Contractor's plan to execute the work, from the first working day of the project, and which must be approved by the Engineer.

CONTRACT COMPLETION DATE.--The current extended date for completion of the Contract, as shown on the weekly statement of working days furnished by the Engineer, in conformance with the provisions for "Time of Completion," as provided in the Contract.

CRITICAL PATH.--The longest connected chain of activities through the project that establishes the minimum overall project time, and contains no float. Any delay on the critical path will cause the completion date to be extended.

CRITICAL PATH METHOD (CPM).--A network based planning technique using activity durations, logic, and the relationship of activities, that can mathematically calculate a schedule for the entire work of a project.

DATA DATE.--The beginning date on which a current schedule starts. Everything occurring prior to the data date, is "as-built", and everything occurring on or after the data date is "planned."

EARLY COMPLETION TIME.--The difference in time between an early scheduled completion date and the contract completion date.

FLOAT.--The difference in time between the earliest and latest allowable start or finish dates for an activity.

MILESTONE.--An 'event activity' that has zero duration, typically used to represent the date of the event, or, the beginning or ending date of a certain stage, or phase, of the project.

NARRATIVE REPORT.--A document submitted with each schedule that discusses topics related to the project's progress and scheduling. It is required to describe any changes made to the schedule, subsequent to the approval and acceptance of the Baseline Schedule.

SCHEDULED COMPLETION DATE.--The planned project finish date, as shown on the current accepted schedule.

STATE OWNED FLOAT ACTIVITY.--The activity documenting time saved on the critical path, by actions of the State. It should be shown as the last activity prior to the scheduled completion date, except when there is a separate Contract Completion Date required for the completion of plant establishment.

TIME IMPACT ANALYSIS.--The development of a schedule and narrative report to specifically demonstrate the effect a proposed change or delay has made, or will make, on the current scheduled completion date.

TOTAL FLOAT.--The amount of time that an activity or a chain of activities can be delayed, before extending the scheduled completion date.

UPDATE SCHEDULE.--A current schedule developed from the Baseline, through regular monthly review, to incorporate as-built progress, as well as any planned changes, and the resulting recalculated completion date.

SUBMITTALS.—

The Contractor shall submit the following schedule submittals, each consistent in all respects with the time and order of work requirements of the contract. The project work shall be executed in the sequence indicated on the most current accepted schedule.

- Resume of Scheduler
- Preliminary Schedule
- Baseline Schedule
- Baseline Schedule - Monthly Updates
- Time Impact Analysis, if required
- As-Built Schedule

The Contractor shall furnish hard copies of time scaled network diagrams and bar charts, narrative reports, tabular reports, and other required schedule data, as a part of each schedule submittal.

Contractor shall submit 2 colored copies of each submittal of the schedules, size to be approved by the Engineer, along with 2 CD Rom computer disks which include all electronic files of the current Schedules and all shared layouts and filters being submitted. Contractor shall also submit 2 copies of all bar charts, reports and/or other data, pertaining to the schedule.

Resume of Scheduler.--Contractor shall submit a resume of its scheduler for review and acceptance, prior to the preparation of the Baseline Schedule. Contractor shall retain at least one full time scheduler with a minimum of 3 years direct experience using automated scheduling systems of the types set forth in these special provisions. Scheduler will cooperate with the Engineer and shall be available on a full time basis for continuously monitoring, maintaining and updating the detailed schedule. The Engineer has the right to refuse to accept the scheduler based upon lack of experience as required by these special provisions. If the Engineer refuses to accept the proposed scheduler, Contractor shall propose another scheduler meeting the stated experience requirements.

Preliminary Schedule.--A preliminary schedule of no less than a “3 month look ahead” shall be prepared and submitted within 10 days following the Notice to Proceed. This schedule is to show the Contractor’s plan for executing the early stages of the work and required submittals, and serve in the interim, until acceptance of the Base Line Schedule. This schedule can be prepared as a simple and manually drawn, time scaled, Bar Chart, or, a time scaled Logic Diagram, to describe the work planned. Review of this preliminary schedule shall not represent nor confirm it to be a complete listing of all submittals, or all the work required, for the Project.

Baseline Schedule.--Within 20 days after the approval of the Contract, Contractor shall submit the initial Baseline Schedule. The Baseline Schedule shall include all of the detailed activities required to complete the contract. Contractor shall update and correct the Baseline Schedule as required and re-submit until it is accepted. Contractor shall obtain acceptance of the Baseline Schedule within 55 days of the Approval of the Contract . Upon final acceptance of the Baseline Schedule, it shall become the schedule against which all subsequent schedule updates are made; against which Contractor shall report progress to, and/or variances from; and by which the Engineer shall measure Contractor’s performance and progress.

Baseline Schedule-Monthly Updates.--The Contractor shall submit an Update Schedule and meet with the Engineer to review contract progress, on or before the first day of each month, beginning one month after the Baseline Schedule is accepted. The Contractor shall allow 2 weeks for the Engineer's review after the Update Schedule and all support data are submitted, except that the review period shall not start until the previous month's required schedule is accepted. Update Schedules that are not accepted or rejected within the review period will be considered accepted by the Engineer.

The Update Schedule shall have a data date of the twenty-first day of the month or other date established by the Engineer. The Update Schedule shall show the status of work actually completed to date, and the work yet to be performed, as planned. Actual activity start dates, percent complete and finish dates shall be shown as applicable. Durations for work that has been completed shall be shown on the Update Schedule as the work actually occurred, including Engineer's submittal review, and if applicable, the time required for Contractor's resubmittal process.

The Contractor may include modifications such as adding or deleting activities or changing activity constraints, durations or logic that do not (1) alter the critical path(s) or near critical path(s) or (2) extend the scheduled completion date compared to that shown on the current accepted schedule, for the Engineer's approval. The Contractor shall state in writing the reasons for any changes to planned work. If any proposed changes in planned work will result in (1) or (2) above, then the Contractor shall submit a time impact analysis as described herein.

Time Impact Analysis.--The Contractor shall submit a written time impact analysis (TIA) to the Engineer with each request for adjustment of contract time, or when the Contractor or Engineer consider that an approved or anticipated change may impact the critical path or contract progress.

The Engineer may adjust contract working days for ordered changes that affect the scheduled completion date, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications. The Contractor shall prepare a time impact analysis to determine the effect of the change in conformance with the provisions in "Time Impact Analysis" specified herein, and shall include the impacts acceptable to the Engineer in the next update schedule. Changes that do not affect the controlling operation on the critical path will not be considered as the basis for a time adjustment. Changes that do affect the controlling operation on the critical path will be considered by the Engineer in decreasing time or granting an extension of time for completion of the contract. Time extensions will only be granted if the total float is absorbed and the scheduled completion date is delayed one or more working days because of the ordered change.

The TIA shall illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate. The analysis shall use the accepted schedule that has a data date closest to and prior to the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions prior to the event, the accepted schedule shall be updated to the day before the event being analyzed. The TIA shall include an impact schedule developed from incorporating the event into the accepted schedule by adding or deleting activities, or by changing durations or logic of existing activities. If the impact schedule shows that incorporating the event modifies the critical path and scheduled completion date of the accepted schedule, the difference between scheduled completion dates of the two schedules shall be used for, and shall be equal to, the adjustment of contract time. The Engineer may construct and utilize an appropriate project schedule or other recognized method to determine adjustments in contract time until the Contractor provides the TIA.

The Contractor shall submit a TIA in duplicate within 15 working days of receiving a written request for a TIA from the Engineer. The Contractor shall allow the Engineer 2 weeks after receipt to approve or reject the submitted TIA. All approved TIA schedule changes shall be shown on the next update schedule.

If a TIA submitted by the Contractor is rejected by the Engineer, the Contractor shall meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, the Contractor will be allowed 15 days from the meeting with the Engineer to give notice in conformance with the provisions in Section 7-1.03, "Notice of Potential Claim," of the General Conditions. The Contractor shall only show actual as-built work, and approved changes, related to the TIA, in subsequent update schedules. If agreement is reached at a later date, approved TIA schedule changes shall be shown on the next update schedule.

The Engineer will withhold 25% of the estimated value of the work performed during the current estimate period, as provided by this specification, if the required TIA is not submitted by the Contractor within the 15 working days.

As-Built Schedule.--The Contractor shall submit a final update, As-Built Schedule with actual start and finish dates for the activities, within 30 days after completion of contract work. The Contractor shall provide a written certificate with this submittal signed by the Contractor's project manager and an officer of the company stating, "To my knowledge and belief, the enclosed As-Built Schedule reflects the actual start and finish dates of the actual activities for the project contained herein." An officer of the company may delegate in writing the authority to sign the certificate to a responsible manager. Final close-out of the project will be withheld until the As-Built Schedule has been submitted and accepted by the Engineer.

PART 2.- PRODUCTS

SCHEDULING SOFTWARE.--

Contractor shall utilize either Primavera Project Planner™ for Windows® (P3), or, SureTrak Project Manager™ software (latest version) by Primavera Systems, Inc., or an approved equivalent scheduling software, and employ the Critical Path Method (CPM) in the development and maintenance of the Schedule network in Precedence Diagram Mode (PDM). The scheduling software shall be capable of being resource loaded with manpower, costs and materials. It shall also be capable of generating time-scaled logic diagrams, resource histograms and profiles, bar charts, layouts and reports, with any and/or all, activity detail.

The Contractor shall furnish an unused copy of the schedule software and all original software instruction manuals to the Engineer, with submittal of the Baseline Schedule. The schedule software furnished shall be the same as the Contractor uses for preparation of the schedule(s). The software shall be licensed to the State and include an agreement for technical support to be provided by Primavera, until the Contract is accepted. The software will not be returned to the Contractor. The State will compensate the Contractor in conformance with the provisions in Section 3, "Changes in the Work," of the General Conditions for replacement of software which is damaged, lost or stolen after delivery to the Engineer.

The Contractor shall provide instruction for the Engineer in the use of the software. Within 20 working days of contract approval, the Contractor shall provide a commercial 8-hour training session for 2 Department employees, in the use of the software at a location acceptable to the Engineer. The instruction shall be provided by an instructor certified by Primavera to conduct training in the use of the software. If software other than Primavera SureTrak Project Manager™ is furnished, then the training session shall be a total of 16-hours for each Department employee.

In utilizing the schedule calculation rules, auto cost rules and resource calculation rules shall be in a format acceptable to the Engineer.

PART 3.- EXECUTION

BASELINE SCHEDULE AND MONTHLY UPDATES.—

Pre-construction scheduling conference.--The Contractor shall schedule, and the Engineer will conduct a pre-construction scheduling conference with the Contractor's Project Manager and Construction Scheduler within 10 working days of the approval of the contract. At this meeting the Engineer will review the requirements of this section of the special provisions with the Contractor.

The Contractor shall submit a general time-scaled logic diagram displaying the major activities and sequence of planned operations and shall be prepared to discuss the proposed work plan and schedule methodology that comply with the requirements of these special provisions. If the Contractor proposes deviations to the construction staging of the project, then the general time-scaled logic diagram shall also display the deviations and resulting time impacts. The Contractor shall be prepared to discuss the proposal.

At this meeting, the Contractor shall additionally submit the alphanumeric coding structure and the activity identification system for labeling the work activities. To easily identify relationships, each activity description shall indicate its associated scope or location of work by including such terms as quantity of material, type of work, building name, area, phase, responsibility, etc.

The Engineer will review the logic diagram, coding structure, and activity identification system, and provide any required baseline schedule changes to the Contractor for implementation.

The Schedules shall incorporate activity descriptions, sequence, logic relationships, duration estimates, use of resources, and other information as may be required to develop a detailed and complete plan for execution the work of the Contractor, his Subcontractors, Vendors, and Suppliers.

The Schedules shall include all activities required for the work, as well as all engineering, fabrication, delivery, and installation dates required to support the progress of the work. Schedules shall accurately represent the Contractor's plan to complete the work within the Milestones and/or Contract Time. The network shall show continuous flow from left to right.

The Baseline Schedule with a completion date extending beyond the contract time, will not be acceptable.

The Contractor may show a scheduled completion date that is later than the contract completion date on a Baseline Update schedule, after the Baseline Schedule is accepted. The Contractor shall provide an explanation for a late scheduled completion date in the narrative report that is included with the schedule.

A Baseline Schedule indicating the work to be completed in less than the Contract time may be accepted, providing it includes and meets all the requirements of the Contract. The Contractor shall indicate any available float.

The Contractor may show early completion time on any schedule provided that the requirements of the contract are met. Early completion time shall be considered a resource for the exclusive use of the Contractor. The Contractor may increase early completion time by improving production, reallocating resources to be more efficient, performing sequential activities concurrently or by completing activities earlier than planned.

The Contractor may also submit for approval a cost reduction incentive proposal in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications that will reduce time of construction.

If the Contractor submits an early completion baseline schedule that shows contract completion in less than 85 percent of the working days specified in these special provisions, the baseline schedule shall be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations shall be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for the Contractor and subcontractors. The Contractor shall use average composite crews to display the labor loading of on-site construction activities. The Contractor shall optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not duplicated in concurrent activities. The time-scaled resource histograms shall show labor crafts and equipment classes to be utilized on the contract. The Engineer may review the baseline schedule activity resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable.

State-owned float shall be considered a resource for the exclusive use of the State. The Engineer may accrue State-owned float by the early completion of review of any type of required submittal when it saves time on the critical path. The Contractor shall prepare a time impact analysis, when requested by the Engineer, to determine the effect of the action in conformance with the provisions in "Time Impact Analysis" specified herein. The Engineer will document State-owned float by directing the Contractor to update the State-owned float activity on the next update schedule. The Contractor shall include a log of the action on the State-owned float activity and include a discussion of the action in the narrative report. The Engineer may use State-owned float to mitigate past, present or future State delays by offsetting potential time extensions for Contract Change Orders.

A Schedule found unacceptable by the Engineer shall be revised by Contractor and resubmitted within 5 days.

Each activity shall include a clear and legible description. All constraints must be revealed. Activities shall also be coded to include, but not necessarily limited to: Building or other designation of area; Phase; Craft, Trade, or Responsibility; work shift; and such other coding as may be necessary to facilitate detailed monitoring, measuring, and evaluation of status and progress of the work.

Activities to be integrated and shown in the Baseline Schedule shall include, in addition to all construction tasks, activities representing: Contractor, Subcontractor, and Supplier submittal dates of all submittals; activities representing the Engineer's review period of each submittal, with each review period scheduled for no less than 15 working days; procurement of materials and equipment; manufacture and/or fabrication; testing and delivery to the project site for materials and equipment; material and equipment installation; preliminary, final, and performance testing of equipment or systems installed under these special provisions.

Indicate start and completion dates for all activities, including: temporary facilities; construction of mock-ups, prototypes and/or samples; start up, test, and balance of equipment; preparation and completion of punch list; Engineer interfaces and furnishing of items; interfaces with separate work contracts; regulatory agency approvals; securing of any approvals and permits required for performance of the work.

Contractor shall take into account all foreseeable factors or risks affecting, or which may affect, performance of the work including, applicable laws, regulations or collective bargaining agreements pertaining to health and life safety, labor, transportation, traffic, air quality, storm water, noise, and any other applicable regulatory requirements.

The number of activities shall be sufficient to assure adequate detail for planning of the work, permit monitoring and evaluation of progress, and provide sufficient data for accurate analysis of time impacts. All the work of each separate building and/or other independent element(s) of the project shall be individually and uniquely identified in the schedule. Each activity shall have not less than one predecessor and one successor activity, except for start and finish activities. No activity shall have a duration longer than 20 working days except activities for fabrication and procurement of equipment and materials, unless previously approved by the Engineer. Critical activities are to be uniquely identified.

Contractor shall not use any float suppression techniques, such as preferential sequencing or logic, special lead/lag constraints or unjustifiably over-estimating activity durations in preparing the construction schedule except, the use of "finish no later than constraints", for Milestones will be permissible.

Contractor shall include with the Schedules, a written narrative report sufficiently comprehensive to explain basis and determinations of Contractor's approach to the work, including but not limited to: actual start/finish dates, actual vs. planned durations; any unusual conditions or restrictions; manpower flow; average crew sizes; equipment requirements; production rates; restraints: changes in critical path and completion dates; critical path activities that contain time contingencies for impacts to be expected from, holidays and other non-work days; potential problem areas; cause of any delay(s); corrective action planned to adjust for delay(s); permits; required coordination with authorities, utilities, separate work contracts and other parties; and long lead delivery items requiring more than 30 days from the date of order to delivery, on the project site, any other items that may/will impact the approved schedule.

The Engineer will notify the Contractor of any adjustments to the Schedule. Contractor shall perform any required adjustments to the Schedule and resubmit it for acceptance certifying in writing all information contained therein complies with these special provisions.

Upon notification by the Engineer of acceptance of the Schedule, the Contractor shall prepare computer plots, print outs, and complete submission of the Schedule, which shall include the following, as a minimum:

A time scaled logic network, and bar chart type presentation, of all the activities, including relationships and logic, critical activities uniquely identified, and which can provide individual columns to identify, but not be limited to; activity number, description, duration, calendar, early/late start/finish dates, total/free float, phase, area, building, responsibility, etc.

The Engineer will request printouts of no more than 3 sorts, and which are to be determined at the time of each Baseline Schedule update. Typical sorts may include:

Early Start / Total Float;
Grouped by Building or Area / Early Start / Total Float;
Critical activities / Early Start / Total Float;

The Engineer's review and acceptance of schedules shall not waive any contract requirements and shall not relieve the Contractor of any obligation there under or responsibility for submitting complete and accurate information. Schedules that are rejected shall be corrected by the Contractor and resubmitted to the Engineer within 5 working days of notification by the Engineer, at which time a new review period of one week will begin.

Notwithstanding acceptance of the Baseline Schedule, failure to identify and/or include any element of the contract into the Baseline Schedule shall not release Contractor from obligation of completing all required work in accordance with these special provisions.

Submittal of the Baseline Schedule shall constitute Contractor confirmation the schedule meets the requirements of these special provisions, and the work will be executed in the sequence indicated in the Milestones schedule.

MILESTONE.--

Milestones are designated dates as may be set forth in the schedule, in which work, or portions thereof, are required to be started and/or completed in accordance with these special provisions.

Where the term completion or similar terms are used in the designation of a Milestone, it shall be construed to mean all portions of the work in the indicated phase, area and/or zone are complete and acceptable to Engineer. Where the term start or similar terms are used in the designation of a Milestone, it shall be construed to mean a portion of the work in the indicated phase, area and/or zone is required to be commenced.

Contractor shall identify all Engineer defined Milestones in the schedule. Engineer defined Milestones shall serve as an essential instrument of measurement by the Engineer, of Contractor compliance with the schedule.

RETENTION.--

The Department will retain an amount equal to 25 percent of the estimated value of the work performed during each estimate period in which the Contractor fails to submit an acceptable schedule conforming to the requirements of these special provisions, or, if the Contractor fails to provide required time impact analysis, as determined by the Engineer. Schedule retentions will be released for payment on the next monthly estimate for partial payment following the date that acceptable schedules are submitted to the Engineer or as otherwise specified herein. Upon completion of all contract work

and submittal of the As-Built Schedule and certification, any remaining retained funds associated with this section, "Progress Schedule (Critical Path Method)", will be released for payment. Retentions held in conformance with this section shall be in addition to other retentions provided for in the contract. No interest will be due the Contractor on retention amounts.

FAILURE TO COMPLY WITH REQUIREMENTS.--

If Contractor fails to comply with the specified requirements, Engineer reserves the right, but will not be required, to engage an independent scheduling consultant and/or provide its own expertise to fulfill these requirements. Upon notice to Contractor, Engineer shall retain additional professional services and shall be entitled to recover by assessment all incurred costs for the additional services.

In such an event, Engineer will require, and Contractor shall participate and provide all requested and/or required information to ensure the resulting Milestones Schedule accurately reflects Contractor plan to execute the work in compliance with these special provisions. If it becomes necessary for Engineer to recommend logic and/or duration revisions as a result of Contractor failure to furnish acceptable data, and if Contractor has objections to the recommendations, Contractor shall provide notice to Engineer within 3 days and Contractor shall provide an acceptable alternate plan. If Contractor fails to so note any objections and provide an acceptable alternate plan, or if Contractor implements the recommendations of Engineer without so noting any objections, Contractor will be deemed to have waived all objections and concurred with the recommended logic/duration revisions provided by Engineer.

Submittal of any Schedule is subject to review and acceptance by Engineer. Engineer retains the right, including, but not limited to Section 6-1.04, "Progress Schedule," of the General Conditions, to withhold progress payments in whole or part until Contractor submits a schedule acceptable to Engineer.

CONTRACTOR RESPONSIBILITY.--

Nothing in this section shall be construed to be a usurpation of Contractor authority, responsibility and obligation to plan and schedule work as Contractor deems, subject to all other requirements of these special provisions.

1.15 OBSTRUCTIONS

Attention is directed to Sections 5-1.02, "Protection and Use of Property," 5-1.031, "Indemnification," 5-1.032, "Insurance," and 5-1.06, "Responsibility for Utilities," of the General Conditions and these special provisions.

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installations at least 5 working days prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include but are not limited to the following:

Underground Service Alert
Northern California (USA)
Telephone: 1(800)642-2444

Underground Service Alert
Southern California (USA)
Telephone: 1(800)422-4133

South Shore Utility
Coordinating Council (DIGS)
Telephone: 1(800)541-3447

Western Utilities
Underground Alert, Inc.
Telephone: 1(800)424-3447

1.16 PRESERVATION OF PROPERTY

Attention is directed to Sections 5-1.02, "Protection and Use of Property," 5-1.031, "Indemnification," 5-1.032, "Insurance," 5-1.05, "Contractor's Responsibility for the Work," and 5-1.06, "Responsibility for Utilities," of the General Conditions.

The Contractor shall protect the building interiors, facilities, and equipment from dust, dirt, debris, or other nuisance arising out of the Contractor's operations or storage practices. The building interiors and facilities shall be restored to a condition as good as when the Contractor entered upon the work.

Operations shall be conducted in such a manner that existing facilities, surfacing, installations, and utilities which are to remain in place will not be damaged. Temporary surfacing, facilities, utilities and installations shall also be protected until they are no longer required. The Contractor, at his expense shall furnish and install piling, sheet piling, cribbing, bulkheads, shores, or whatever means may be necessary to adequately support material carrying such facilities, or to support the facilities themselves and shall maintain such support until they are no longer needed.

1.17 WATER POLLUTION CONTROL

PART 1. GENERAL

SUMMARY.--

Scope.--This work shall consist of providing water pollution control measures in conformance with the details shown on the plans, the provisions in Section 5-1.01R, "Water Pollution," of the General Conditions, section of these special provisions entitled "Relations With California Regional Water Quality Control Board," and these special provisions.

A Storm Water Information Handout has been prepared for this contract and is available as described in "Project Information" of these special provisions.

The Contractor shall perform water pollution control work in conformance with the requirements in the "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual" and addenda in effect on the day the Notice to Contractors is dated. This manual is referred to as the "Preparation Manual." Copies of the Preparation Manual may be obtained from:

State of California
Department of Transportation
Publication Distribution Unit
1900 Royal Oaks Drive
Sacramento, California 95815
Telephone: (916) 445-3520

The Preparation Manual and other references for performing water pollution control work are available from the Department's Construction Storm Water and Water Pollution Control web site at:

<http://www.dot.ca.gov/hq/construc/stormwater/stormwater1.htm>

The Contractor shall designate in writing a Water Pollution Control Manager (WPCM). The Contractor shall ensure that the WPCM is qualified to prepare and implement the WPCP.

The WPCM shall be:

1. Responsible for water pollution control work.
2. The primary contact for water pollution control work.
3. Have authority to mobilize crews to make immediate repairs to water pollution control practices.

The Contractor may designate one manager to prepare the WPCP and a different manager to implement the plan.

WATER POLLUTION CONTROL PROGRAM

The Contractor shall submit a Water Pollution Control Program (WPCP) to the Engineer for approval. The WPCP shall conform to the requirements in the Preparation Manual and these special provisions.

The WPCP shall include water pollution control practices:

- A. For storm water and non-storm water from areas outside of the job site related to construction activities for this contract such as:
 - 1. Staging areas.
 - 2. Storage yards.
 - 3. Access roads.
- B. Appropriate for each season as described in "Implementation Requirements" of these special provisions.

The WPCP shall include a schedule that:

- A. Describes when work activities that could cause water pollution will be performed.
- B. Identifies soil stabilization and sediment control practices for disturbed soil area.
- C. Includes dates when these practices will be 25, 50, and 100 percent complete.
- D. Shows 100 percent completion of these practices before the rainy season.

Within 7 days after contract approval, the Contractor shall submit 2 copies of the WPCP to the Engineer. The Contractor shall allow 15 days for the Engineer's review. If revisions are required, the Engineer will provide comments and specify the date that the review stopped. The Contractor shall revise and resubmit the WPCP within 7 days of receipt of the Engineer's comments. The Engineer's review will resume when the complete WPCP is resubmitted. When the Engineer approves the WPCP, the Contractor shall submit 3 copies of the approved WPCP to the Engineer. The Contractor may proceed with construction activities if the Engineer conditionally approves the WPCP while minor revisions are being completed. If the Engineer fails to complete the review within the time allowed and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay, the Contractor will be compensated for resulting losses, and an extension of time will be granted, as provided for in Section 6-1.08, "Liquidated Damages," of the General Conditions.

The Contractor shall not perform work that may cause water pollution until the WPCP has been approved by the Engineer. The Engineer's review and approval shall not waive any contract requirements and shall not relieve the Contractor from complying with Federal, State and local laws, regulations, and requirements.

If there is a change in construction schedule or activities, the Contractor shall prepare an amendment to the WPCP to identify additional or revised water pollution control practices. The Contractor shall submit the amendment to the Engineer for review within a time agreed to by the Engineer not to exceed the number of days specified for the initial submittal of the WPCP. The Engineer will review the amendment within the same time allotted for the review of the initial submittal of the WPCP.

If directed by the Engineer or requested in writing by the Contractor and approved by the Engineer, changes to the water pollution control work specified in these special provisions will be allowed. Changes may include addition of new water pollution control practices. The Contractor shall incorporate these changes in the WPCP. Additional water pollution control work will be paid for in accordance with Section 3, "Changes in the Work," of the General Conditions.

The Contractor shall keep a copy of the approved WPCP at the job site. The WPCP shall be made available when requested by a representative of the Regional Water Quality Control Board, State Water Resources Control Board, United States Environmental Protection Agency, or the local storm water management agency. Requests from the public shall be directed to the Engineer.

IMPLEMENTATION REQUIREMENTS

The Contractor shall construct, inspect, maintain, remove, and dispose of the water pollution control practices.

The Contractor's responsibility for WPCP implementation shall continue throughout any temporary suspension of work ordered in conformance with the provisions in Section 6-1.06, "Temporary Suspension of Work," of the General Conditions.

If the Contractor or the Engineer identifies a deficiency in the implementation of the approved WPCP, the deficiency shall be corrected immediately, unless an agreed date for correction is approved in writing by the Engineer. The deficiency shall be corrected before the onset of precipitation. If the Contractor fails to correct the deficiency by the agreed date or before the onset of precipitation, the Department may correct the deficiency and deduct the cost of correcting deficiencies from payments.

Year-Round

The Contractor shall monitor the National Weather Service weather forecast on a daily basis during the contract. The Contractor may use an alternative weather forecasting service if approved by the Engineer. Appropriate water pollution control practices shall be in place before precipitation.

The Contractor may discontinue earthwork operations for a disturbed area for up to 21 days and the disturbed soil area will still be considered active. When earthwork operations in the disturbed area have been completed, the Contractor shall implement appropriate water pollution control practices within 15 days, or before predicted precipitation, whichever occurs first.

Rainy Season

Soil stabilization and sediment control practices conforming to these special provisions shall be in place during the rainy season between October 15 and April 15.

INSPECTION AND MAINTENANCE

The WPCM shall inspect the water pollution control practices identified in the WPCP as follows:

- A. Before a forecasted storm,
- B. After precipitation that causes site runoff,
- C. At 24-hour intervals during extended precipitation,
- D. On a predetermined schedule, a minimum of once every two weeks outside of the defined rainy season, and
- E. On a predetermined schedule, a minimum of once a week during the defined rainy season.

The WPCM shall oversee the maintenance of the water pollution control practices.

The WPCM shall use the Storm Water Quality Construction Site Inspection Checklist provided in the Preparation Manual or an alternative inspection checklist provided by the Engineer. A copy of the completed site inspection checklist shall be submitted to the Engineer within 24 hours of finishing the inspection.

REPORTING REQUIREMENTS

If the Contractor identifies discharges into surface waters or drainage systems causing or potentially causing pollution, or if the project receives a written notice or order from a regulatory agency, the Contractor shall immediately inform the Engineer. The Contractor shall submit a written report to the Engineer within 7 days of the discharge, notice or order. The report shall include the following information:

- A. The date, time, location, nature of the operation, type of discharge; and the cause of the notice or order.
- B. The water pollution control practices used before the discharge, or before receiving the notice or order.
- C. The date of placement and type of additional or altered water pollution control practices placed after the discharge, or after receiving the notice or order.
- D. A maintenance schedule for affected water pollution control practices.

PART 2.- PRODUCTS (Not applicable)

PART 3.- EXECUTION (Not applicable)

PART 4.- PAYMENT

General.--Except as provided herein, full compensation for water pollution control shall be considered as included in the contract lump sum price paid for building work and no additional compensation will be allowed therefor.

Attention is directed to Section 7-1.05, "Partial Payment," and Section 7-1.07, "Final Payment and Claims," of the General Conditions. Payments for Prepare Water Pollution Control Program will be made as follows:

- A. After the WPCP has been approved by the Engineer, 75 percent of the cost shown in the Water Pollution Control Cost Break-Down for Prepare Water Pollution Control Program will be included in the monthly partial payment estimate.

- B. After acceptance of the contract in conformance with the provisions in Section 7-1.07, "Final Payment and Claims," of the General Conditions, payment for the remaining 25 percent of the cost shown in the Water Pollution Control Cost Break-Down for Prepare Water Pollution Control Program will be made.

1.18 RELATIONS WITH CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

This project lies within the boundaries of the Central Valley Regional Water Quality Control Board (RWQCB).

The Contractor shall know and comply with provisions of Federal, State, and local regulations and requirements that govern the Contractor's operations and storm water and non-storm water discharges from the project site and areas of disturbance outside the project limits during construction. Attention is directed to Sections 5-1.01, "Laws to be Observed," 5-1.02, "Protection and Use of Property," and 5-1.031, "Indemnification," and 5-1.032, "Insurance," of the General Conditions.

The Contractor shall be responsible for penalties assessed on the Contractor or the Department as a result of the Contractor's failure to comply with the provisions in "Water Pollution Control" of these special provisions or with the applicable provisions of the Federal, State, and local regulations and requirements.

Penalties as used in this section shall include fines, penalties, and damages, whether proposed, assessed, or levied against the Department or the Contractor, including those levied under the Federal Clean Water Act and the State Porter-Cologne Water Quality Control Act, by governmental agencies or as a result of citizen suits. Penalties shall also include payments made or costs incurred in settlement for alleged violations of applicable laws, regulations, or requirements. Costs incurred could include sums spent instead of penalties, in mitigation or to remediate or correct violations.

WITHHOLDS

The Department will withhold money due the Contractor, in an amount determined by the Department, up to and including the entire amount of penalties proposed, assessed, or levied as a result of the Contractor's violation of the permits, or Federal or State law, regulations, or requirements. Funds will be withheld by the Department until final disposition of penalties has been made. The Contractor shall remain liable for the full amount of penalties until they are finally resolved with the entity seeking the penalties.

If a regulatory agency identifies a failure to comply with the permits and modifications thereto, or other Federal, State, or local requirements, the Department will withhold money due the Contractor, subject to the following:

- A. The Department will give the Contractor 30 days notice of the Department's intention to withhold funds from payments which may become due to the Contractor before acceptance of the contract. Funds withheld after acceptance of the contract will be made without prior notice to the Contractor.
- B. No withholds of additional amounts out of payments will be made if the amount to be withheld does not exceed the amount being withheld from partial payments in accordance with Section 7-1.05, "Partial Payments," of the General Conditions.
- C. If the Department has withheld funds, and it is subsequently determined that the State is not subject to the entire amount of the costs and liabilities assessed or proposed in connection with the matter for which the withhold was made, the Department will be liable for interest on the amount withheld for the period of the withhold. The interest rate payable shall be 6 percent per annum.

The Contractor shall notify the Engineer immediately upon request from the regulatory agencies to enter, inspect, sample, monitor, or otherwise access the project site or the Contractor's records pertaining to water pollution control work. The Contractor and the Department shall provide copies of correspondence, notices of violation, enforcement actions, or proposed fines by regulatory agencies to the requesting regulatory agency.

1.19 PROJECT INFORMATION

The information in this section has been compiled specifically for this project and is made available for bidders and Contractors. Other information referenced in the Instructions to Bidders and General Conditions for Building Construction and these special provisions do not appear in this section. The information is subject to the conditions and limitations set forth in Section 1-1.03, "Examination of Plans, Special Provisions and Site of the Work," of the Instructions to Bidders. Bidders and Contractors shall be responsible for knowing the procedures for obtaining information.

Information included in the Information Handout provided to bidders and Contractors is as follows:

- A. Limited Site Investigation Report Asbestos and Peeling/Flaking Lead-Containing Paint Survey dated March 19, 2004.
- B. Limited Asbestos and Lead-Containing Paint Survey Report dated November 15, 2005.
- C. Limited Asbestos Survey Report dated May 31, 2006.
- D. Asbestos Visual Inspection and Asbestos Bulk Sample Collection Report.
- E. Lead Analysis Settled Out Dust on Horizontal Surfaces and Paint on Structural Steel.

Plans of the existing buildings may be requested by fax from the Office of Structure Maintenance and Investigations, 1801 30th Street, Sacramento, CA, Fax (916) 227-8357.

Plans of the existing buildings available to bidders and Contractors are reproductions of the original contract plans, with significant changes noted, and working drawings, and do not necessarily show normal construction tolerances and variances. Where dimensions of new construction required by this contract are dependent on the dimensions of the existing buildings, the Contractor shall verify the controlling field dimensions and shall be responsible for adjusting dimensions of the work to fit existing conditions.

1.20 PROJECT RECORD DRAWINGS

The Contractor shall prepare and maintain one set of project record drawings, using an unaltered set of original project plans, to clearly show all as-constructed information for the project. As a minimum, the information to be shown shall include 1) any plan clarifications or change orders, 2) locations of any underground utilities, or 3) the location, size, type, and manufacturer of all major products or components selected by the Contractor for use in the work.

All markings shall be placed on the project record drawings using red ink or red pencil. Original figures shall not be eradicated nor written over and superseded material shall be neatly lined out. Additional drawings shall be submitted if the required information cannot be clearly shown on the original set of project plans. The additional drawings shall be not less than 279 mm x 432 mm in size and shall have the contract number on each sheet. The Contractor shall sign and date each sheet of the project record drawings to verify that all as-constructed information shown on the drawings is correct.

The Contractor shall periodically review the set of project record drawings with the Engineer during the progress of the work to assure that all changes and other required information are being recorded.

Before completion of the work, the Contractor shall request a review of the project record drawings to determine the completeness and adequacy of them. If the project record drawings are unacceptable, the Contractor shall inspect, measure, and survey the project as necessary to record the required additional information.

The set of completed project record drawings shall be delivered to the Engineer prior to acceptance of the contract.

1.21 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS

Only materials and products conforming to the requirements of the specifications shall be incorporated in the work. When metric materials and products are not available, and when approved by the Engineer, and at no cost to the State, materials and products in the inch-pound (imperial) system which are of equal quality and of the required properties and characteristics for the purpose intended, may be substituted for the equivalent metric materials and products, subject to the following requirements:

Materials and products shown on the plans or in the special provisions as being equivalent may be substituted for the metric materials and products specified or detailed on the plans.

Before other non-metric materials and products will be considered for use the Contractor shall furnish, at the Contractor's expense, evidence satisfactory to the Engineer that the materials and products proposed for use are equal to or better than the materials and products specified or detailed on the plans. The burden of proof as to the quality and suitability of substitutions shall be upon the Contractor and the Contractor shall furnish all information necessary as required to the Engineer. The Engineer will be the sole judge as to the quality and suitability of the substituted materials and products and the Engineer's decision shall be final.

When the Contractor elects to substitute non-metric materials and products, including materials and products shown on the plans or in the special provisions as being equivalent, a list of substitutions to be made shall be submitted for approval.

The following substitutions of materials and products will be allowed:

SUBSTITUTION TABLE FOR SIZES OF HIGH STRENGTH STEEL FASTENERS, ASTM Designation: A 325M	
METRIC SIZE SHOWN ON THE PLANS mm x thread pitch	IMPERIAL SIZE TO BE SUBSTITUTED inch
M16 x 2	5/8
M20 x 2.5	3/4
M22 x 2.5	7/8
M24 x 3	1
M27 x 3	1-1/8
M30 x 3.5	1-1/4
M36 x 4	1-1/2

SUBSTITUTION TABLE FOR REINFORCEMENT	
METRIC BAR DESIGNATION NUMBER AS SHOWN ON THE PLANS	IMPERIAL BAR DESIGNATION NUMBER TO BE SUBSTITUTED
10	3
13	4
16	5
19	6
22	7
25	8
29	9
32	10
36	11
43	14
57	18

SUBSTITUTION TABLE FOR WELDED PLAIN WIRE REINFORCEMENT, ASTM DESIGNATION: A 185	
	US CUSTOMARY UNITS SIZE TO BE SUBSTITUTED inch ² x 100
MW9	W1.4
MW10	W1.6
MW13	W2.0
MW15	W2.3
MW19	W2.9
MW20	W3.1
MW22	W3.5
MW25	W3.9, except W3.5 in piles only
MW26	W4.0
MW30	W4.7
MW32	W5.0
MW35	W5.4
MW40	W6.2
MW45	W6.5
MW50	W7.8
MW55	W8.5, except W8.0 in piles only
MW60	W9.3
MW70	W10.9, except W11.0 in piles only
MW80	W12.4
MW90	W14.0
MW100	W15.5

The sizes in the following tables of materials and products are exact conversions of metric sizes of materials and products and are listed as acceptable equivalents:

CONVERSION TABLE FOR SIZES OF: (1) STEEL FASTENERS FOR GENERAL APPLICATIONS, ASTM Designation: A 307 or AASHTO Designation: M 314, Grade 36 or 55, and (2) HIGH STRENGTH STEEL FASTENERS, ASTM Designation: A 325 or A 449 DIAMETER	
METRIC SIZE SHOWN ON THE PLANS mm	EQUIVALENT IMPERIAL SIZE inch
6, or 6.35	1/4
8 or 7.94	5/16
10, or 9.52	3/8
11, or 11.11	7/16
13 or 12.70	1/2
14, or 14.29	9/16
16, or 15.88	5/8
19, or 19.05	3/4
22, or 22.22	7/8
24, 25, or 25.40	1
29, or 28.58	1-1/8
32, or 31.75	1-1/4
35, or 34.93	1-3/8
38 or 38.10	1-1/2
44, or 44.45	1-3/4
51, or 50.80	2
57, or 57.15	2-1/4
64, or 63.50	2-1/2
70 or 69.85	2-3/4
76, or 76.20	3
83, or 82.55	3-1/4
89 or 88.90	3-1/2
95, or 95.25	3-3/4
102, or 101.60	4

CONVERSION TABLE FOR NOMINAL THICKNESS OF SHEET METAL			
UNCOATED HOT AND COLD ROLLED SHEETS		HOT-DIPPED ZINC COATED (GALVANIZED) SHEETS	
METRIC THICKNESS SHOWN ON THE PLANS mm	EQUIVALENT US STANDARD GAGE inch	METRIC THICKNESS SHOWN ON THE PLANS mm	EQUIVALENT GALVANIZED SHEET GAGE inch
7.94	0.3125		
6.07	0.2391		
5.69	0.2242		
5.31	0.2092		
4.94	0.1943		
4.55	0.1793		
4.18	0.1644	4.270	0.1681
3.80	0.1495	3.891	0.1532
3.42	0.1345	3.510	0.1382
3.04	0.1196	3.132	0.1233
2.66	0.1046	2.753	0.1084
2.28	0.0897	2.372	0.0934
1.90	0.0747	1.994	0.0785
1.71	0.0673	1.803	0.0710
1.52	0.0598	1.613	0.0635
1.37	0.0538	1.461	0.0575
1.21	0.0478	1.311	0.0516
1.06	0.0418	1.158	0.0456
0.91	0.0359	1.006 or 1.016	0.0396
0.84	0.0329	0.930	0.0366
0.76	0.0299	0.853	0.0336
0.68	0.0269	0.777	0.0306
0.61	0.0239	0.701	0.0276
0.53	0.0209	0.627	0.0247
0.45	0.0179	0.551	0.0217
0.42	0.0164	0.513	0.0202
0.38	0.0149	0.475	0.0187

CONVERSION TABLE FOR WIRE		
METRIC THICKNESS SHOWN ON THE PLANS	EQUIVALENT USA STEEL WIRE THICKNESS	GAGE NO.
mm	inch	
6.20	0.244	3
5.72	0.225	4
5.26	0.207	5
4.88	0.192	6
4.50	0.177	7
4.11	0.162	8
3.76	0.148	9
3.43	0.135	10
3.05	0.120	11
2.69	0.106	12
2.34	0.092	13
2.03	0.080	14
1.83	0.072	15
1.57	0.062	16
1.37	0.054	17
1.22	0.048	18
1.04	0.041	19
0.89	0.035	20

CONVERSION TABLE FOR COMMON NAILS				
NAIL SIZE	METRIC mm		ENGLISH inch	
	Length	Diameter	Length	Diameter
8d	63.5	3.33	2 1/2	0.131
10d	76.2	3.76	3	0.148
16d	88.9	4.11	3 1/2	0.162

CONVERSION TABLE FOR LUMBER	
METRIC NOMINAL SURFACE DRY SIZE	EQUIVALENT NOMINAL SURFACE DRY U S SIZE
mm	inch
51	2
102	4
152	6
203	8
254	10
305	12

CONVERSION TABLE FOR PLYWOOD	
METRIC mm	ENGLISH inch
6.4	1/4
7.9	5/16
9.5	3/8
11.1	7/16
11.9	15/32
12.7	1/2
15.1	19/32
15.9	5/8
18.3	23/32
19.1	3/4
22.2	7/8
25.4	1
28.6	1 1/8

CONVERSION TABLE FOR INSULATION R-VALUE	
METRIC (K m ² /W)	ENGLISH (HR FT ² F/BTU)
0.5	3
0.7	4
1.4	8
1.9	11
2.3	13
2.5	14
3.3	19
5.3	30

CONVERSION TABLE FOR VAPOR TRANSMISSION RATING	
METRIC (Perm-m)	ENGLISH (perm-inch)
0.29	0.02

CONVERSION TABLE FOR LOW PRESSURE	
METRIC (Pa)	ENGLISH (Inches of Water Column)
30	0.125
60	0.25
90	0.375
120	0.50
150	0.60
155	0.625
175	0.70
185	0.75
200	0.80
250	1.00
310	1.25

CONVERSION TABLE FOR PRESSURE	
METRIC (kPa)	ENGLISH (psi)
10	1.5
210	30
280	40
350	50
690	100
860	125
1040	150
1100	160
1210	175
1380	200
1730	250
2070	300
2170	315
2410	350
2590	375
2760	400
4830	700
5170	750
5520	800
13800	2000
17200	2500
20700	3000
27600	4000
34500	5000
137900	20000

CONVERSION TABLE FOR MIL THICKNESS	
METRIC (mm)	ENGLISH (inch/1000)
0.10	4
0.13	5
0.15	6
0.50	20
0.75	30
1.00	40

CONVERSION TABLE FOR HVAC DUCTING.	
METRIC (mm)	ENGLISH (inch)
100	4
125	5
150	6
175	7
200	8
225	9
250	10
300	12
360	14
410	16
460	18
510	20
560	22
610	24
660	26
710	28
760	30

CONVERSION TABLE FOR MECHANICAL PIPING		
METRIC (GSP, PVC, BSP, DUCTILE IRON)	METRIC (mm)	ENGLISH (inch)
NPS 1/2	15	1/2
NPS 3/4	20	3/4
NPS 1	25	1
NPS 1 1/4	32	1 1/4
NPS 1 1/2	40	1 1/2
NPS 2	50	2
NPS 2 1/2	65	2 1/2
NPS 3	75	3
NPS 4	100	4
NPS 6	150	6

CONVERSION TABLE FOR LUBRICATION PIPING TUBING WALL THICKNESS	
METRIC (mm)	ENGLISH (inch)
2.1	0.083
0.9	0.035

CONVERSION TABLE FOR HOSE/TUBING SIZES O. D.	
METRIC (mm)	ENGLISH (inch)
6	1/4
10	3/8
13	1/2
16	5/8
19	3/4
22	7/8
25	1

CONVERSION TABLE FOR DRUM SIZES			
METRIC		ENGLISH	
L	kg	gallons	pounds
205	180	55	400
60	55	16	120
19	16	5	35

CONVERSION TABLE FOR POWER	
METRIC (kW)	ENGLISH (HP)
0.037	1/20
0.075	1/10
0.18	1/4
0.25	1/3
0.37	1/2
0.55	3/4
0.75	1
1.1	1 1/2
1.5	2
2.2	3
3.7	5
5.5	7 1/2
7.5	10
11	15
15	20
18.5	25
22	30
30	40
37	50
45	60
55	75
75	100
90	120
110	150

CONVERSION TABLE FOR IMPELLER BALANCE		
SYNCHRONOUS RPM	METRIC (g mm/kg)	ENGLISH (ounce- inch/pound)
720	94	0.059
900	73	0.046
1200	54	0.034
1800	41	0.026
3600	17	0.011

CONVERSION TABLE FOR ELECTRICAL CONDUIT	
METRIC SIZE SHOWN ON THE PLANS mm	EQUIVALENT IMPERIAL SIZE inch
16	1/2
21	3/4
27	1
35	1 1/4
41	1 1/2
53	2
103	4

DIVISION 2. SITEWORK

2.01 BUILDING DEMOLITION

PART 1.-GENERAL

Scope.--This work shall consist of demolition and removal of existing facilities, including salvaging of materials and equipment, in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Work Plan.--The Contractor shall submit a complete building removal plan to the Engineer for the building demolition and removal. The plan shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and transmittal of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The plan shall include a detailed description of the methods and equipment to be used for each operation and the sequence of operations.

PROTECTION.--

Necessary precautions shall be taken to avoid damage to existing items to remain in place, to be reused, or to remain the property of the State. Damaged items shall be repaired or replaced at the Contractor's expense. The Contractor shall coordinate demolition with all other work.

Burning.--The use of burning at the project site shall not be allowed.

Explosives.--The use of explosives shall not be used.

PART 2.- PRODUCTS (Not applicable)

PART 3.- EXECUTION

PREPARATION.--

The Contractor shall notify the Engineer 10 days prior to the start of demolition work. The limits of removal shall be located and identified. Items to be removed and the interface of items to be removed and items to remain intact shall be identified and marked.

Prior to removing concrete or masonry, a saw cut approximately one inch deep shall be made along the limits of removal on all faces that will be visible in the completed work.

REMOVAL.--

Removal shall be to the limits shown on the plans. Removal shall be done carefully to minimize damage to the portions to remain.

Assemblies to be salvaged which require dismantling for removal shall be matchmarked before dismantling.

Replace any removed or destroyed labels or signage in kind.

Surfaces, such as ceiling, wall, and flooring that are exposed to view at the limits of removal work and where new work is applied to the existing surfaces shall be patched, bumps shall be removed and depressions filled, and the surface shall be finished to match the existing surrounding surfaces. Depressions in concrete less than one inch deep shall be deepened to one-inch minimum depth before filling with cement mortar.

Anchor bolts and reinforcement shall be removed at least one inch below the surrounding surfaces, and the resulting hole shall be patched with cement mortar.

Structures.--Existing structures indicated shall be removed to grade including underground foundations as shown on the plans. Interior walls, other than retaining walls and partitions, shall be removed as shown on the plans.

Utilities and Related Equipment.--The existing utilities shall be removed as shown on the plans and terminated in a manner conforming to the nationally recognized code covering the specific utility and approved by the Engineer.

Air Conditioning Equipment.--Air conditioning equipment shall be removed without releasing chlorofluorocarbon refrigerants to the atmosphere in accordance with the Clean Air Act Amendment of 1990.

Disposal of Ozone Depleting Substance (ODS).--Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. The contractor shall prevent discharge of Class I and Class II ODS to the atmosphere. Recovered ODS shall be placed in cylinders meeting ARI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and appropriate labeling shall be provided. Recovered ODS shall be removed from State property and disposed of in accordance with State requirements. Equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) shall be disposed of in accordance with 40 CFR 82.

Piping and Conduits.--Piping and conduits to be abandoned shall be capped or plugged.

DISPOSAL.--

Materials that are to be removed shall become the property of the Contractor and shall be disposed of away from the premises. Such disposal shall conform to the laws, rules, and regulations of all agencies having jurisdiction at the disposal site.

SALVAGE.--

Materials or equipment shown on the plans to be salvaged shall remain the property of the State and shall be removed, cleaned and stockpiled at a location at the project site designated by the Engineer.

2.02 RELOCATING MATERIALS AND EQUIPMENT

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of relocating existing materials and equipment in accordance with the details shown on the plans and these special provisions.

PART 2.- PRODUCTS (Not applicable)

PART 3.- EXECUTION

RELOCATION.--

General.--Materials or equipment to be relocated shall be removed carefully to avoid damage to the materials or equipment or to the materials or equipment which are to remain. Assemblies to be relocated which require dismantling for removal shall be matchmarked before dismantling.

The Contractor shall notify the Engineer prior to the relocation work in order that the materials or equipment may be inspected for existing damage.

Materials or equipment to be relocated shall have all adhering concrete, mastics, earth or other deleterious materials removed and shall have all exterior surfaces cleaned.

Materials or equipment which are damaged by the Contractor's operations shall be replaced or restored to match the condition of the materials or equipment prior to the beginning of the Contractor's operations. Replacement or restoration of damaged materials or equipment shall be at the Contractor's expense.

Connections, anchorages and fasteners for relocated materials and equipment shall match existing and shall be furnished and installed by the Contractor. Assemblies which have been dismantled shall be reassembled to match the existing installation. Relocated materials and equipment shall be installed as required for new work.

Modifications to wiring and plumbing to accommodate relocated items shall be as shown on the plans. Ends of piping and conduits to be abandoned shall be capped.

Surfaces that are exposed to view upon removal or relocation of materials or equipment shall be patched. Bumps shall be removed and depressions filled, and the surface finished to match the existing surfaces. Depressions in concrete less than 25 mm deep shall be deepened to 25 mm minimum depth before filling with cement mortar.

DISPOSAL.--

General.--Material from existing facilities to be reused in the work, in the opinion of the Engineer, is unsuitable for use shall become the property of the Contractor and disposed of away from the premises. Such disposal shall conform to the laws, rules, and regulations of all agencies having jurisdiction at the disposal site. The unsuitable material shall be replaced as ordered by the Engineer and will be paid for as provided in Section 3, "Changes in the Work," of the General Conditions.

2.03 REMOVING PORTIONS OF EXISTING ROOF COVERING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of removing portions of the existing roof covering in accordance with the details shown on the plans and these special provisions.

PART 2.- PRODUCTS (Not applicable)

PART 3.- EXECUTION

REMOVAL.--

General.--Existing roof covering shall be removed to the top of existing T & G sheathing. Removal of portions of existing roof covering shall be done carefully to minimize damage to portions of the roof covering which are to remain.

Surface irregularities resulting from the removal of the existing roof covering shall be filled or trimmed to provide a flat substrate surface for receiving the new roof covering.

T & G sheathing exposed by removal of existing roof covering shall be covered by new roofing or cutoffs the same day as removal.

Removal of portions of T & G sheathing shall be to neat lines.

Damage to the T & G sheathing caused by the Contractor's operations shall be repaired or replaced at the Contractor's expense.

Disposal.--Removed materials shall be disposed of away from the premises. Such disposal shall conform to the laws, rules, and regulations of all agencies having jurisdiction at the disposal site.

2.04 BUILDING DEMOLITION

PART 1.-GENERAL

Scope.--This work shall consist of demolition and removal of existing facilities, including salvaging of materials and equipment, in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Work Plan.--The Contractor shall submit a complete building removal plan to the Engineer for the building demolition and removal. The plan shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and transmittal of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The plan shall include a detailed description of the methods and equipment to be used for each operation and the sequence of operations.

PROTECTION.--

Necessary precautions shall be taken to avoid damage to existing items to remain in place, to be reused, or to remain the property of the State. Damaged items shall be repaired or replaced at the Contractor's expense. The Contractor shall coordinate demolition with all other work.

Burning.--The use of burning at the project site shall not be allowed.

Explosives.--The use of explosives shall not be used.

PART 2.- PRODUCTS (Not applicable)

PART 3.- EXECUTION

PREPARATION.--

The Contractor shall notify the Engineer 10 days prior to the start of demolition work. The limits of removal shall be located and identified. Items to be removed and the interface of items to be removed and items to remain intact shall be identified and marked.

Prior to removing concrete or masonry, a saw cut approximately one inch deep shall be made along the limits of removal on all faces that will be visible in the completed work.

REMOVAL.--

The Contractor shall comply with all federal, state and local agencies regulating the handling, transporting and disposal of materials containing asbestos. Safety requirements shall conform with ANSI A10.6-2006 Safety Requirements for Demolition Operations.

The Contractor shall furnish notification of demolition to Federal, State, and local authorities in accordance with 40 CFR 61 NESHAP Regulation Subpart M and Sacramento Metropolitan Air Quality Management District (SMAQMD) Rule 902 where applicable. Notify the State Environmental Protection Agency and the Engineer in writing 10 days prior to commencement of work.

Removal shall be to the limits shown on the plans. Removal shall be done carefully to minimize damage to the portions to remain.

Assemblies to be salvaged which require dismantling for removal shall be matchmarked before dismantling.

Replace any removed or destroyed labels or signage in kind.

Surfaces, such as ceiling, wall, and flooring that are exposed to view at the limits of removal work and where new work is applied to the existing surfaces shall be patched, bumps shall be removed and depressions filled, and the surface shall be finished to match the existing surrounding surfaces. Depressions in concrete less than one inch deep shall be deepened to one-inch minimum depth before filling with cement mortar.

Anchor bolts and reinforcement shall be removed at least one inch below the surrounding surfaces, and the resulting hole shall be patched with cement mortar.

Structures.--Existing structures indicated shall be removed to grade including underground foundations as shown on the plans. Interior walls, other than retaining walls and partitions, shall be removed as shown on the plans.

Utilities and Related Equipment.--The existing utilities shall be removed as shown on the plans and terminated in a manner conforming to the nationally recognized code covering the specific utility and approved by the Engineer.

Air Conditioning Equipment.--Air conditioning equipment shall be removed without releasing chlorofluorocarbon refrigerants to the atmosphere in accordance with the Clean Air Act Amendment of 1990.

Disposal of Ozone Depleting Substance (ODS).--Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. The contractor shall prevent discharge of Class I and Class II ODS to the atmosphere. Recovered ODS shall be placed in cylinders meeting ARI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and appropriate labeling shall be provided. Recovered ODS shall be removed from State property and disposed of in accordance with State requirements. Equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) shall be disposed of in accordance with 40 CFR 82.

Piping and Conduits.--Piping and conduits to be abandoned shall be capped or plugged.

DISPOSAL.--

Materials that are to be removed shall become the property of the Contractor and shall be disposed of away from the premises. Such disposal shall conform to the laws, rules, and regulations of all agencies having jurisdiction at the disposal site.

SALVAGE.--

Materials or equipment shown on the plans to be salvaged shall remain the property of the State and shall be removed, cleaned and stockpiled at a location at the project site designated by the Engineer.

2.05 ASBESTOS ABATEMENT

GENERAL

This work includes removal, clean up and disposal of the below listed asbestos containing material (ACM) and asbestos containing construction material (ACCM) to the extent necessary for the building and structure demolition work of this project. The Contractor shall review all demolition plans, survey reports and field verify location and extent of materials containing asbestos related work. Hazardous material survey reports are available as Information Handouts.

Existing site conditions

Location of asbestos containing materials and presumed asbestos containing materials from survey reports include:

ASBESTOS CONTAINING MATERIALS				
Location	Description	Asbestos Concentration	Approximate Amount	Category
Main Building				
	Joint compound associated with gypsum wallboard (sheetrock)	ACM	65,000 sq ft	RACM
	Gypsum wall board (sheetrock)	ACM	65,000 sq ft	RACM
	Thermal system pipe insulation	ACM	throughout	RACM
	All 9 x 9 floor tile	ACM	throughout	Category I non friable
	All 12 x 12 inch floor tiles	ACM	throughout	Category I Non friable
	All floor tile mastic	ACM	throughout	Category II Non friable
Administration Wing				
	Asphalt roofing mastic	5%	Total 3000 sq ft including Laboratory wings	Category I Non friable
Exterior	Cementitious corrugated panels	15%	200 sq ft	Category II Non friable
	Cementitious flat panels	12%	200 sq ft	Category II Non friable
Laboratory Wings				
	Asphalt roofing mastic	5%	Total 3000 sq ft including Administration wing	Category I Non friable
	Oven gaskets	PACM	220 lf	RACM
Attic and Roof	Cementitious vent flues	15%	500 sq ft	Category II Non friable
Room 218	Fume hood duct insulation	TSI-ACM	30 sq ft	RACM
Room 254 & 280 (Between walls)	Pipe insulation (debris from abatement)	ACM	1 cu ft	RACM
Rooms 286 & 284A-C	Cementitious ceiling tile – splined (24 x 24 inch)	35%	3000 Sq ft	Category II Non friable
Basement				
	Safe door insulation	85%	20 sq ft	RACM
Boiler Room	2 inch pipe fitting insulation	TSI-ACM	10 lf	RACM
	3 inch pipe insulation	TSI-ACM	15 lf	RACM
	6 inch pipe insulation	TSI-ACM	100 lf	RACM
	6 inch pipe insulation	TSI-ACM	25 lf	RACM
	Boiler exhaust duct	TSI-ACM	40 lf	RACM
	Stairwell - East Entry 6 inch pipe insulation	TSI-ACM	30 lf	RACM
	East Entry boiler flue	PACM	50 lf	RACM
Chiller Room	1 inch pipe fitting insulation	TSI-ACM	5 lf	RACM
	2 inch pipe insulation	TSI-ACM	50 lf	RACM
	2 inch fitting insulation	TSI-ACM	20 lf	RACM
	4 inch pipe insulation	TSI-ACM	75 lf	RACM

	4 inch pipe fitting insulation	TSI-ACM	20 lf	RACM
	8 inch pipe fitting insulation	TSI-ACM	25 lf	RACM
	Chiller jacket – cork	ACM	350 sq ft	RACM
Attic				
Attic space above room #252	TSI Insulation on pipe support bracket	25% Amosite 5% Crocidolite	50 cu ft	RACM
Attic space above Room #252	TSI Pipe insulation	10% Amosite 2% Chrysotile	100 lf	RACM

TSI-Thermal System Insulation

PACM-Presumed Asbestos Containing Material

Asbestos at a concentration of 10% was detected in samples representing 1000 square feet of friable acoustic ceiling spray (RACM) observed in the Administration Wing auditorium. There is no work scheduled in this area for this contract. This information shall be communicated to all Employers, Employees, Contractors and Sub-Contractors in writing prior to any activities that may disturb this material during the course of work.

This work includes all plans, permits and the removal, transportation, storage, and disposal of all material containing asbestos as specified or shown on the plans.

References

Codes, regulations and references applicable to asbestos abatement work include but are not limited to the following:

1. American National Standards Institute (ANSI) publications;

Z9.2-79 Fundamentals Governing the Design and Operation of Local Exhaust Systems.

A10.6. Safety Requirements For Demolition Operations

2. American Society for Testing and Materials (ASTM) publications;

D1331-89 (Re-approved 2001) Surface and Interfacial Tensions of Solutions of Surface Active Agents.

E1494-92 (Re-approved 2002) Specifications for Encapsulants for Friable Asbestos-Containing Building Materials.

E1368.90 Standard Practices For Visual Inspection of Asbestos Abatement Projects.

3. Code of Federal Regulations (CFR);

29 CFR 1926.1101 Safety and Health Regulations for Construction.

40 CFR 61 Subpart A and Subpart M, USEPA, National Emission Standards for Hazardous Air Pollutants (NESHAPS).

4. National Fire Protection Association (NFPA):

No. 70.2005 National Electrical Code.

5. California Code of Regulations (CCR):

Title 8 Chapter 3.2, Subchapter 2, Regulations of the Division of Occupational Safety and Health; Article 2.5, Section 341.6 to 341.14; Registration-Asbestos-Related Work.

Title 8 Chapter 4, Subchapter 7, General Industry Safety Orders, Article 110, Section 5203; Carcinogen Report of Use Requirements.

Title 8 ; Chapter 4, Subchapter 4, Construction Safety Orders, Section 1529: Dust, Fumes, Mists, Vapors and Gases

Title 22 Division 4.5, Environmental Health Standards for the Management of Hazardous Waste; Chapters 11, 12 and 13

6. Local Air Pollution Control District Regulations

Pre construction meeting.--

At least one week before asbestos removal work commences, a pre-construction meeting shall be held at a location designated by the Engineer. Attendees shall include the Engineer, Department's Observation Service, Contractor's Competent Person; the Contractor's Project Superintendent, and others as necessary. The agenda shall include a review of project safety requirements, the Contractor's written asbestos compliance work plan, emergency contacts and notification plan, containment and work area design, facility requirements, submittals, and any other issues pertinent to the safe execution of the asbestos abatement work.

Work shall not commence until the Engineer has approved submittals and plans for asbestos abatement work.

Equipment and medical surveillance.--

Personnel protective equipment, training, and medical surveillance required by the Contractor's Health and Safety Plan shall be provided to State personnel by the Contractor. The number of State personnel will be 4. The Contractor shall comply with all Federal State and local requirements for safety which shall include providing employees with coveralls (preferably disposable plastic coated), rubber gloves (to be discarded after use), rubber boots (to be washed thoroughly after use) and appropriate respirators (to cover nose and mouth). The Contractor shall be responsible for verifying that all employees, who are involved in asbestos removal operations, wear the protective devices enumerated herein during removal operations.

Submittals.--

Product data.--A list of manufacturer's product data, specifications, samples and application instructions and other pertinent information as necessary shall be submitted for approval.

Abatement Procedure Plans.-- The Contractor shall submit the following detailed plan of the work procedures for abatement of asbestos materials:

1. Personal monitoring procedures.
2. Phasing of abatement work indicating daily roster of workers for each phase.
3. Security system warning signs locations.
4. Detailed plans for decontamination facilities, toilets, and systems providing intraroom and Work Area to outside communication showing connections to existing building.
5. Standard procedures for protecting workers, visitors, and employees and protection of spaces outside Work Area from contamination.
6. Engineering systems exposure control indicating number, location, and capacity of supply and exhaust systems, the expected direction of flow, and the range of expected differential pressure in each area.
7. Safety precautions such as lockout, tagout, fall protection, and confined space entry procedures and equipment and work procedures to be used in the encapsulation, removal and demolition of materials containing asbestos.

The plan shall be prepared, signed and stamped by a certified asbestos consultant.

Waste Transportation.--Submit the method of transport of hazardous waste including name, address, EPA I.D. number and telephone number of transporter.

Hazardous Waste Site.--Submit for approval the name, class, address, EPA I.D. number and telephone number of hazardous waste site(s) to be utilized for disposal.

Waste Manifest.--For Waste Manifest purposes the Generator is the facility of the subject work. Obtain necessary information for this purpose from the Engineer. Give a copy of the Waste Manifest to the State's Observation Service for each shipment of material containing asbestos. The Contractor shall submit a non hazardous waste manifest for disposal of material containing asbestos that is not classified as a hazardous waste (WSR).

Qualifications.--The following documents shall be submitted:

Registration: Submit copy of the registration for Asbestos-Related work from the Division of Occupational Safety and Health in accordance with Title 8, Article 2.5 of the California Code of Regulations.

Medical Examination: Submit proof that personnel who will be entering regulated asbestos areas have had medical examinations, and furnish the results of said exam to the Engineer and signed by the medical examiner.

Submit an employee roster to the Engineer for each Work Shift and confirm in writing within 24 hours of commencement of shift.

Certifications.—

Land Disposal Restrictions: Submit a copy of the completed Notice and Certification with each Hazardous Waste Manifest for wastes intended for land disposal pursuant to Section 67740 of 22 CCR, Division 4.5, Chapter 45, to the Engineer and signed by the generator.

For HEPA-filtration systems exhausting externally within 15 meters of the building's air intake or entry, submit the results of on-site DOP or Portacount testing of required efficiency.

Qualifications of Analytical Laboratory: The Contractor shall submit asbestos air samples to an analytical laboratory that is enrolled in the American Industrial Hygiene Association Proficiency Analytical Testing Program for Phase Contrast Microscopy (PCM). The Contractor shall choose another ELAP accredited lab if their current ELAP accredited lab does not maintain accreditation throughout the duration of this project.

QUALITY ASSURANCE.--

Notifications, Communications and Postings.--

The Contractor shall notify the Engineer 15 working days prior to the start of any abatement work.

Prior to performing operations involving the removal of material containing asbestos, the Contractor shall provide written notification to the following agencies:

Division of Occupational Safety and Health
2424 Arden Way, Suite 165
Sacramento, CA 95825
Telephone No. (916) 263-2800

State Department of Toxic Substances Control
400 P Street
Sacramento, CA 95814
Telephone No. (916) 322-0476

Sacramento Metropolitan Air Quality Management
District (SMAQMD)
777 12 Street, 3rd Floor
Sacramento CA 95814
Telephone No. (916) 874-4800

The Division of Occupational Safety and Health (CAL OSHA) shall be notified 24 hours prior to performing removal operations of materials containing asbestos.

Notification shall be in accordance with the Section 341.9 of Title 8 of California Code of Regulations.

Asbestos NESHAPS Coordinator
Air Management Division, USEPA
215 Fremont
San Francisco, CA 94105

Contact the agency for the requirements of notification.

California Air resources Board (ARB) Enforcement
Division
Asbestos NESHAP Notification
Post Office Box 2815
Sacramento, California 95812
Phone: 916-322-6036
Fax: 916-445-5745

Notifications shall be in accordance with the NESHAP, 40 CFR, Part 61, Subpart M.

Sacramento Metropolitan Air Quality Management District.

Copies of government agency correspondence shall be included in the submittals.

Secure approval of local police and fire departments having jurisdiction of the proposed security and safety plans for the work prior to submittal to the Engineer. Contact both departments for the requirements of the approval process.

In addition to detailed requirements of this Specification, comply with laws, ordinances, rules, and regulations of federal, state, regional, and local authorities regarding handling, storing, transporting, and disposing of material containing asbestos. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where requirements of this Specification and reference documents vary, the most stringent requirement shall apply.

Field Air Sampling.-- Personal monitoring and other monitoring which is required by law or considered necessary by the Contractor for worker protection shall be the responsibility of the Contractor and performed by the Contractor's Competent Person. The Contractor shall disclose any interest in the firm or laboratory performing the Field Air Sampling or analysis.

EXECUTION.--

Project procedures.—

General

Asbestos abatement work shall not commence until:

- Arrangements have been made for disposal of material containing asbestos at an acceptable site.
- Arrangements have been made for containing and disposal of waste water containing asbestos resulting from wet stripping.
- Work Areas and Decontamination Enclosure Systems and parts of the building required to remain in use are effectively segregated.
- Tools, equipment and material waste receptacles are on hand.
- Arrangements have been made for building security.
- Preparatory steps have been taken and applicable notices posted and permits obtained.
- Differential pressure systems are installed and operating, where applicable.

The Contractor submittal for the isolating non-asbestos Work Areas have been reviewed and approved by the Engineer.

Work Areas.—

Furnishings

Furniture and portable equipment will be removed from the area of work by the Department before asbestos work begins.

Work area requirements

All asbestos abatement shall be performed in regulated areas with access limited to the asbestos removal contractor's employees, regulating officials and Engineer until cleared.

All regulated areas require clearance testing by the Department's observation service using the TEM analysis method.

Mini-enclosure's shall have clearance testing in accordance with TEM analysis method.

The department will pay for all laboratory tests necessary for clearance testing.

Assume all floor tile mastic to be ACM. A non hazardous waste manifest will be required.

When performing removal work on wall or ceiling areas with unknown asbestos analysis reports, a full containment, negative pressure enclosure, 3 stage decontamination area will be required.

Shut down electric power. Provide temporary power and lighting and ensure safe installation of temporary power sources and equipment per applicable electrical code requirements and provide ground-fault interrupter circuits as power source for electrical equipment.

Shut down and isolate heating, cooling, ventilation air systems to prevent contamination and fiber dispersal to other areas of the structure. Isolate and depressurize steam, compressed gas, hydraulics, and other pressurized systems prior to work involving piping or components in such systems. During the work, vents within the Work Area shall be sealed with 2 layers of 6 mil fire rated plastic sheeting sealed with tape.

Do not begin work until area is free of loose equipment.

Pre-clean fixed objects within the proposed Work Areas, using HEPA filtered vacuum equipment or wet cleaning methods, as appropriate, and enclose with protective barriers of plywood covered with minimum 6 mil fire rated plastic sheeting sealed with tape.

All stationary equipment will be pre-cleaned with a HEPA filtered vacuum and protected with a water-tight double 6 mil fire rated plastic sheeting.

Clean the proposed Work Areas using HEPA filtered vacuum equipment or wet cleaning methods as necessary to maintain fiber levels at or below 0.01 f/cc. Methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters shall not be used.

Seal off openings, including but not limited to corridors, doorways, ducts, grills, diffusers, and any other penetrations of the Work Areas, with 2 layers of 6 mil fire rated plastic sheeting sealed with tape. Doorways and corridors which will not be used for passage during work must be sealed with barriers.

Cover floor and wall surfaces with plastic sheeting sealed with tape. Use a minimum of two layers of 6 mil fire rated plastic on floors. Cover floors first so that plastic extends at least 305 mm up on walls, then cover walls with a minimum of 6 mil fire rated plastic sheeting to the floor level, thus overlapping the floor material by a minimum of 305 mm. The Contractor may use additional layers to assist in protection during the replacement of materials.

Install Decontamination Enclosure System or equivalent prefabricated portable decontamination units as approved.

Maintain emergency and fire exits from Work Areas.

Maintenance of Containment/Negative Pressure Enclosure Systems.--Ensure that barriers and plastic linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.

Visually inspect enclosures at the beginning of each work period.

Use smoke methods to test effectiveness of barriers prior to implementing asbestos removal and when directed by the Engineer. Ensure that the integrity of the enclosure system is not breached during the duration of its use.

DISPOSAL.--

Containers to be loaded for transportation from the Holding Area must be removed by workers who have entered from unregulated areas, dressed in clean overalls. Workers must not enter from the Holding Area into the Wash Room or the Work Area.

The sealed asbestos containers shall be delivered to the Contractor's pre-designated approved Hazardous Waste Site for burial; in accordance with Title 22, CCR, EPA guidelines and 40 CFR 61.156 and local Air Pollution Control District Regulations.

Notify the Engineer 48 hours in advance of the time when materials containing asbestos are to be removed from the site.

The Contractor shall be responsible for safe handling and transportation of hazardous waste generated by this Contract to the designated Hazardous Waste Site.

The Contractor shall hold the State harmless for claims, damages, losses, and expenses against the State, including attorney's fees arising out of or resulting from asbestos spills on the site or spills enroute to the disposal site.

DECONTAMINATION OF WORK AREA (GROSS REMOVAL TECHNIQUE).--

After visual inspection and written notification to proceed from the State's Observation Service and after visual inspection by the State's observation Service, encapsulate surfaces where asbestos material has been removed.

Surfaces from which asbestos have been removed shall be sealed with a clear encapsulant after the surface is clean and dry. Post abatement lockdown encapsulant shall be applied using airless spray equipment.

Prepare and apply encapsulant according to the manufacturer's specifications.

Upon completion of encapsulation work, notify the Engineer in writing that encapsulation surfaces are ready for review. The State's Observation Service shall determine that a clearance fiber count is at or below 70 s/mm² by TEM analysis following Asbestos Hazard Emergency Response Act (AHERA) protocol.

Upon proper notification, the Engineer and the State's Observation Service will review encapsulated surfaces for conformance with Specifications. Non-conformance of work shall be remedied until work is in compliance.

Upon successful compliance with review of the Engineer, and after written notification from the State's Observation Service, remove outer layer of plastic floors. Inner plastic layer and isolation barriers, vents, grilles, diffuser, etc. shall remain in place.

Wet clean or clean with a HEPA vacuum equipment, surfaces within Work Area. Equipment used in Work Area shall be included in clean-up and shall be removed from Work Area. Decontamination Enclosure System(s) shall remain during cleaning sequence until after final air clearance.

After final cleaning operation or removal procedure notify the Engineer that the Work Area is ready for review and "Clearance Testing". If "Clearance Testing" shows Work Area has not been decontaminated, repeat cleaning, application of encapsulant, or both, until Work Area is in compliance.

After written notification from the Engineer accepting decontamination of Work Area, remove inner plastic layer isolation barriers and proceed with any remaining repairs or refinish work and reestablishment of objects and systems as specified.

AIR MONITORING.—

Perimeter Area Air Monitoring.--Throughout the abatement process perimeter area air monitoring may be conducted by the State's Observation Service to ensure work is done in conformance with fiber concentration limits of these Specifications.

If perimeter area air monitoring outside the Work Area is in excess of 0.01 f/cc the Contractor shall make modifications in work procedures to assure compliance with minimum standards. Unsatisfactory results are fiber counts in excess of 0.01 fibers/cc by Phase Contract Microscopy (PCM) NIOSH 7400 method measured outside the Work Area as Perimeter Area Air Monitoring.

The State's Observation Service will report perimeter area air monitoring results collected outside the Work Area to the Engineer on the following day prior to start of work.

The Contractor shall submit the laboratory analysis report and chain of custody (COC) to the State's Observation Service of the Contractor's personal monitoring results within 48 hours following completion of that work shift. Personal air monitoring results shall not exceed the maximum use level (MUL) of the respiratory protection factor (PF) in use for asbestos.

Clearance Testing: The State's Observation Service upon completion of the visual inspection and encapsulation review form (Form A) will conduct final air clearance sampling for each work area. For the purpose of this work, clearance shall be defined as an air sample showing fiber counts at or below 70s/mm² by Transmission Electron Microscopy (TEM) analysis following the Asbestos Hazard Emergency Response Act (AHERA) 40 CFR Part 763 Appendix A to Subpart E (Transmission Electron Microscopy Analytical Method). The Contractor will be given a Clearance Testing and Asbestos Air Monitoring Notification (Form B) by the State's Observation Service.

RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS.--

When clean-up is complete:

1. Re-establish HVAC including installation of new filters and disposal on used filters, and insure mechanical and electrical systems in proper working order.

REPAIR AND PAINTING.--

Damage to finishes and other items, not scheduled for demolition or removal, as a result of work under this section shall be repaired or replaced, painted, or cleaned to match existing adjacent surfaces to satisfaction of the Engineer. Painting shall comply with the requirements under "Painting" in Division 9, "Finishes," of these special provisions.

VISUAL INSPECTION AND ENCAPSULATION REVIEWS

FORM A

PROJECT:
LOCATION:
WORK AREA (if applicable):
CONTRACTOR:

WORK ORDER NO.:
BUILDING NAME:

VISUAL INSPECTION REVIEW

In accordance with the Contract Specifications, for the referenced project, Contractor hereby certifies that all surfaces in the referenced building Work Area are free from all visible material and residue, and notifies the Engineer or Observation Service that the referenced area is ready for visual inspection review.

By: _____ Date: _____
(Signature) _____

(Print Name) _____ Title: _____

Observation Service hereby certifies that Observation Service has performed the Visual Inspection Review of the referenced Work Area, and verifies that this inspection has been thorough and that all surfaces in the Work Area are free from all visible material and residue. Observation Service hereby notifies Contractor to proceed with the encapsulation of the abated surfaces and decontamination of the Work Area.

By: _____ Date: _____
(Signature) _____

(Print Name) _____ Title: _____

ENCAPSULATION REVIEW

Contractor hereby notifies the Engineer or Observation Service that the Work Area encapsulated surfaces are ready for review.

By: _____ Date: _____
(Signature) _____

(Print Name) _____ Title: _____

Observation Service certifies the review of the Work Area encapsulated surfaces was acceptable and found them to be in conformance with the Specifications.

By: _____ Date: _____
(Signature) _____

(Print Name) _____ Title: _____

CLEARANCE TESTING & ASBESTOS AIR MONITORING NOTIFICATION FORM B

PROJECT: WORK ORDER NO.:
LOCATION: BUILDING NAME:
WORK AREA (if applicable):
CONTRACTOR:

CLEARANCE TESTING CERTIFICATION

Observation Service hereby certifies that Observation Service has taken air sample "Clearance Test" upon completion of each Work Area. Observation Service further certifies that the decontamination of the Work Area has complied with the Specifications and the air samples indicated a fiber count of at or below 70 s/mm² by TEM analysis as per AHERA protocol.

By: Date:
(Signature) Title:

(Print Name)

ASBESTOS AIR MONITORING NOTIFICATION

To: (Name of Facility CPO)

(Name & Location of Facility)

(Department)

In accordance with Asbestos Notification Law, health and Safety Code Section 25915, and for the above referenced project Building (Work Area, if applicable), the Real Estate Services Division (RES D) is transmitting the information herein above related to the air monitoring results conducted pursuant to Section 1529 of Title 8 of the California Code of Regulations. RES D has logged this transmittal as a part of Asbestos Program records.

If you have any questions regarding this information, contact the Project Manager.

From: Date:

Signature of RES D Construction Supervisor

(Print Name)

2.06 LEAD ABATEMENT

PART 1.- GENERAL

SUMMARY.--

Scope.--The work shall consist of procedures for removal, repair, and disposal of lead based materials which are designated on the plans or specified in these special provisions to be removed and disposed of.

The Contractor shall take special precautions for that part of the work which involves the demolition and handling of materials which may contain lead, either during demolition or construction.

Construction activities (including demolition) that disturb materials or paints containing any amount of lead are subject to certain requirements of the Cal/OSHA lead standard in Title 8, California Code of Regulations Section 1532.1.

Any work that disturbs the existing paint system will expose workers to health hazards and will:

1. Produce debris containing heavy metal in amounts that may exceed the thresholds established in Titles 8 and 22 of the California Code of Regulations.
2. Produce toxic fumes when heated.

The building areas to be removed are known to contain lead containing materials. A hazardous material survey report by GEOCON (Project No. S8875-06-71) dated November 15, 2005, and by Earthshine Consulting (Report Number M089298) dated October 10, 2007 are available as an Information Handout. The following items tested positive for Lead Based Paint material in excess of 600 mg/kg:

Lead-based paint		
Item	Description	Total Lead (mg/kg)
Administration Wing		
	Gray exterior trim	29,000
	Silver roofing paint	1,300
Laboratory Wings		
	Silver roofing paint	1,300
Attic		
Trusses	Red primer paint	290,000-430,000
HVAC Ducting	Settled out lead particulate	2900-18,000
Settled out paint debris and dust on horizontal surfaces	Settled out lead particulate	180-1,200

Where existing lead based materials are to be removed during demolition, construction or alterations, such material may need to be treated as hazardous waste, and shall be removed, hauled and disposed of in accordance with all applicable Federal, State and local laws and ordinances.

SUBMITTALS.--

Lead Compliance Plan, Abatement Procedure Plan and Debris Containment and Collection Program must be submitted to the Engineer at least 15 days prior to lead abatement.

Lead Compliance Plan.—The Contractor shall prepare a project specific Lead Compliance Plan to prevent or minimize worker exposure to lead. Attention is directed to Title 8, California Code of Regulations, Section 1532.1, "Lead," for specific Cal-OSHA requirements when working with lead.

The Lead Compliance Plan shall contain the elements listed in Title 8, California Code of Regulations, Section 1532.1(e)(2)(B). The Lead Compliance Plan shall be prepared, signed and stamped by an Industrial Hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene. If measures being taken by the Contractor are inadequate to provide for worker safety and the containment and collection of residue from existing paint systems, the Engineer will direct the Contractor to revise his operations and the compliance program. Such directions will be in writing and will specify the items of work for which the Contractor's compliance programs are inadequate. No further work shall be performed on said items until the compliance programs are adequate and, if required, a revised compliance program has been approved.

The State will not be liable to the Contractor for failure to approve all or any portion of an originally submitted or revised compliance program for worker safety and the containment and collection of residue from existing paint systems, nor for any delays to the work due to the Contractor's failure to submit an acceptable compliance program.

Abatement Procedure Plans.—The Contractor shall submit an abatement procedure plan prepared, signed and stamped by a Lead Project Monitor or Lead Project Designer currently certified by the California Department of Health Services.

The plan shall address but not be limited to the following abatement procedures:

1. Personal monitoring procedures.
2. Phasing of abatement work indicating daily roster of workers for each phase.
3. Security system warning signs locations.
4. Detailed plans for decontamination facilities, toilets, and systems providing anteroom and Work Area to outside communication showing connections to existing building.
5. Standard procedures for protecting workers, visitors, and employees and protection of spaces outside Work Area from contamination.
6. Engineering systems exposure control indicating number, location, and capacity of supply and exhaust systems, the expected direction of flow, and the range of expected differential pressure in each area.
7. Safety precautions such as lockout, tagout, fall protection, and confined space entry procedures and equipment and work procedures to be used in the encapsulation, removal and demolition of lead based paint.
8. Final clearance inspection criteria.

Debris Containment and Collection Program.—The Contractor shall submit a debris containment and collection program under Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, for debris produced when the existing paint system is disturbed. The Debris Containment and Collections Program must be prepared, signed and stamped by a Lead Project Monitor or Lead Project Designer currently certified by the California Department of Health Services. The program must identify materials, equipment, and methods to be used when the existing paint system is disturbed and must include working drawings of containment systems, and provisions for ventilation and air movement for visibility and worker safety.

If inadequate measures are taken to provide for the containment and collection of debris produced when the existing paint system is disturbed, the Engineer will direct you to revise the operations and the debris containment and collection program. The directions will be in writing and will specify the items of work for which the debris containment and collection program is inadequate. No further work shall be performed on the items until the debris containment and collection program is adequate and, if required, a revised program has been approved for the containment and collection of debris produced when the existing paint system is disturbed.

The lead abatement shall be supervised by a California Department of Health Services Lead-Related Construction Certified Lead Supervisor. The supervisor shall be on-site during abatement preparation and post-abatement clean-up and be readily available as required by Title 17 California Code of Regulations 36100 (A1). Personnel for lead abatement shall be California Department of Health Services Lead-Related Construction Lead Worker Certified.

State personnel shall complete a safety training program provided by the Contractor, that meets the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead," and the Contractor's Lead Compliance Program.

Personal protective equipment, training, and washing facilities, required by the Contractor's Health and Safety Plan shall be supplied to State personnel by the Contractor. The number of State personnel will be 3.

QUALITY ASSURANCE.--

Codes and standards.--Codes which govern removal and disposal of materials containing lead include, but are not limited to the following:

1. California Health and Safety Code, Division 20, Chapter 6.5, "Hazardous Waste Control Act."
2. California Code of Regulations, Title 17, "
3. California Code of Regulations, Title 22, Division 4, Chapter 30, "Minimum Standards for Management of Hazardous and Extremely Hazardous Material."
4. California Code of Regulations, Title 8, Construction Safety Order, Section 1532.1, Lead.
5. Occupational Safety and Health Administration, Part 26 (amended), of Title 29 of the Code of Federal Regulations.

PART 2.- PRODUCTS (Not applicable.)

PART 3.- EXECUTION

REMOVAL.--

Preparation.--Prior to performing operations involving the removal of hazardous waste containing lead, the Contractor shall provide written notification to the following agency:

Division of Occupational Safety and Health
2424 Arden Way, Suite 165
Sacramento, CA 95825
Telephone No. (916) 263-2800

The Contractor shall notify Division of Occupational Safety and Health (CAL OSHA) 24 hours prior to performing removal operations of materials containing lead or lead based materials.

Notification.--The Contractor shall notify the Engineer 3 working days in advance of commencement of removal operations of material containing lead or lead based materials.

Method of removal.--Painted materials shall be removed using the wet process, vacuum blasting process or other acceptable processes that contain paint debris. Removal equipment and methods, to a depth required to remove all paint and provide clean substrate suitable for a new finish.

Removed material and water used for removal shall be collected. Removed material shall be separated from water using approved filters.

Handling.--The Contractor shall comply with all Federal, State, and local regulations for the removal of material containing lead prior to demolition, shall place such removed material in approved plastic containers (double ply, 0.15 mm minimum thickness, plastic bags) with caution labels affixed to said bags. Such caution labels shall have conspicuous, legible lettering which spells out the following, or equivalent warning:

CAUTION
CONTAINS LEAD

Temporary storage on the ground of material and residue produced when the existing paint system is disturbed will not be permitted. Material and residue shall be stored in leak proof containers and shall be handled in such a manner that no spillage will occur.

Safety measures.--The Contractor shall comply with all Federal, State and local requirements for safety which shall include providing employees with coveralls (preferably disposable plastic coated), rubber gloves (to be discarded after use), rubber boots (to be washed thoroughly after use), and respirators.

The Contractor shall be responsible for verifying that all employees, who are involved in removal operations, wear the required protective devices during removal operations.

DISPOSAL.--

Transporting.--The debris shall be hauled by a transporter currently registered with the California Department of Toxic Substances Control using correct manifesting procedures and vehicles displaying current certification of compliance. The Contractor shall make all arrangements with the operator of the disposal facility and perform any testing of the debris required by the operator. All vehicles used to transport hazardous waste material shall have affixed to the vehicle a valid Certificate of Compliance issued by United States Department of Transportation. If a roll off or drop box is utilized, both the drop box and the transporting vehicle must have a valid Certificate of Compliance issued by the United States Department of Transportation.

Disposal.—The Engineer will obtain the required EPA generator identification numbers, and will sign the hazardous waste manifests.

All material and residue produced during removal operations shall be tested and profiled to determine hazardous waste characteristics.. Dispose of residue and waste at an approved disposal facility in accordance with the requirements of the disposal facility operator.

The Contractor shall notify the proper authorities at the disposal site in advance of delivery of hazardous waste containing lead to the disposal site.

Final Clearance Inspection.—Final clearance inspection wipe testing will be performed after clean-up activities are completed following Department of Health Services and requirements of California Code of Regulations Title 17.

2.07 TEMPORARY CHAIN LINK FENCING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing, constructing, maintaining, and later removing temporary chain link fencing and gates in accordance with the details shown on the plans and these special provisions.

When no longer required for the work, as determined by the Engineer, temporary chain link fence shall be removed. Removed facilities shall become the property of the Contractor and shall be removed from the site of the work, except as otherwise provided in this section.

PART 2.- PRODUCTS

General.--All ferrous materials shall be galvanized. Posts, caps, braces and other rolled or formed elements shall be hot-dip galvanized after rolling or forming.

Used materials may be installed provided the used materials are good, sound and are suitable for the purpose intended, as determined by the Engineer.

Materials may be commercial quality provided the dimensions and sizes of the materials are equal to, or greater than, the dimensions and sizes shown on the plans or specified herein.

Concrete footings for metal posts will not be required.

Style, finish, and color of each fence post shall match that of the other fence components.

MATERIALS.--

Posts and braces.--

Posts and braces shall conform AASHTO Designation: M 181. Minimum nominal thickness before galvanizing shall be 3 mm for posts and 2 mm for braces. Midpoint deflection of posts about major axis shall not be greater than 6 mm and permanent set about either axis shall not be greater than 0.25 mm as determined by California Test 674. Post lengths shall be 815 mm longer than height of fabric. Rainproof caps shall be furnished for tubular posts.

The resisting moment for posts or braces is defined as the product of the member's section modulus about the designated axis and its yield strength. Posts and braces shall have resisting moments not less than the following minimum values:

Item	Resisting Moment
Line posts	1100 N•m perpendicular to fence line. 550 N•m parallel to fence line.
End, latch and corner posts	1900 N•m in any direction.
Braces	550 N•m about the major axis. 400 N•m about the minor axis.

Fabric.--

Fence fabric shall conform to AASHTO Designation: M 181 for Type I zinc coated fabric with Class C coating. Fabric shall be fabricated of 3 mm (11-gage) wire for fences 2135 mm or less in height, 3.8 mm (9-gage) wire for fences over 2135 mm in height, and shall have 50 mm mesh and knuckled finish on top and bottom edges.

WIRE.--

Tension wire.--

Tension wire shall be 4.34 mm (7-gage) coil spring wire galvanized in accordance with the provisions of ASTM Designation: A 116 Coating Class 3.

FENCE FITTINGS.--

Tie wires and hog rings.--

Tie wires and hog rings for attaching fabric to tension wire, top rail and intermediate posts shall be a minimum of 3.8 mm (9-gage) wire conforming to ASTM Designation: F 626, and shall have a Class 3 zinc coating.

Post clips.--

Post clips for fastening fabric to H-posts shall be a minimum of 4.94 mm (6-gage) conforming to ASTM Designation: F 626, and shall have a Class 3 zinc coating.

Turnbuckles and truss tighteners.--

Turnbuckles and truss tighteners shall be galvanized, commercial quality steel, malleable iron, or wrought iron. Truss tightener straps shall be at least 6 mm thick. Devices shall develop the truss bar or rod strength.

Truss rod.--

Truss rod shall be 9 mm diameter steel rod equipped with turnbuckle or truss tightener.

Post caps.--

Post caps shall be galvanized steel, malleable iron or wrought iron with loop to receive tension wire of top rail; one per post. Post caps for tubular posts shall be designed to fit snugly over the post.

MISCELLANEOUS.--**Concrete.--**

Concrete for fence construction shall be commercial quality concrete with not less than 300 kilograms of cement per cubic meter.

GATES.--

General.--Gates shall be constructed to be opened and closed easily by one person.

Gate fabric shall be as specified for fence fabric and be firmly attached to frames at a maximum spacing not to exceed 380 mm.

Gate frames shall be fabricated of a minimum of 38 mm standard weight steel pipe or rectangular tubular steel except vertical stays may be 25 mm in outside dimension. Gates shall include all necessary fittings, latches, rods, slide rails, axles, hinges and other gate hardware of commercial quality steel, malleable iron or wrought iron.

Swinging gates.--

Swinging gates shall conform to ASTM Designation: F 900, except as modified in this section.

Hinges shall be furnished with large bearing surfaces for clamping in position and designed to swing either 180 degrees outward, 180 degrees inward, or 90 degrees in or out as shown on the plans. Hinges shall not twist or turn under action of the gate.

Latches for swing gates shall be plunger type arranged to engage the stop, except single gates of less than 3 meters wide may have a forked latch. Latches shall have provision for padlock. Latches for double gates shall be capable of securing both leaves with one padlock.

Gate stops shall be provided for all double gates and shall be suitable for setting in concrete.

Hold-open keepers shall be designed to automatically engage gate leaf and hold it open until manually released.

Rolling gate.--

Rolling gates shall conform to ASTM Designation: F 1184, except as modified in this section.

Track shall be fabricated of 50 mm x 50 mm x 6 mm angle with anchors 12 mm diameter by 152 mm long with 50 mm bends as shown on the plans. Anchor shall be placed at 152 mm from ends and at 614 mm on center.

Wheel assembly shall consist of wheel box and sides with malleable iron, V-groove wheel and axle as recommended by the gate manufacturer. Wheel axle shall be fitted for lubrication.

Gate shall be fitted with a latch with provision for a padlock.

PART 3.- EXECUTION

INSTALLATION.--

General.--Posts shall be set vertically and at not more than 3.0 meter center to center spacing. Fencing shall be erected in straight lines between angle points.

Bracing.--End, latch and corner posts shall be braced to the nearest line post. Gate posts shall be braced with horizontal compression braces and 9 mm truss rods as tension members. Other braces shall be the same as gate post braces or diagonal braces.

Chain link fabric.--Chain link fabric shall be fastened on the side of the posts designated by the Engineer.

The fabric shall be fastened to end, latch, corner, and gate posts with 6 mm x 19 mm stretcher bars and not less than 3 mm x 19 mm stretcher bar bands spaced at one foot intervals or, in lieu of using stretcher bars and bar bands for fastening fabric to end and corner posts, the fabric may be fastened by threading through loops formed on the posts.

The fabric shall be fastened to line posts with tie wires or post clips and to tension wires and rails with tie wires or hog rings. The fasteners shall be spaced at approximately 350 mm on line posts and at approximately 450 mm on tension wires and rails. Wire ties shall be given at least one complete turn. Hog rings shall be closed with ends overlapping. The tension wires shall be wrapped around terminal posts. The distance from the top of the fabric to the top tension wire shall be 50 mm maximum.

The fabric shall be stretched and securely fastened to the posts and tension wires. Tension wires shall be stretched tight. The bottom tension wire shall be installed on a straight grade between posts by excavating the high points of ground and in no case will filling of depressions between posts be permitted.

Gates.--Gates shall be hung and hardware adjusted so gates operate satisfactorily from open or closed position. Gate stops shall be set in concrete to engage center drop or plunger bar.

PROTECTION.--

General.--Temporary chain link fence that is damaged during the progress of the work shall be repaired or replaced by the Contractor at the Contractor's expense.

DIVISION 3. CONCRETE AND REINFORCEMENT

3.01 CAST-IN-PLACE CONCRETE

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of constructing cast-in-place concrete facilities in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for admixtures, expansion joint material, vapor barrier, hardener, and sealer shall be submitted for approval.

Descriptive data shall be delivered to the Engineer at the jobsite.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of Compliance shall be furnished for cement, reinforcement, epoxy products, and admixtures in accordance with the requirements specified in Section 4-1.04, "Certificates of Compliance," of the General Conditions.

PART 2.- PRODUCTS

CONCRETE MIXES.--

Concrete (structural work).--

Commercial quality concrete shall be proportioned to provide a workable mix suitable for the intended use; shall have not less than 350 kg/m³ of cement; 0 to 50 mm penetration, inclusive, as determined by California Test 533.

Concrete (minor work).--

Commercial quality concrete for concrete floor fill shall be proportioned to provide a workable mix suitable for the intended use; shall have not less than 300 kg/m³ of cement; 0 to 50 mm penetration, inclusive, as determined by California Test 533.

CONCRETE MATERIALS.--

Cement.--

Cement shall conform to ASTM Designation: C 150, Types II, or III portland cement; or Type IP (MS) Modified cement. Type IP (MS) Modified shall conform to ASTM Designation: C 595 and shall be comprised of an intimate mixture of Type II Modified cement and not more than 20 percent of a pozzolanic material.

Aggregates.--

Aggregates shall be free from deleterious coatings, clay balls and other extraneous materials.

Admixtures.--

Admixtures used in portland cement concrete shall be included on the Department's current list of approved admixtures, and shall conform to ASTM Designation: C 494, Types A, B, D, F or G for chemical admixtures; ASTM Designation: C 260 for air-entraining admixtures; and ASTM Designation: C 618 for mineral admixtures, except loss on ignition shall not exceed 4 percent. Properties of admixtures shall be uniform in each lot.

FORM MATERIALS.--

Forms for exposed finish concrete.--

Forms for exposed surfaces shall be plywood, metal or other panel type materials. Plywood shall be not less than 16 mm thick and without scars, dents, and delaminations. Forms shall be furnished in largest practical pieces to minimize number of joints.

Plywood shall conform to the requirements of U. S. Product Standard PS-1 for Exterior B-B (Concrete Form) Class I.

Forms for edges of slabs shall be nominal 50 mm solid stock lumber, plywood, or metal forms.

Forms for unexposed finish concrete.--

Forms for unexposed finish concrete surfaces shall be plywood, lumber, metal or other acceptable material.

Form ties.--

Form ties shall be factory fabricated, removable or snapoff metal ties for use as necessary to prevent spreading of forms during concrete placement.

Form oil.--

Form oil shall be commercial quality form oil which will permit the ready release of the forms and will not discolor the concrete.

REINFORCING MATERIALS.--**Bar reinforcement.--**

Bar reinforcement shall conform to ASTM Designation: A 615/A 615M, Grade 60 [420], or ASTM Designation: A 706/A 706M.

Welded wire fabric.--

Welded wire fabric shall conform to ASTM Designation: A 185.

Bar supports.--

Bar supports for reinforcement shall be precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under applied loads.

EPOXY.--

General.--Epoxy shall be furnished as 2 components which shall be mixed together at the site of the work.

Epoxy resin adhesive.--

Epoxy resin adhesive shall conform to State of California Specification No. 8040-21M-08 or other epoxy suitable for bonding new concrete to old.

Epoxy mortars.--

Epoxy mortar and epoxy mortar surface treatment shall consist of a commercial quality, trowelable mixture consisting of epoxy and sand. Epoxy shall have a pull-off strength of not less than 6895 MPa and a 90-percent cure in 24 hours. Epoxy shall be of the type that requires no primer as a bonding agent.

Sand.--

Sand for use in epoxy mortars shall be clean and shall have a moisture content of not more than 0.50-percent when tested in accordance with California Test 226.

Sand for epoxy mortar surface treatment shall be graded such that 100-percent passes the 150 µm sieve.

RELATED MATERIALS.--**Anchor bolts, nuts, and washers.--**

Nonheaded anchor bolts shall conform to ASTM Designation: A 36/A 36M, with a minimum hook length of 6.2 diameters.

Headed anchor bolts shall conform to ASTM Designation: A 307.

Threaded rods shall conform to ASTM Designation: A 572.

Nuts shall conform to ASTM Designation: A 563M, Grade A.

Washers for anchor bolts shall be commercial quality.
Exposed anchor bolts, nuts, and washers shall be hot dipped galvanized.

Expansion joint material.--

Expansion joint material shall be commercial quality asphalt impregnated pressed fiber sheets, 13 mm minimum thickness.

Vapor barrier.--

Vapor barrier shall be commercial quality polyethylene sheets not less than 0.15 mm thick.

Bond breaker.--

Bond breaker shall be Type I asphalt saturated organic felt or such other material approved by the Engineer.

Type A control joints.--

Type A control joints shall be commercial quality, preformed, T-shaped plastic strips with detachable top flange.

Keyed construction joint forms.--

Keyed construction joint forms shall be commercial quality, galvanized metal or plastic, factory fabricated construction joint forms. Forms shall produce a rabbeted key type joint.

Divider and edger strips.--

Divider and edger strips shall be foundation grade redwood.

Mortar.--

Mortar shall consist of one part cement to 2 parts clean sand and only enough water to permit placing and packing.

Curing compound.--

Curing compound shall be a non-pigmented curing compound with fugitive dye conforming to the requirements of ASTM Designation: C 309, Type 1-D, Class A.

Stair tread warning stripe.--

Warning stripe shall be commercial grade, anti-slip safety tape for exterior applications and shall be installed per manufacture's requirements. Location and size shall be as shown on the plans, color shall be approved by the Engineer.

ADMIXTURES.--

General.--Admixtures shall be used when specified or ordered by the Engineer and may be used at the Contractor's option to conserve cement or to facilitate any construction operation.

Calcium chloride shall not be used in any concrete.

Admixtures shall be combined with concrete materials by methods that produce uniform properties throughout the concrete.

If more than one admixture is used, said admixtures shall be compatible with each other so that the desirable effects of all admixtures will be realized.

Mineral admixtures may be used to replace up to 15 percent of Type II portland cement provided the weight of mineral admixture used is not less than the weight of cement replaced. Mineral admixtures shall not be used to replace Type IP (MS) Modified or Type III cements. Chemical admixtures may be used to reduce up to 5 percent of the portland cement except that the cement content shall not be less than 300 kg/m³. When both chemical and mineral admixtures are used with Type II cement, the weight of cement replaced by mineral admixture may be considered as cement in determining the resulting cement content.

Mineral admixtures will be required in the manufacture of concrete containing aggregates that are determined to be "deleterious" or "potentially deleterious" when tested in accordance with ASTM Designation: C 289. The use of mineral admixture in such concrete shall conform to the requirements in this section except that the use of set retarding admixtures will not be permitted.

When the use of a chemical admixture is specified or is ordered by the Engineer, the admixture shall be used at the rate specified or ordered. If no rate is specified or ordered, or if the Contractor uses a chemical admixture for his own convenience, the admixture shall be used at the dosage normally recommended by the admixture manufacturer.

When air-entrainment is specified or is ordered by the Engineer, the air-entraining admixture shall be used in amounts to produce concrete having the specified or ordered air content as determined by California Test 504. If the Contractor uses air-entrainment for his own convenience, the average air content shall not exceed 4 percent and no single test shall exceed 5 1/2 percent.

Chemical admixtures and air-entraining admixtures shall be dispensed in liquid form. Dispensers shall have sufficient capacity to measure at one time the total quantity required for each batch. If more than one liquid admixture is used in the concrete, a separate measuring unit shall be provided for each liquid admixture and dispensing shall be such that the admixtures are not mixed at high concentrations. When air-entraining admixtures are used with other liquid admixtures, the air-entraining admixtures shall be the first to be incorporated into the mix. Unless liquid admixtures are added to premeasured water for the batch, they shall be discharged to flow into the stream of water so that the admixtures are well dispersed throughout the batch.

BAR REINFORCING STEEL.--

Bending.--Reinforcing steel bars shall accurately conform to the dimensions shown on the plans.

Bars shall be bent or straightened in a manner that will not crack or break the material. Bars with kinks or improper bends shall not be used.

Hooks, bends and splices shall conform to the provisions of the Building Code Requirements for Reinforced Concrete of the American Concrete Institute.

MIXING AND TRANSPORTING CONCRETE.--

General.--When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be complete within 1 1/2 hours, or before 250 revolutions of the drum or blades, whichever comes first, after the introduction of cement to the aggregates.

The temperature of mixed concrete, immediately before placing, shall be not less than 10°C nor more than 32°C.

Truck mixers or agitator shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified. The counters shall be of the continuous-registering type, which accurately register the number of revolutions and shall be mounted on the truck so that the Engineer may safely and conveniently inspect them from alongside the truck. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, a time less than 1 1/2 hours may be required.

When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be complete within one hour after the introduction of cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C, or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.

Each load of concrete for the work shall be accompanied by a trip ticket, a copy of which shall be delivered to the Engineer at the jobsite. The trip ticket shall show volume of concrete, weight of cement and aggregates, quantity of each admixture, quantity of water including water added at the jobsite, time of day the concrete is batched, and revolution counter readings on transit mix trucks at the times the truck is charged and unloaded.

PART 3.- EXECUTION

PREPARATION.--

Existing concrete construction.--Where fresh concrete joins existing or previously placed concrete or masonry, the contact surfaces of the existing or previously placed material shall be roughened, cleaned, flushed with water and allowed to dry to a surface dry condition immediately prior to placing the fresh concrete. The roughened surface shall be no smoother than a wood trowelled surface. Cleaning of the contact surfaces shall remove laitance, curing compounds, debris, dirt and such other substances or materials which would prevent bonding of the fresh concrete.

Abrasive blast methods shall be used to clean horizontal construction joints to the extent that clean aggregate is exposed.

Exposed reinforcing steel located at the contact surfaces which is to be encased in the fresh concrete shall be cleaned to remove any substance or material that would prevent bonding of the fresh concrete.

Forms.--Forms shall be mortar tight, true to the dimensions, lines, and grades shown on the plans, securely fastened and supported, and of adequate rigidity to prevent distortion during placing of concrete.

Forms for exposed surfaces shall be constructed with triangular fillets not less than 19 mm x 19 mm attached so as to prevent mortar runs and to produce smooth straight chamfers at all sharp edges of the concrete.

Form fasteners shall be removable without chipping, spalling, heating or otherwise damaging the concrete surface. Form ties shall be removed to a depth of at least 25 mm below the surface of the concrete.

The inside surfaces of forms shall be cleaned of all dirt, mortar and foreign material. Forms shall be thoroughly coated with form oil prior to use.

Forms shall not be stripped until at least 40 hours after placing concrete, except soffit forms and supports shall not be released or removed until at least 10 days after placing concrete.

Anchorage and embedded items shall be placed and rigidly secured at their planned locations prior to placing concrete.

Reglets or embedded flashing shall be installed on concrete forms before the concrete is placed.

Redwood dividers shall have 4 mm x 89 mm galvanized nails partially driven into both vertical faces at 450 mm on centers.

Vapor barrier.--Vapor barrier shall be lapped 150 mm and securely taped at splices. Vapor barrier shall be protected with a 75 mm layer of clean uncompacted sand cover.

Unless otherwise shown on the plans, vapor barrier shall be placed under portions of the floor slab scheduled to receive finish flooring.

Placing reinforcing steel.--Reinforcing steel bars shall be accurately placed to the dimensions shown on the plans.

Bar reinforcement conforming to ASTM Designation: A 615/A 615M, Grade 60 [420], or A 706//A 706M shall be lapped at least 45 diameters.

Bars shall be firmly and securely held in position by means of wiring and approved bar supports. The spacing of supports and ties shall prevent displacement of the reinforcing or crushing of supports.

Tie wire shall be clear of concrete formwork and concrete surfaces.

All reinforcing steel shall be in place and inspected before concrete placement begins. Placing of bars on fresh layers of concrete will not be permitted.

PLACING CONCRETE.--

General.--Concrete shall be placed and consolidated by means of internal vibrators to form dense, homogeneous concrete free of voids and rock pockets.

Forms and subgrade shall be thoroughly moistened with water immediately before placing concrete.

Concrete shall be placed as nearly as possible to its final location and the use of vibrators for extensive shifting of the concrete will not be permitted.

Concrete shall be deposited and consolidated in a continuous operation within limits of construction joints, until the placing of the panel or section is completed.

When concrete is to be placed in large areas requiring more than two pours, concrete shall be placed in alternate long strips between construction joints and the final slab infilled.

Vibrators used to consolidate concrete containing epoxy-coated bar reinforcement shall have a resilient covering to prevent damage to such reinforcement.

FINISHING CONCRETE SURFACES.--

Finishing unformed surfaces.--Slabs shall be placed full thickness to finish elevation and leveled to screeds by use of long straightedges. The screeds shall be set to grade at approximately 1.8 meter centers. After leveling, screeds shall be removed and the surface shall be floated with wooden floats.

Type A control joint strips shall be inserted into the floated concrete so that the bottom of the top flange is flush with the finish elevation. Strips shall be standard manufactured lengths and shall be placed on an approximate straight line. The top flange of the strips shall be removed after the concrete has set and cured.

The floated surface shall be trowelled with steel trowels. Troweling shall form a dense, smooth and true finish. Walkways, pedestrian ramps, stairs and outdoor slabs for pedestrian traffic shall be given a non-slip broom finish unless a different finish is called for on the plans or in these special provisions.

The application of cement dust coat will not be permitted.

Steel trowel finish and broom finish will not be required for slabs to receive exposed aggregate finish nor for slabs to be covered with ceramic tile.

Concrete floor surfaces to receive ceramic tile shall be floated to grade and then, before final set of the concrete, the floated surfaces shall be roughened with stiff bristled brushes or rakes.

Finished surfaces of floor slabs shall not deviate more than 3 mm from the lower edge of a 3-meter long straight edge.

Finishing formed surfaces.--Formed concrete surfaces shall be finished by filling holes or depressions in the surface, repairing all rock pockets, and removing fins. All surfaces of formed concrete exposed to view shall have stains and discolorations removed, unsightly bulges removed, and all areas which do not exhibit the required smooth, even surface of uniform texture and appearance shall be sanded with power sanders or other approved abrasive means until smooth, even surfaces of uniform texture and appearance are obtained.

Cement mortar, patching and finishing materials used to finish exposed surfaces of concrete shall closely match the color of surrounding surfaces.

CURING CONCRETE.--

General.--Freshly placed concrete shall be protected from premature drying and excessive cold or hot temperatures.

Initial curing of floor slabs shall start as soon as free water has disappeared from the concrete surface. The concrete shall be kept continuously wet by application of water for not less than 7 days after the concrete has been placed.

Cotton mats, rugs, carpets, or sand blankets may be used as a curing medium to retain the moisture during the curing period. Curing materials that will stain or discolor concrete shall not be used on surfaces exposed to view.

Prior to placing the curing medium, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. At the expiration of the curing period, the concrete surfaces shall be cleared of all curing mediums.

Concrete surfaces, other than floor slabs, shall be kept moist for a period of at least 5 days by leaving the forms in place or by covering the exposed surfaces using moist rugs, cotton mats or other curing materials approved by the Engineer.

Concrete curbs, sidewalks, collars, and gutter depressions may be cured with a curing compound.

PROTECTING CONCRETE.--

General.--Concrete shall not be placed on frozen or frost covered surfaces.

Concrete shall be protected from damage due to rain, freezing or inclement weather, and shall be maintained at a temperature of not less than 4°C for 72 hours. When required by the Engineer, the Contractor shall provide a written outline of his proposed methods of protecting concrete.

Vehicles, equipment, or concentrated loads weighing more than 140 kg individually and material stockpiles weighing more than 240 kg/m² will not be permitted on the concrete within 10 calendar days after placing.

SPECIAL TREATMENTS.--

Epoxy resin adhesive.--Epoxy resin adhesive shall be applied to concrete surfaces shown on the plans. Epoxy resin adhesive shall be mixed and applied in accordance with the manufacturer's recommendations.

Epoxy mortars.--Epoxy for use as a binder in epoxy mortars shall be thoroughly mixed together before the aggregate is added, and unless otherwise specified, the mix proportions shall consist of one part binder to approximately 4 parts of aggregate, by volume.

All surfaces against which epoxy mortars are to be applied shall be free of rust, paint, grease, asphalt, and loose or deleterious material.

3.02 DRILL AND BOND DOWELS (EPOXY CARTRIDGE)

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of drilling holes in existing concrete and installing and bonding bar reinforcing steel dowels with epoxy cartridges into such drilled holes in existing concrete in accordance with the details shown on the plans and these special provisions.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of Compliance shall be furnished for epoxy cartridges in accordance with the requirements specified in Section 4-1.04, "Certificates of Compliance," of the General Conditions. The certificate shall state that the material complies in all respects to the requirements of ICBO AC58 and Caltrans Augmentation/Revisions to ICBO AC58.

PART 2.- PRODUCTS

Epoxy cartridge system .--

The Contractor shall select an epoxy cartridge system which has passed the testing requirements of the International Conference of Building Officials (ICBO) document - AC58 and additional test requirements as specified in the Caltrans Augmentation/Revisions to ICBO AC58. Testing shall be performed by an independent testing facility and the results will be reviewed and approved by the Transportation Laboratory. The Caltrans Augmentation/Revisions to ICBO AC58 document may be obtained by contacting the Transportation Laboratory, telephone: (916) 227-7000.

The epoxy cartridge system used shall be appropriate for the ambient concrete temperature and installation conditions at the time of installation in conformance with the manufacturer's specifications.

Dowels.--

Dowels shall be bar reinforcing steel, as specified under "Cast-In-Place Concrete" in Division 3, "Concrete and Reinforcement," of these special provisions.

PART 3.- EXECUTION

INSTALLATION.--The holes shall be drilled by methods that will not shatter or damage the concrete adjacent to the holes. The diameter of drilled holes shall be 13 mm larger than the nominal diameter of the dowels unless otherwise shown on the plans.

Each epoxy cartridge shall be clearly and permanently marked with the manufacturer's name, model number of the epoxy cartridge system, manufacturing date, and lot number. Each carton of epoxy cartridges shall contain the manufacturer's recommended installation procedures, minimum cure time, and such warning or precautions concerning the contents as may be required by State or Federal Laws and Regulations.

The drilled holes shall be cleaned in conformance with the manufacturer's instructions and shall be dry at the time of placing the epoxy cartridge bonding material and the steel dowels. The bonding material shall be a 2-component epoxy system contained in a cartridge having 2 separate chambers and shall be inserted into the hole using a dispensing gun and replaceable mixing nozzle approved by the manufacturer. Unless otherwise specified, the depth of hole and the installation procedure shall be as recommended by the manufacturer. A copy of the manufacturer's recommended installation procedure shall be provided to the Engineer at least 2 days prior to the start of work.

Immediately after inserting the dowels into the epoxy, the dowels shall be supported as necessary to prevent movement during curing and shall remain undisturbed until the epoxy has cured a minimum time as specified by the manufacturer. Dowels that are improperly bonded, as determined by the Engineer, will be rejected. Adjacent new holes shall be drilled, and new dowels shall be placed and securely bonded to the concrete. All work necessary to correct improperly bonded dowels shall be performed at the Contractor's expense.

DIVISION 4. BLANK

DIVISION 5. METALS

5.01 STRUCTURAL STEEL FOR BUILDINGS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of fabricating, assembling, furnishing and erecting structural steel in accordance with the details shown on the plans and these special provisions.

Structural steel consists of:

- Angle shaped members
- Channel shaped members
- Structural tubing ledgers, beams, and columns
- Plates, angles, and connections

Source quality control.--Materials and fabrication procedures are subject to inspection and tests in mill, shop and field, conducted by the Engineer or a qualified inspection agency. The Contractor or fabricator shall provide access to the Engineer or testing agency to places where the structural steel work is being fabricated or produced so that the required inspection and testing can be accomplished. Such inspections and tests will not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. The testing agency may inspect the structural steel at the plant before shipment; however, the Engineer reserves the right, at any time before final acceptance to reject the material that does not conform to the contract requirements.

REFERENCES.--

General.--Structural steel shall be fabricated, assembled and erected in accordance with American Institute of Steel Construction (AISC), "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings."

Welding shall be in accordance with American Welding Society (AWS) D1.1, "Structural Welding Code - Steel," current edition. Maintain fire watch and portable fire-suppression devices during welding operations.

SUBMITTALS.--

Product data.--Product data for items to be incorporated into the work, including structural steel, high strength bolts, nuts and washers and alternative connectors, shall be submitted for approval.

Shop drawings.--Shop drawings and calculations shall be submitted for approval.

Shop drawings shall show any changes proposed in the work, details of connections and joints exposed to the weather, details for connections not dimensioned on the plans, the sequence of shop and field assembly and erection, welding sequences and procedures. If required, the location of butt welded splices on a layout drawing of the entire structure, and the location and details of any temporary supports that are to be used.

Calculations and shop drawings for falsework to be used for the erection of structural steel shall be submitted for approval. The falsework shall be designed and constructed to provide the necessary rigidity and to support loads which will be applied. Shop drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown.

CLOSEOUT SUBMITTALS.--

Final drawings.--At the completion of each building on the contract, one set of reduced prints on 27 kg (minimum) bond paper, 280 mm x 432 mm in size, of the corrected original tracings of all approved drawings for each building shall be furnished to the Engineer. An index prepared specifically for the drawings for each building containing sheet numbers and titles shall be included on the first reduced print in the set for each building. Reduced prints for each building shall be arranged in the order of drawing numbers shown in the index.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided on the upper left side of each page to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

QUALITY ASSURANCE.--

Qualifications for welding.--A certified copy of qualification test record for welders shall be submitted to the Engineer at the jobsite. Descriptive data for equipment for field welding structural steel, including type and electric power requirements, shall be submitted for approval.

Welders shall be qualified in accordance with "Welder Qualification," procedures of AWS D1.1, "Structural Welding Code-Steel.", current edition.

Certificates of Compliance.--Certificate of Compliance shall be furnished for structural steel products in accordance with the requirements specified in Section 4-1.04, "Certificates of Compliance," of the General Conditions. Certificate of Compliance shall include mill test certificates for each heat number used in the work.

DELIVERY, HANDLING AND STORAGE.--

Structural materials shall be loaded, transported, unloaded and stored so that it is kept clean and undamaged. Material shall be stored above ground on platforms, skids, or other supports. Covers and protection shall be provided to protect the materials from corrosion.

Anchorage and anchor bolts, which are to be embedded in concrete or masonry, shall be delivered in ample time to not delay the work.

PART 2.- PRODUCTS

MATERIALS.--

Steel bars, plates and shapes.--

Steel bars, plates and shapes shall conform to ASTM Designation: A 36/A 36M or A 572/A 572M, Grade 50 [345].

Pipe.--

Pipe shall conform to ASTM Designation: A 53, standard weight, unless otherwise shown on the plans.

Hollow Structural Section.--

Hollow structural section shall conform to ASTM Designation: A 500, Grade B.

Stud connectors.--

Stud connectors shall conform to ASTM Designation: A 108, Grades 1018 through 1020, cold drawn, either semi- or fully killed.

Anchor bolts, nuts and washers.--

Nonheaded anchor bolts shall conform to ASTM Designation: A 36/A 36M, with a minimum hook length of 6.2 diameters.

Headed anchor bolts shall conform to ASTM Designation: A 307.

Nuts shall conform to ASTM Designation: A 563M, Grade A.

Washers for anchor bolts shall be commercial quality.

Machine bolts, nuts and washers.--

Machine bolts and nuts shall conform to ASTM Designation: A 307.

Washers for machine bolts shall be commercial quality.

Inorganic zinc primer.--

Inorganic zinc primer shall be used for exposed or partially exposed structural steel. Inorganic zinc primer shall be a waterborne inorganic zinc primer conforming to the requirements of AASHTO Designation: M 300-92 I, Type II. Inorganic zinc primer shall be listed on the qualified products list which may be obtained from the Transportation Laboratory, (916) 227-7000.

Mortar.--

Mortar shall consist of one part cement, measured by volume, to 2 parts clean sand and only enough water to permit placing and packing.

FABRICATION.--

Shop fabrication and assembly.--Workmanship and finish shall be equal to the best general practice in modern shops.

Cuts shall not deviate more than 2 mm from the intended line. Roughness, notches or gouges shall be removed.

Bearing stiffeners at points of loading shall be square with the web and shall have at least 75 percent of the stiffener in contact with the flanges.

Finished members shall be true to line, shall have square corners and smooth bends and shall be free from twists, kinks, warps, dents and open joints.

Exposed edges and ends of metal shall be dressed smooth, with no sharp edges and with corners slightly rounded.

Stud connectors.--Steel surfaces shall be prepared as recommended by the manufacturer of the stud connectors. Stud connectors shall be welded to the flanges of beams or girders as shown on the plans. Automatic end welding of headed stud connectors shall be in accordance with the manufacturer's instructions.

Connections.--Abutting surfaces at connections shall be clean.

Cutting and welding at the jobsite will not be allowed except as shown on the approved drawings or specifically approved by the Engineer.

Finished holes for bolts shall be cylindrical and perpendicular to the plane of the connection. Subpunched and subdrilled holes shall be 6 mm smaller in diameter than the diameter specified for the finished hole.

Bolted Connections.--Bolts for connecting steel to steel shall be machine bolts conforming to ASTM Designation: A 307 as shown on the plans.

Bolts attached to structural steel, nuts, and washers shall be galvanized by mechanically deposited coating.

Holes for other work.--Holes for securing other work to structural steel and passage of other work through steel framing members shall be as shown on the approved drawings.

Threaded nuts or specialty items for securing other work to steel members shall be as shown on the approved drawings.

Holes shall be cut, drilled or punched perpendicular to metal surfaces. Holes shall not be flame cut or enlarged by burning. Holes are to be drilled in bearing plates.

SHOP PAINTING.--

General.--Structural steel members, except those to receive sprayed-fireproofing, shall be painted.

Surface preparation.--Surfaces of structural steel to receive inorganic zinc primer shall be blast cleaned in accordance with Steel Structures Painting Council, SSPC-SP 10, "Near-White Blast Cleaning."

Bolted connections.--Contact surfaces of high strength bolted connections and ungalvanized anchor bolt assemblies shall be blast cleaned and coated with waterborne inorganic zinc primer before assembly. The total thickness of primer on each surface shall be between 0.025 mm to 0.076 mm and may be applied in one application.

Painting.--Immediately after surface preparation, surfaces of structural steel shall receive an undercoat of waterborne inorganic zinc primer. Color shall essentially match Federal Standard 595B, No. 36373.

The manufacturer's published mixing and application instructions for inorganic zinc primer shall be followed.

Surface preparation.--Surfaces of structural steel to be painted shall be blast cleaned in accordance with Steel Structures Painting Council, SSPC-SP 6, "Commercial Blast Cleaning."

Bolted connections.--Contact surfaces of high strength bolted connections and ungalvanized anchor bolt assemblies shall be blast cleaned and primed with red oxide primer designed for steel surfaces before assembly. The total thickness of primer on each surface shall be between 0.025 mm to 0.076 mm and may be applied in one application.

Painting.--Immediately after surface preparation, surfaces of structural steel shall receive an undercoat of red oxide primer designed for steel surfaces.

PART 3.- EXECUTION

ERECTION AND ASSEMBLY.--

Field splices.--Field splices shall be made only at the locations shown on approved shop drawings.

The parts shall be accurately assembled in their final position as shown on the plans and in true alignment with related and adjoining work before final fastening.

All parts shall be supported adequately and at locations to provide a vibration free, rigid, and secure installation.

Bolted connections.--The bolt head type and head location shall be consistent within a joint.

Nuts shall be on side of member least exposed to view.

Setting bases and bearing plates.--Concrete and masonry surfaces shall be cleaned and roughened to improve bond. Bottom of base and bearing plates shall be clean.

Base plates and bearing plates for structural members shall be set on wedges or other adjusting devices.

Anchor bolts shall be wrench tightened after supported members have been positioned and plumbed.

Mortar shall be solidly packed between bearing surfaces and base or bearing plates to ensure that no voids remain. Exposed surfaces shall be finished and allowed to cure.

FIELD PAINTING.--

Touch-up painting.--After erection, the Contractor shall clean field welds, bolted connections, and abraded areas of shop paint and apply the same materials as applied for shop painting.

Surfaces which are scheduled to receive finish coats shall be painted with an additional prime coat and finish coats in accordance with the requirements specified for shop primed steel under "Painting" in Division 9.

QUALITY CONTROL.--

Testing and inspection.--Ultrasonic examination shall be performed by the Contractor on at least 50 percent of all full penetration butt-welded splices in accordance with the requirements of AWS D1.1 and these special provisions.

Welding procedures and methods shall be subject to inspection for conformance with AWS D1.1.

Butt welds shall be tested in accordance with AWS D1.1, Chapter 6, Part C, Ultrasonic Testing of Groove Welds.

Examination, reporting and disposition of tests shall be in accordance with the provisions of 6.12, AWS D1.1.

In addition to ultrasonic examinations by the Contractor, welds may be subject to inspection or non-destructive testing by the Engineer.

When additional inspection or non-destructive testing is required by the Engineer, the Contractor shall provide sufficient access facilities in the shop and at the jobsite to permit the Engineer or his agent to perform such inspection and testing.

The Contractor shall correct all deficiencies in the structural steel work which inspections and laboratory test reports have indicated to be not in compliance with these special provisions. Additional tests shall be performed by the Contractor at his expense to reconfirm any non-compliance of original work, and to show compliance of the corrected work.

5.02 COLD FORMED METAL FRAMING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing cold formed metal framing in accordance with the details shown on the plans and these special provisions.

SYSTEM DESCRIPTION.--

Loadings.--Wall system shall be designed to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclical day/night temperature range.

Wall system design shall accommodate construction tolerance, deflection of building structural members, and clearances of intended openings.

REFERENCES.--

Component design.--Structural properties of studs and joists shall be computed in accordance with American Iron and Steel Institute (AISI), "Specification for Designing of Cold-Formed Steel Structural Members."

Welding.--Welding shall be in accordance with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel," current edition.

Welders shall be qualified in accordance with "Welder Qualification," procedures of AWS D1.1, "Structural Welding Code-Steel," current edition.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions for each item of cold-formed metal framing and accessories shall be submitted for approval.

Installation instructions shall include instructions for securing studs to tracks and other framing connections.

Shop drawings.--Shop drawings and calculations for cold formed metal framing components not fully dimensioned in manufacturer's descriptive data shall be submitted for approval.

Shop drawings shall include framing members showing size and gage designations, number, type, location and spacing. Shop drawings shall include supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.

QUALITY ASSURANCE.--

Fire-rated assemblies.--Where cold formed metal framing units are components of assemblies indicated to be fire-rated, provide units which have been approved for the rating indicated on the plans.

DELIVERY, STORAGE AND HANDLING.--

General.--Cold formed metal framing components shall be protected from rusting and damage. Components shall be delivered to the jobsite in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Components shall be stored off ground in a dry ventilated space.

PART 2.- PRODUCTS

COLD FORMED METAL FRAMING.--

Steel studs, joists and rafters.--

Load-bearing studs shall be formed to channel shape, punched web, and knurled faces, conforming to ASTM Designation: A 653/A 653M, Grade 50 [340].

Joists, rafters, and other framing components shall be fabricated of commercial quality galvanized steel sheets; conforming to ASTM Designation: A 653/A 653M, Grade 50 [340].

Steel Track.--

Track shall be formed steel, channel shape, and same width as studs; solid web; conforming to ASTM Designation: A 653/A 653M, Grade 50.

ACCESSORIES.--

Fasteners.--

Fasteners shall be hot-dipped galvanized, self-drilling, self-tapping screws, or bolts, nuts and washers.

Anchorage.--

Anchorage shall be ICBO approved for the purpose intended, integral stud type, powder driven or drilled expansion bolts.

FINISHES.--

Studs, track and headers.--

Studs, tracks and headers shall be hot-dipped galvanized to conform to ASTM Designation: A 653M, G60.

Miscellaneous metal parts.--

Miscellaneous parts, including, bracing, furring, plates, gussets, and bridging, shall be hot dipped galvanized to not less than 381 kilograms per square meter.

FABRICATION.--

General.--Cold formed metal framing components shall be fabricated in place or prefabricated into panels to the maximum extent possible prior to erection. Panels shall be fabricated plumb, square, true to line and braced against racking with joints welded. Lifting of prefabricated panels shall be performed in a manner to prevent damage or distortion.

Panels shall be fabricated in jig or templates to hold members in proper alignment and position to assure accurate placement.

Fastenings.--Components shall be fastened by shop welding, bolting or screw fasteners as shown on the approved drawings.

PART 3.- EXECUTION

INSTALLATION.--

Studs.--Studs shall be erected plumb, except as needed for diagonal bracing or similar requirements. Channel tracks shall be aligned accurately to the wall layout at both floor and ceiling. Tracks shall be secured to floor and ceiling. Fasteners shall be provided at corners and ends of track.

Studs shall extend from floor to underside of ceiling except at wall openings. Each stud shall be secured to tracks at both top and bottom by bolting or screw fastening at both inside and outside flanges. Field welding shall not be permitted. A 12 mm clearance shall be provided at the top shoes. Door openings shall have double studs continuous across head and from floor to ceiling on each jamb.

Studs at openings shall be fastened solidly and securely to floor clips. Floor clips shall be fastened to the floor with 2 anchors unless otherwise shown on the plans.

Supplemental framing, blocking and bracing shall be installed in steel stud system wherever walls or partitions are to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition.

One continuous, horizontal 19 mm channel reinforcement shall be placed approximately 152 mm above all wall openings. The reinforcement shall pass through the web openings in the studs and shall extend through the first stud located beyond the double studs at either side of the opening and shall be saddle tied to each stud it passes through.

Joists and rafters.--Joists and rafters shall be installed directly over bearing studs or a load distribution member shall be installed at the top track.

Web stiffeners shall be provided at reaction points where shown on the plans.

Ends of joists shall be reinforced with end clips, steel hangers, steel angle clips, steel stud section, or as otherwise recommended by the manufacturer.

Joists shall be secured to interior support systems to prevent lateral movement of bottom flanges.

5.03 BUILDING MISCELLANEOUS METAL

PART 1.- GENERAL

Scope.--This work shall consist of fabricating, furnishing and installing building miscellaneous metal in accordance with the details shown on the plans and these special provisions.

Building miscellaneous metal shall consist of the following:

Guard railing and handrailing
Stair riser plates

including all anchors, fastenings, hardware, accessories and other supplementary parts necessary to complete the work.

REFERENCES.--

Codes and standards.--Welding of steel shall be in accordance with American Welding Society (AWS) D 1.1, "Structural Welding Code-Steel" and D 1.3, "Structural Welding Code-Sheet Steel," current editions.

SUBMITTALS.--

Product data.--Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications.

ICC-ES reports for drill and bond anchors, mechanical expansion anchors, and concrete screws shall be submitted for approval.

Shop drawings.--Shop drawings of fabricated items shall be submitted for approval.

QUALITY ASSURANCE.--

Qualifications for welding.--Welders shall be qualified in accordance with "Welder Qualification," procedures of AWS D1.1, "Structural Welding Code-Steel.", current edition.

Shop assembly.--Preassemble items in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark all units for reassembly and installation.

Inspection and tests.--Materials and fabrication procedures shall be subject to inspection and tests by the Engineer, in mill, shop and field. Such tests will not relieve the Contractor of responsibility of providing materials and fabrication procedures in compliance with specified requirements.

PART 2.- PRODUCTS

MATERIALS.--

Steel bars, plates and hot-rolled shapes.--

Steel bars, plates and hot-rolled shapes shall conform to ASTM Designation: A 36/A 36M.

Galvanized sheet steel.--

Galvanized sheet steel shall conform to ASTM Designation: A 653/A 653M, Grade 33 [230]. Galvanizing shall be G60 [Z180].

Pipe.--

Pipe shall be conform to ASTM Designation: A53, standard weight unless otherwise shown on the plans.

Bolts, studs, threaded rods, nuts and washers.--

Bolts, studs, threaded rods, and nuts for general application shall conform to ASTM Designation: A 307. Washers shall be commercial quality.

Fittings.--

Brackets, bolt, threaded studs, nuts, washers, and other fittings for railings and handrailings shall be commercial quality pipe and fittings.

Expansion anchors.--

Expansion anchors shall be ICBO approved for the purpose intended, integral stud type anchor or internally threaded type with independent stud, hex nut and washer, for use in concrete and grout-filled concrete masonry.

Powder driven anchors.--

Powder driven anchors shall be plated, spring steel alloy drive pin or threaded stud type anchors for use in concrete or steel. Spring steel shall conform to ASTM Designation: A 227M, Class 1. The diameter, length and type of shank and the number and type of washer shall be as recommended by the manufacturer for the types and thickness of material being anchored or fastened.

Drill and Bond anchors.--

Drill and bond anchors shall be an adhesive anchor system consisting of adhesive components in a dual cartridge and threaded steel rod for use in concrete and grout-filled concrete masonry. Threaded rods shall be carbon steel conforming to ASTM A307, Grade C or ASTM A 193, Grade B7, or stainless steel conforming to ASTM F593, CW.

Anchors installed on outside of building shall be stainless steel.

Concrete screws.--

Concrete screws shall be threaded screw with hex-washer heads. Concrete screws shall be manufactured from steel conforming to AISI C1022.

Mortar.--

Mortar shall consist of one part cement, measured by volume, to 2 parts clean sand and only enough water to permit placing and packing.

FABRICATION.--**Workmanship and finish.--**Workmanship and finish shall be equal to the best general practice in modern shops.

Miscellaneous metal shall be clean and free from loose mill scale, flake rust and rust pitting, and shall be well formed and finished to shape and size with sharp lines and angles. Bends from shearing or punching shall be straightened.

The thickness of metal and details of assembly and support shall give ample strength and stiffness.

Built-up parts shall be true to line and without sharp bends, twists and kinks. Exposed ends and edges of metal shall be milled or ground smooth, with corners slightly rounded.

Joints exposed to the weather shall be made up to exclude water.

Galvanizing.--Items indicated on the plans to be galvanized shall be hot-dip galvanized after fabrication. The weight of galvanized coating shall be at least 460 grams per square meter of surface area.

Painting.--Building miscellaneous metal items not galvanized shall be cleaned and prime painted prior to erection in accordance with the requirements specified for steel and other ferrous metals under "Painting" in Division 9, "Finishes," of these special provisions.

Loose bearing and leveling plates.--Loose bearing and leveling plates shall be furnished for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Plates shall be drilled to receive anchor bolts. Galvanize after fabrication.

Steel pipe railings and handrailings.--Pipe handrailing shall consist of handrailing elements supported by metal brackets (wall type) or handrailing elements supported by tubular steel posts (post type).

Ends of railing pipe shall be closed, except for a 3 mm diameter weep hole at the low point.

All corners on railings shall be rounded. Simple and compound curves shall be formed by bending pipe in jigs to produce uniform curvature; maintain cylindrical cross-section of pipe throughout the bend without buckling, twisting or otherwise deforming exposed surfaces of the pipe.

Wall brackets, end closures, flanges, miscellaneous fitting and anchors shall be provided for interconnections of pipe and attachment of railings and handrails to other work. Inserts and other anchorage devices shall be furnished for connecting railings and handrails to concrete or masonry.

Steel railing shall be galvanized after fabrication. After galvanizing, all elements of the railing shall be free of fins, abrasions, rough or sharp edges, and other surface defects and shall not be kinked, twisted or bent.

PART 3.- EXECUTION

GENERAL.--

Anchorage.--Anchorage devices and fasteners shall be provided for securing miscellaneous metal in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws and other connectors.

Cutting, drilling and fitting shall be performed as required for installation of miscellaneous metal fabrications. Work is to set accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

Loose leveling and bearing plates.--Plates shall be set on wedges or other adjustable devices. Anchor bolts shall be wrench tightened after the plates have been positioned and plumbed. Mortar shall be packed solidly between bearing surfaces and plates to ensure that no voids remain.

Steel pipe railings and handrailings.--Railings shall be adjusted prior to anchoring to ensure matching alignment at abutting joints. Secure posts and railing ends to building construction as shown on the plans.

Resin capsule anchors shall not to be used for anchoring railings and handrailings.

Powder driven anchors.--Powder driven anchors shall be installed with low velocity powder actuated equipment in accordance with the manufacturer's instructions and State and Federal OSHA regulations.

Drill and bond anchors and mechanical expansion anchors.--Drill and bond anchors and mechanical expansion anchor shall be installed in accordance with the manufacturer's instructions and requirements of the ICC-ES report. Installation requires special inspection in accordance with Section 1701 of the UBC and the requirements of the ICC-ES report. Locate anchors to avoid existing steel reinforcement.

Concrete screws.—Concrete screws shall be installed in accordance with manufacturer's instruction and requirements of the ICC-ES report.

DAMAGED SURFACES.--

General.--Galvanized surfaces that are abraded or damaged at any time after the application of the zinc coating shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating, after which the clean areas shall be painted with 2 applications of unthinned zinc-rich primer (organic vehicle type). Aerosol cans shall not be used.

5.04 ALUMINUM LADDER

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing aluminum ladder with telescoping safety post in accordance with the details shown on the plans and these special provisions.

The aluminum ladder shall conform to the requirements of Title 8 "General Industry Safety Orders" Section 3277, "Fixed Ladders. "

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for products and processes used in ladder with telescoping safety post shall be submitted for approval.

Shop drawings.--Shop drawings of ladder with telescoping safety post shall be submitted for approval.

DELIVERY, STORAGE AND HANDLING.--

Storage.--Ladder with telescoping safety post shall be stored in clean, dry location, away from uncured concrete and masonry, protected from damage of any kind. Ladder with telescoping safety post shall be covered with waterproof paper, tarpaulin, or polyethylene sheeting. Allow for air circulation.

PART 2.- PRODUCTS

MATERIALS.--

Roof access ladder.--

Roof access ladder shall be floor and wall mounted. Rungs shall be deeply serrated, 32 mm, non-slip high strength 6063-T6 aluminum. Rungs shall be able to withstand a 450 kilogram load without failure.

Side rail shall be 3 mm minimum wall thickness by 76 mm wide, heavy duty tubular, and high strength 6063-T5 aluminum. Construction shall be self-locking stainless steel fasteners, full penetration TIG welds, and clean, smooth and burr-free surfaces.

Brackets, flanges, fittings and anchors.--

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Brackets, flanges, fittings and anchors shall be the manufacturer's standard for interconnection of ladder handrail and railing members to other work.

Fasteners.--

Fasteners shall be of adequate size to provide a 4:1 safety factor, based on ultimate loading, and shall be an integral part of the fixed ladder.

Telescoping safety post.--

Telescoping safety post shall be an aluminum tubular section that locks automatically when fully extended. Upward and downward movement shall be controlled by a stainless steel spring balancing mechanism.

PART 3.- EXECUTION

INSTALLATION.--

General.--The ladder shall be installed rigidly, securely, and plumb in accordance with the manufacturer's recommendations.

Corrosion protections.--Aluminum surfaces to be in contact with grout or concrete materials shall be given a heavy coat of alkali-resistant bituminous paint or zinc chromate primer.

An isolation coating shall be provided on aluminum surfaces in contact with dissimilar metals.

CLEANING.--

General.--Paint, dirt, stains and grout shall be removed without marring or scratching the aluminum surfaces. Solvents and cleaning compounds shall be chemically compatible with the anodic coating and aluminum.

PROTECTION.--

General.--Finishes of ladder with telescoping safety post shall be protected from damage during constructions by use of temporary protective coverings. Coverings are to be removed upon completion of the work.

Finishes damaged during installation and construction shall be restored so that no evidence remains of construction work.

DIVISION 6. WOOD AND PLASTICS

6.01 ROUGH CARPENTRY

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing materials and performing rough carpentry work including wood framing, furring, and sheathing in accordance with the details shown on the plans and these special provisions.

Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed.

SUBMITTALS.--

Product Data.--Manufacturer's material data and installation instructions shall be submitted for gypsum sheathing, framing hardware and underlayments.

Wood treatment data.--Chemical treatment manufacturer's instructions shall be submitted for the handling, sorting, installation, and finishing of treated materials.

For each type of preservative treatment used, certification by treating plant shall include type of preservative solution and pressure process used, net amount of preservative retained and conformance with the applicable standards of the American Wood Preservers Association.

For each type of fire-retardant treatment, include certification by treating plant that the treated material complies with the applicable standards and other requirements.

DELIVERY, HANDLING AND STORAGE.--

Delivery and storage.--Materials shall be kept under cover and dry. All materials shall be protected from exposure to weather and contact with damp or wet surfaces with blocking and stickers. All lumber, plywood and other panels shall be stacked in such a manner to provide air circulation within and around the stacks.

PART 2.- PRODUCTS

LUMBER.--

General.--Lumber shall be manufactured to comply with PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection.

Softwood lumber shall be quality grade stamped or shall be accompanied by a certificate of inspection. Inspection certificates or grade stamps shall indicate compliance with the grading requirements of WWPA, WCLIB, RIS, or other approved lumber inspection agencies.

All lumber used shall be nominal sized and dressed S4S unless otherwise specified in these special provisions.

Framing lumber shall be solid stock lumber, Douglas Fir-Larch, and the grades indicated under WCLIB or WWPA rules. Moisture content shall not exceed 19 percent and shall be grade stamped "S-Dry."

DIMENSION LUMBER.--

Except as otherwise shown on the plans, lumber shall have the following grades.

Vertical framing lumber.--

Vertical framing lumber, nominal 51 mm x 51 mm through 102 mm x 102 mm, shall be Construction grade or better.

Vertical framing lumber, nominal 51 mm x 152 mm through 102 mm x 152 mm shall be No. 2 or better.

Horizontal framing lumber.--

Horizontal framing lumber, nominal 51 mm x 102 mm and wider, including joists and rafters, shall be No. 2 or better.

Horizontal framing lumber, nominal 102 mm x 102 mm and wider, including joist and rafters, shall be No. 1 or better.

Exposed framing lumber.--

Exposed framing lumber which is not concealed and is to receive a stain or natural finish shall be the same grade and species as indicated for structural framing and hand selected for appearance.

Miscellaneous lumber.--

Miscellaneous lumber for support or attachment of other work including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members shall be not less than No. 2 or better.

Lumber in contact with concrete or masonry construction shall be pressure treated Douglas Fir-Larch.

TIMBERS.--

Materials for patching, extending, and matching.--

Diagonal sheathing and tongue and groove straight sheathing provide same products as in existing structure as needed to patch, extend, or match existing work. Determine products by inspection and testing as necessary by reference to existing as sample of comparison.

PLYWOODPANELS.--

General.—Plywoodpanels shall comply with Voluntary Product Standard PS1, "U. S. Product Standard for Construction and Industrial Plywood."

Plywood panels shall be Group 1 unless otherwise noted.

Each plywood panel shall be factory marked with APA or other trademark evidencing compliance with grade requirements.

Structural plywood wall sheathing.--

Structural plywood wall sheathing for walls shall be APA RATED SHEATHING, Exposure 1. Thickness and grade shall be as shown on the plans.

Structural plywood roof sheathing.--

Structure plywood roof sheathing shall be APA RATED SHEATHING, Exposure 1. Span rating, thickness and grade shall be as shown on the plans.

Structure plywood roof sheathing in exposed overhangs shall be APA RATED SHEATHING, A-C, Exterior, Group 1. Thickness shall be the same as the remainder of the sheathing.

MISCELLANEOUS MATERIALS.--

Rough Carpentry Hardware.--

Steel plates and rolled sections shall be mild, weldable steel, conforming to AISI grades 1016 through 1030 except 1017.

Nails, screws, bolts, nuts, washers shall be commercial quality. Exposed fasteners shall be hot dipped galvanized or stainless steel.

Joist hangers, clips and other standard framing hardware shall be ICBO approved, commercial quality, galvanized sheet steel or hot dipped galvanized, of the size shown on the plans.

Expansion anchors and powder driven anchors shall be as specified under "Building Miscellaneous Metal," in Division 5, "Metals," of these special provisions.

Nails.--

Nails shall conform to ASTM F 1667-95. "Common" nails shall conform to the following table:

Nail Size	Length (mm)	Diameter (mm)
8d	63.5	3.33
10d	76.2	3.76
16d	88.9	4.11

Building paper.--

Building paper shall be kraft type waterproofing building paper, Type I (No. 15) asphalt saturated roofing felt or high density, bonded polyethylene fiber building paper.

Adhesive.--

Adhesive for plywood glue-nailed systems shall conform to APA Specification: AFG-01.

WOOD TREATMENT BY PRESSURE PROCESS.--**Preservative treatment.--**

Preservative treatment shall be copper naphthenate, pentachlorophenol or water-borne arsenicals (ACA, CCA or ACZA).

The following items shall be treated:

Wood cants, nailers, curbs, equipment support bases, blocking, stripping and similar members in connection with roofing, flashing, vapor barriers and waterproofing.

Wood sills, sleepers, blocking, furring and other similar members in contact with concrete or masonry.

All holes, daps and cut ends of treated lumber shall be thoroughly swabbed with 2 applications of copper naphthenate.

Fire retardant treatment.--

Fire retardant treatment shall be paintable, odorless fire retardant preservative applied by pressure treating methods.

PART 3.- EXECUTION**INSTALLATION.--**

Wood framing.--Wood framing shall be in accordance with Chapter 23 of the California Building Code.

Framing members shall be of sizes and spacing shown on the plans. Unless otherwise shown on the plans, structural members shall not be spliced between supports.

Wood framing shall be accurately cut and assembled to provide closely fitted members. Framing shall be erected true to the lines and grades shown on the plans and shall be rigidly secured in place as shown and as required by recognized standards. Bracing shall be placed wherever necessary to support all loads on the structure during erection.

The size and spacing of fasteners and the edge distance for nails shall be as shown on the plans.

Nailing schedule shall be as shown on the plans and shall comply with the California Building Code.

Wall coverings exposed to the weather shall have a backing of building paper applied weatherboard fashion to the framing or sheathing. Backing shall be lapped 50 mm at horizontal joints, 152 mm at vertical joints and 305 mm at building corners.

Plywood panels.--Plywood panels shall be attached to the framing as shown on the plans and these special provisions. All structural plywood sheathing (both roof and wall) shall be nailed with "Common" nails.

Plywood sheathing shall be nailed to the framing system and shall be continuous over 2 or more supports. Roof and floor panels shall be installed with the long dimension across the supports, with end joints staggered 1.22 m. Wall sheathing shall have all edges blocked. Spacing between panels shall be 3 mm.

6.02 PRE-ENGINEERED WOOD TRUSSES**PART 1.- GENERAL****SUMMARY.--**

Scope.--This work shall consist of designing, fabricating, furnishing and erecting pre-engineered, factory fabricated wood trusses in accordance with the details shown on the plans and these special provisions.

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SUBMITTALS.--

Product data.--Manufacturer's data for lumber, metal plates, hardware and fabrication process shall be submitted for approval.

Shop drawings.--Complete shop drawings, erection drawings, if required, and design calculations for the pre-engineered wood trusses and permanent bracing shall be submitted for approval. Submittals shall be approved prior to the start of fabrication.

Shop drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown. Engineer's original signature shall be submitted, copies will not be accepted.

Shop drawings shall show the lumber size, species and grades for all truss and temporary and permanent bracing members. Joint and connection details shall be shown.

Shop drawings shall include a location plan which shows the location and identification of each truss.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of Compliance shall be furnished for trusses in accordance with the requirements specified in Section 4-1.04, "Certificates of Compliance," of the General Conditions.

Codes and standards.--Wood trusses and permanent bracing shall be designed for the loads shown on the plans. The design shall be in accordance with the requirements of the CBC, the "National Design Specification for Wood Construction" by the National Forest Products Association (NFPA), the "Timber Construction Standards" by the American Institute of Timber Construction (AITC) and the "Design Specifications for Light Metal Connected Wood Trusses" by the Truss Plate Institute (TPI).

Wood trusses with light metal plate connectors shall be fabricated in accordance with the requirements of the CBC Section 2343.

DELIVERY, STORAGE AND HANDLING.--

Trusses shall be transported and handled in such a manner as to prevent damage due to warping, distortion and moisture.

Trusses shall be stored off the ground in such a manner as to avoid damage from bending, overturning or other cause for which the truss is not designed to resist or endure.

PART 2.- PRODUCTS

Pre-engineered truss.--

Pre-engineered truss shall be factory fabricated pre-engineered truss sized to fit the location shown on the plans. Lumber sizes, species and grades shall be as shown on the approved shop drawings. Lumber shall bear grade marks of a recognized grading association and the moisture content of the lumber shall be within the amount specified in the referenced specifications.

Connector plates.--

Connector plates shall be galvanized sheet steel conforming to ASTM Designation: A 653/A 653M, Grade 33 [230]. Zinc coating by hot dip galvanizing shall conform to ASTM Designation: A 924/A 924M, G60 [Z180].

Steel plates and rolled sections.--

Steel plates and rolled sections shall be mild, weldable steel, AISI grades 1016 through 1030 except 1017.

Bolts, nuts and washers.--

Bolts, nuts and washers shall conform to ASTM Designation: A 307.

FABRICATION.--

General.--Truss and bracing members shall be accurately cut to length and shape to provide tightly fitted joints.

Connectors, framing anchors and other hardware accessories shall be coordinated for placement in the proper locations and positions.

Camber, if required by the design, shall be built into the trusses.

Each truss shall be stamped or marked with a location identification mark or symbol and with the name and address of the manufacturer.

PART 3.- EXECUTION

INSTALLATION AND ERECTION.--

General.--Trusses shall be erected plumb and true and shall be secured rigidly in place in accordance with the truss manufacturer's recommendations.

Fasteners and connectors shall be placed as shown on the plans and as recommended by the truss manufacturer.

Longitudinal and transverse bracing shall be installed during erection to hold the trusses plumb and true and in a safe position until sufficient permanent construction is in place to provide full stability.

All permanent bracing shall be secured in place before any sustained permanent loads are applied to the roof truss system.

Materials loaded on the truss system shall be located in such a manner that the design load of the trusses is not exceeded in the area of placement of the loads.

6.03 FINISH CARPENTRY

PART 1.- GENERAL

SUMMARY.--

Scope.--This work consists of furnishing and installing materials and performing finish carpentry, including exterior and interior trim, as shown on the plans and these special provisions.

Finish carpentry includes carpentry work not specified as part of other sections and which is generally exposed to view.

SUBMITTALS.--

Product data.--Manufacturer's specifications and installation instructions for each item of factory-fabricated siding and paneling.

Samples.--One sample shall be submitted to the Engineer at the jobsite for each species and cut or pattern of finish carpentry as shown below:

Exterior standing and running trim - 610 mm long x full board or molding width, finished on one side and one edge.

Interior standing and running trim - 610 mm long by full board or molding width, finished on one side and one edge.

QUALITY ASSURANCE.--

Factory marks.--Each piece of lumber and plywood shall be marked with type, grade, mill and grading agency identification. Marks shall be omitted from surfaces to receive transparent finish. A mill certificate stating that material has been inspected and graded in accordance with requirements shall be furnished if marks cannot be placed on concealed surfaces.

PRODUCT DELIVERY, STORAGE AND HANDLING.--

Delivery.--Carpentry materials shall be delivered after painting, wet work and similar operations have been completed.

Protection.--Finish carpentry materials shall be protected during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

PART 2.- PRODUCTS

WOOD PRODUCT QUALITY STANDARDS.--

Softwood lumber.--Softwood lumber shall conform to the requirements of PS 20, "American Softwood Lumber Standard," with applicable grading rules of inspection.

Plywood.--Plywood shall conform to the requirements of Voluntary Products Standard PS-1, "U. S. Product Standard for Construction and Industrial Plywood."

Hardwood lumber.--Hardwood lumber shall conform to the requirements of the National Hardwood Lumber Association (NHLA) rules.

Woodworking.--Woodworking shall conform to the requirements of Woodwork Institute of California (WIC), "Manual of Millwork."

MATERIALS.--

General.--Lumber sizes indicated shall be nominal sizes except as indicated by detailed dimensions. Lumber which is to be dressed or worked and dressed shall be manufactured to the actual sizes as required by PS 20.

Lumber that is to receive a transparent finish (stained or clear) shall be made of solid lumber stock.

Lumber that is to be painted may be solid or glued-up lumber at the contractor's option.

Glued-up lumber for exterior finish work shall comply with PS 56 for "wet use" and be so certified by the inspection agency.

Exterior standing and running trim.--

Standing and running trim in the form of boards or worked products shall be clear, all heart Redwood.

Trim to be painted shall be finished smooth.

Trim which is to be exposed to view and to receive transparent finish (stained or clear) shall be saw textured.

Interior standing and running trim.--

Standing and running trim to be painted shall be paint-grade pine, solid stock or finger jointed.

Standing and running trim to have transparent finish shall be solid hardwood, species to be shown on the plans.

Miscellaneous Materials.--

Nails, screws and other anchoring devices of the type, size, material and finish required shall be provided for secure attachment, concealed where possible.

Fasteners and anchorages for exterior use shall be hot dip galvanized.

Screens for soffit vents shall be 4 x 4 or 8 x 8 mesh, galvanized screen. Open area shall be not less than 50 percent.

Preservative treatment.--

Preservative treatment shall be copper naphthenate, pentachlorophenol or water-borne arsenicals (ACA, CCA or ACZA).

Wood members, except those of redwood, in contact with mortar setting beds, concrete block walls, slab on grade and other concrete work, and wood used for roofing cant and curbs shall be pressure treated with leach resistant preservative. Each piece of pressure treated lumber shall bear the AWPA label.

All holes, daps, or cuts made after treating shall be thoroughly swabbed with copper naphthenate

Fire retardant treatment.--

Fire retardant treatment shall be paintable, odorless fire retardant preservative applied by pressure treating methods.

PART 3.- EXECUTION

INSTALLATION.--

General.--All work shall be installed plumb, level and true with no distortions.

Standing and running trim.--Standing and running trim shall be installed with minimum number of joints possible, using full length pieces to the greatest extent possible.

Exterior joints shall be made water-resistant by careful fitting.

Anchor finish carpentry.--Finish carpentry shall be anchored to framing or blocking built in or attached directly to the substrate.

ADJUSTMENT, CLEANING, FINISHING AND PROTECTION.--

General.--Damaged and defective finish carpentry work shall be repaired or replaced.

All exposed or semi-exposed surfaces shall be cleaned.

Finish carpentry shall be finished in accordance with the requirements specified under "Painting" in Division 9, "Finishes," of these special provisions.

6.04 ACCESSIBLE STATION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing an accessible station as shown on the plans and in these special provisions.

The accessible station shall include wood cabinets, plastic laminate tops, splashes, and returns.

SUBMITTALS.--

Product data.--Manufacturer's product data for plastic laminates and cabinet hardware shall be submitted for approval.

Samples.--Three samples shall be submitted for each of the items shown below:

Plastic laminate, 203 mm x 254 mm for each type, color, pattern and surface finish.

Shop drawings.--Shop drawings for cabinets showing location of cabinets, dimensioned plans and elevations, attachment devices and other components shall be submitted for approval. Shop drawings shall bear the "WIC Certified Compliance Label," on the first sheet of the drawings.

QUALITY ASSURANCE.--

Codes and standards.--Cabinets and swinging gate shall be manufactured and installed in accordance with the Manual of Millwork of the Woodwork Institute of California (WIC) requirements for the grade or grades specified or shown on the plans.

Certificates of Compliance.--Prior to delivery to the jobsite, the cabinet manufacturer shall issue a WIC Certified Compliance Certificate indicating that the products he will furnish for this job and certifying that they will fully meet all the requirements of the grade or grades specified.

WIC Certified Compliance Label shall be stamped on all cabinet work and swinging gate.

Each plastic laminate top shall bear the WIC Certified Compliance Label.

Prior to completion of the contract, a WIC Certified Compliance Certificate for Installation shall be delivered to the Engineer.

DELIVERY, STORAGE AND HANDLING.--

Protection.--Cabinets shall be protected during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

PART 2.- PRODUCTS

ACCEPTABLE MANUFACTURERS.--

Manufacturers.--Subject to compliance with these specifications, high pressure decorative laminates shall be Consoweld Corp.; Formica Corp.; Nevamar Corp.; or equal.

MANUFACTURED UNITS.--

General.--Cabinets shall be fabricated to the dimensions, profiles, and details shown on the plans with openings and mortises precut, where possible to receive hardware and other items and work.

Fabrication, assembly, finishing, hardware application, and other work shall be completed to the maximum extent possible prior to shipment to the jobsite.

Laminate clad cabinets.--

Laminate clad cabinets shall be custom grade, flush overlay construction.

Laminate cladding shall be high pressure decorative laminate complying with NEMA LD 3. Color, pattern and finish shall be as shown on the plans. Laminate surface and grade shall be as follows:

Horizontal and vertical surfaces other than tops shall conform to GP-50 (1.27 mm nominal thickness).

Postformed surfaces shall conform to PF-42 (1.07 mm nominal thickness).

Laminated counter tops and splashes.--

Laminated counter tops and splashes shall be WIC custom grade.

Surface material shall be high pressure laminated plastic conforming to NEMA LD-3, 1.27 mm thickness.

Unless otherwise shown on the plans, splashes shall be 102 mm high from the surface of the deck. Back splashes shall be continuous formed and coved. Side splashes shall be top set.

Laminated counter tops self edged, counter tops to receive sinks or plumbing fixtures shall have a bullnose.

The underside of tops and backsides of splashes shall be covered with an approved backing sheet.

CABINET HARDWARE AND ACCESSORY MATERIALS.--

General.--Cabinet hardware and accessory materials shall be provided for cabinets. Hardware shall be provided with standard US 26 D metal plated finish.

Drawer slides.--

Drawer slides shall be side mounting full extension with fully enclosed rolling balls and rollers. Concealed slides and bearings, and positive stop. Capacity shall be not less than 35 kg, except capacity shall be not less than 45 kg for heavy duty drawers.

Door guides.--

Sliding door guides shall be continuous, dual channel, metal guides, top and bottom. Bottom guide shall have crowned track.

Shelf supports.--

Shelf supports shall be adjustable, semi-recessed, chrome finished pressed metal, heavy duty standards and support clip, with one inch adjustment increments.

Cabinet hinges.--

Cabinet hinges shall be steel. Length of jamb leaf shall be 64 mm. The type of hinge shall be as shown on the plans. Cabinet hinge manufacturers shall be Stanley, Hager, McKinney, or equal.

Cabinet catches.--

Cabinet catches shall be self aligning magnetic type in aluminum case with zinc plated steel strike. Cabinet catch manufacturers shall be Stanley, Hager, McKinney, or equal.

Cabinet pulls.--

Cabinet pulls shall be 8 mm diameter rod, with 33 mm projection and 75 mm center to center fastening. Cabinet pull manufacturers shall be Stanley, Hager, McKinney, or equal.

FABRICATION.--

Shop assembly.--Nails shall be countersunk and the holes filled, molds shall be neatly mitered and all joints shall be tight and true.

As far as practicable, work shall be assembled at the mill and delivered to the building ready to be set in place. Parts shall be smoothly dressed and interior work shall be belt sanded at the mill and hand sanded at the building. After assembly, work shall be cleaned and made ready for the specified finish.

Veneer sequence matching shall be maintained of cabinets with transparent finish.

All work shall be prepared to receive finish hardware. Finish hardware shall be accurately fitted and securely fastened as recommended by the manufacturer. Finish hardware shall not be fastened with adhesives.

Drawers shall be fitted with dust covers of 6 mm plywood or hardboard above compartments and drawers except where located directly under tops.

Precut openings.--Openings for hardware, appliances, plumbing fixtures, and similar items shall be precut where possible. Openings shall be accurately located and templates used for proper size and shape. Edges of cutouts shall be smoothed and edges sealed with a water-resistant coating.

PART 3.- EXECUTION

INSTALLATION.--

Cabinets.--Cabinets shall be installed without distortion so that doors and drawers fit openings properly and are accurately aligned. Hardware shall be adjusted to center doors and drawers in openings and to provide unencumbered operation. Installation of hardware and accessory items shall be completed as indicated on the approved drawings.

Laminate tops.--Laminate tops shall be securely fastened to base units and other support systems as indicated on the approved drawings.

Cabinet hardware.--Doors for cabinets shall be equipped with one pair of hinges and one catch per leaf, unless otherwise shown on the plans. Each door leaf shall be equipped with one pull.

Drawers up to 610 mm wide shall have one pull and drawers over 610 mm wide shall have two pulls.

DIVISION 7. THERMAL AND MOSTURE PROTECTION

7.01 INSULATION (GENERAL)

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing insulation in accordance with the details shown on the plans and these special provisions.

Insulation materials shall be as specified in these special provisions, and shall be compatible with existing or new materials incorporated in the building.

SUBMITTALS.--

Product data.--A list of materials, manufacturer's descriptive data, location schedule, and time schedule shall be submitted for approval.

The list of materials to be used shall include the trade name, manufacturer's name, smoke developed and flame spread classification, resistance rating and thickness for the insulation materials and accessories.

Schedules.--A location schedule and time schedule shall be submitted for approval.

The location schedule shall show where each material is to be installed.

The Contractor shall provide the Engineer at the jobsite with an accurate time schedule of the areas of the building to be insulated each day. The time schedule shall be submitted 3 working days in advance of the work.

Samples.--Samples of insulation material shall be submitted to the Engineer at the jobsite.

QUALITY ASSURANCE.--

Codes and standards.--All insulating materials shall be certified to comply with the California Quality Standards for Insulating Materials and shall be listed in the Department of Consumer Affairs publication "Consumer Guide and Directory of Certified Insulation Material."

DELIVERY, STORAGE AND HANDLING.--

General.--Insulating materials shall be delivered to the jobsite and stored in a safe dry location with labels intact and legible.

Insulating materials shall be protected from physical damage and from becoming wet or soiled.

In the event of damage, materials shall be repaired or replaced as necessary to comply with these specifications.

PART 2.- PRODUCTS (Not applicable.)

PART 3.- EXECUTION (Not applicable.)

7.02 BATT AND BLANKET INSULATION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing batt or blanket insulation in accordance with the details shown on the plans and these special provisions.

Batt insulation shall include faced and unfaced batts in walls and ceilings, acoustical batts for sound control and exposed batt or blanket insulation for ceilings and walls.

QUALITY ASSURANCE.--

Laminator's qualifications.--Laminator for bonding polyethylene vapor-retarder to insulating batts shall be approved by the insulation manufacturer.

The name of the laminator shall be submitted with the Product Data.

Codes and standards.--All batt or blanket insulation, including facings such as vapor barriers, shall have a flame-spread rating not to exceed 25 and a smoke density not to exceed 450 when tested in accordance with UBC Standard No. 8-1.

The flame-spread and smoke density limitations do not apply to facings on batt insulation installed between ceiling joists, or in roof-ceiling or wall cavities, provided the facing is installed in substantial contact with the surface of the ceiling or wall finish.

PART 2.- PRODUCTS

INSULATING MATERIALS.--

General.--Fiberglass batts shall be thermal insulation produced by combining glass fibers with thermosetting resins to comply with ASTM Designation: C 665.

Wall insulation.--

Wall insulation shall be R-2.3 K• m²/W fiberglass batts with paper-laminate vapor-retarder membrane on one face. Insulation shall conform to ASTM Designation: C 665, Type II, Class C.

Ceiling insulation.--

Ceiling insulation shall be R-5.3 K• m²/W fiberglass batts with paper-laminate vapor-retarder membrane on one face. Insulation shall conform to ASTM Designation: C 665, Type II, Class C.

Acoustical insulation.--

Acoustical insulation shall be 89 mm, unfaced fiberglass insulation batts. Insulation shall conform to ASTM Designation: C 665, Type I.

Exposed insulation.--

Exposed insulation shall be fiberglass batts with foil-paper vapor-retarder membrane on one face. Insulation shall conform to ASTM Designation: C 665, Type III, Class A. Exposed insulation for ceilings shall be $R-5.3 \text{ K} \cdot \text{m}^2/\text{W}$ and $R-2.3 \text{ K} \cdot \text{m}^2/\text{W}$ for walls.

Exposed insulation shall be fiberglass batts with bonded polyethylene vapor-retarder membrane on one face. Insulation shall conform to ASTM Designation: C 665, Type I. Exposed insulation for ceilings shall be $R-5.3 \text{ K} \cdot \text{m}^2/\text{W}$ and $R-2.3 \text{ K} \cdot \text{m}^2/\text{W}$ for walls.

VAPOR-RETARDERS.--**Paper-laminate vapor-retarder.--**

Paper-laminate vapor-retarder shall be kraft paper sheets laminated together with asphalt or other vapor retarding compounds, scrim reinforced at edges of sheets.

Foil-paper vapor-retarder.--

Foil-paper vapor-retarder shall be 0.0076 mm reflective aluminum foil laminated with scrim reinforcing to plastic-coated kraft paper.

Polyethylene vapor-retarder.--

Polyethylene vapor-retarder shall be factory-applied, 0.076 mm, white polyethylene film, a blend of fiberglass and polyester yarn reinforcement, and metallized polyester film laminated with a flame resistant adhesive, and a Class I flame-spread classification.

AUXILIARY INSULATION MATERIALS.--**Insulation tape.--**

Insulation tape shall be as recommended by the insulation manufacturer.

Insulation adhesive.--

Insulation adhesive shall be the type recommended by the insulation manufacturer and complying with the requirements for fire resistance.

Impaling pins.--

Impaling pins shall be self-adhering wire pins with sheet metal retaining clips and protective rubber tips. Adhesive for pins shall be as recommended by the pin manufacturer.

Line wire.--

Line wire shall be commercial quality 0.89 mm (20-gage) galvanized steel wire.

FABRICATION--

General.--Polyethylene shall be factory laminated to fiberglass batts or blankets by an applicator approved by the manufacturer of the batts or blankets.

PART 3.- EXECUTION

INSTALLATION.--

General.--The vapor retarder on faced batts shall be toward the interior and shall be fastened to provide a sealed retarder. Punctures and holes in the retarder shall be repaired.

Unless otherwise shown on the plans or specified elsewhere in these special provisions, insulation shall be kept 75 mm to 100 mm clear of lighting fixtures and heat producing electrical appliances and equipment.

Installing batt type insulation.--Insulation batts shall be installed to completely fill the space between framing members. Apply a single layer of insulation of required thickness, unless otherwise shown on the plans or required to make up total thickness. Installation shall conform to the manufacturer's recommendations and these special provisions.

Installing exposed insulation.--Exposed insulation shall be installed on impaling pins adhered to the substrate at 406 mm centers each direction with a minimum distance of 102 mm to the edge of the batt. Retainer clips shall be placed onto the pins so that the batt is slightly compressed. Pins shall be cut within 13 mm of the retaining clips and protective rubber caps placed on the ends of the pins.

When line wire is shown on the plans, blankets shall be supported with line wire spaced at 405 mm on center.

Joints in exposed insulation shall be sealed by lapping not less than 100 mm. Exposed insulation shall be fastened to framing at top, end and bottom, at perimeter of wall openings and at lap joints.

Overlapping joints shall be sealed with insulation adhesives as recommended by vapor retarder manufacturer's printed directions. Butt joints and fastener penetrations shall be sealed with insulation tape of the type recommended by the vapor retarder manufacturer. Joints at pipes, conduits, electrical boxes and similar items penetrating the vapor retarder shall be sealed.

7.03 THROUGH-PENETRATION FIRESTOPPING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing firestopping materials at penetrations in fire-rated walls, floors, and ceilings in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--A list of materials, manufacturer's descriptive data, and location schedule shall be submitted for approval.

Descriptive data shall include trade names, manufacturers' names, complete information on the materials to be applied, California State Fire Marshal Listing, the material thickness for the required fire resistance ratings, and the manufacturer's printed instructions for installation. Manufacturer's assembly shall be California State Fire Marshal approved.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of Compliance shall be furnished with each shipment of firestopping material in accordance with the requirements specified in Section 4-1.04, "Certificates of Compliance," of the General Conditions.

DELIVERY, STORAGE AND HANDLING.--

Delivery.--Materials to be applied shall be delivered in original unopened packages. Packages shall be identified by the manufacturer's label and shall bear proper labels for fire resistance classification.

Storage.--Materials shall be stored above ground, under cover, and in a dry location until ready for use. Packages which have been exposed to moisture before use shall be discarded.

PART 2.- PRODUCTS

Fire-rated caulk.--

Fire-rated caulk shall conform to ASTM Designation: E 814 and shall be rated for use in 2 and 3-hour fire-rated assemblies. Fire-rated caulk shall be 3M Brand, Fire Barrier Caulk; Dow Corning, Fire Stop Sealant; Standard Oil, Fyre Putty; or equal.

Wrap strip.--

Wrap strip shall be nominal 6 mm thick intumescent elastomeric material in 50 mm wide strips, faced one side with aluminum foil, and rated for use in 1-hour and 2-hour fire-rated systems.

Packing material.--

Packing material shall be polyethylene backer rod or nominal one inch thickness of tightly packed ceramic (alumina silica) fiber blanket, mineral-wool batt or glass fiber insulation material.

Fire-rated mortar.--

Fire-rated mortar shall be non-asbestos, 753 to 913 kilograms per cubic meter air dried density portland cement fly ash through-penetration firestopping mortar. Fire-rated mortar shall conform to ASTM Designation: E 814 and shall be rated for use in 3-hour fire-rated systems at 75 mm minimum thickness.

Fire safing insulation.--

Fire safing insulation shall be inorganic 56 kilograms per cubic meter minimum density, non-combustible fiber insulation conforming to Federal Specifications HH-1-521F, when tested in accordance with ASTM Designation: E 119 and ASTM Designation: E 136 for 3 hour fire resistance.

PART 3.-EXECUTION.--

Installation.--Firestopping materials shall be installed to conform to the requirements of the California State Fire Marshal Listing and the manufacturer's recommendations.

7.04 SINGLE PLY ROOFING

PART 1. - GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a fully adhered, single-ply thermoplastic membrane roofing system in accordance with the details shown on the plans and these special provisions.

The membrane roofing system shall include rigid roof insulation, composite board, single-ply thermoplastic membrane, bonding adhesive, flashing, fasteners and other materials required, but not necessarily mentioned, which provide a complete and waterproof assembly meeting the performance requirements specified herein.

References.--The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM E 108 (1996) Fire Tests of Roof Coverings
FM A/S4470 (1986; R 1992) Class I Roof Covers
FM DS/1-28 (1996) Wind Loads to Roof Systems and Roof Deck
FM DS/1-29 (1996) Above-Deck Roof Components FM P7825 (1999) Approval Guide
UL RMSD (1997) Roofing Materials and Systems Directory
UL 790 (1997) Fire Resistance of Roof Covering Materials

PERFORMANCE REQUIREMENTS.--

General.--The membrane roofing system shall prevent the passage of water, and shall resist specified uplift pressures, thermally induced movement, and exposure to weather without failure. Roofing materials shall be compatible with one another under conditions of service and application required, as demonstrated by the membrane roofing manufacturer based on testing and field experience.

Fire Safety.--The membrane roofing system shall comply with ASTM E 108 Class 1A or UL 790 Class A classification, and shall be listed as part of Fire-Classified roof deck construction in the UL RMSD or Class I roof deck construction in the FM P7825. UL approved components of the roof covering assembly shall bear the UL label.

Wind Uplift.--The membrane roofing system shall be rated Class I-90 in accordance with FM P7825 and shall be capable of withstanding an uplift pressure of 4.30 kilopascals per square of roofing.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, Factory Mutual test reports, product specifications, storage requirements and installation instructions shall be submitted for approval.

Working drawings.--Working drawings for the membrane roofing system shall include plans, elevations, sections, details, base flashings, membrane terminations, insulation fastening pattern, and attachments to other work.

Samples.--Three samples each of the following products shall be submitted to the Engineer for approval:

Roofing membrane sheet of color specified, 300-by-300 mm square, including T-shaped side and end lap seam.

Roof insulation, 300-by-300 mm squares.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of Compliance shall be furnished for the membrane roofing system in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Single source responsibility.-- Membrane roofing materials shall be obtained from a single manufacturer. Secondary materials shall be as recommended by the membrane roofing manufacturer.

Installer's qualification.--Membrane roofing installer shall be approved and certified by the membrane roofing manufacturer as qualified to install this type of roofing. A copy of the manufacturer's certification shall be given to the Engineer prior to the installation of any roofing materials.

Pre-roofing conference.--After approval of submittals and prior to installation of any roofing materials or performing any associated work, the Contractor shall convene a pre-roofing conference with the installer, membrane roofing manufacturer and the Engineer. Discussions and agreements shall be recorded and copies furnished to each participant. Advance notice of the meeting shall be given in writing to each participant at least 72 hours prior to the meeting.

PROJECT CONDITIONS.--

Weather.--Membrane roofing shall not be installed during high winds or inclement weather, or when there is ice, frost, moisture, or visible dampness on the substrate surface. Membrane roofing shall not be installed when air temperature is below 4 degrees C of the dewpoint.

Roofing work shall proceed when existing and forecasted weather conditions permit the work to be performed in accordance with the manufacturer's recommendations and warranty requirements.

DELIVERY, STORAGE AND HANDLING.--

Delivery, storage and handling.--Materials shall be delivered to the job site in manufacturer's original unopened packages clearly labeled with manufacturer's name and identification numbers. Materials shall be stored in strict accordance with the manufacturer's printed storage requirements. Material shall be handled in such a manner as to prevent damage and premature curing.

WARRANTY.--

The Contractor shall furnish the membrane roofing manufacturer's 15 year warranty for the roofing system, including insulation, flashings, and accessories. The warranty shall be supplied directly to the Department.

The warranty shall state that:

1. When, within the warranty period the membrane sheet roofing system becomes non-watertight, splits, tears, or separates at the seams because of defective materials or workmanship, the repair or replacement of defective materials and correction of defective workmanship shall be the responsibility of the membrane roofing manufacturer,
2. When the membrane roofing manufacturer or the manufacturer's approved installers fail to perform repairs within 72 hours of notification, emergency repairs performed by others will not void the warranty, and
3. Damage to the membrane roofing system caused by sustained winds having a velocity of 90 kilometers per hour or less is covered by the warranty.

The warranty period shall commence at the time of completion for the project.

PART 2.- PRODUCTS

GENERAL.--

Performance.--Roofing materials shall be provided which are recognized to be of generic type indicated and tested to show compliance with indicated performance.

Compatibility.--Products which are recommended by the manufacturer shall be fully compatible with the substrates used.

MANUFACTURERS.--

Available manufacturers.--Subject to compliance with the specifications, manufacturers offering products which may be incorporated into the work include, but are not limited to, Carlisle SynTec Incorporated; Firestone Building Products Company; GAF Materials Corporation; or equal.

MATERIALS.--

Membrane.--Membrane shall be Fabric-Reinforced Thermoplastic Polyolefin Sheet: Membrane sheet shall be uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced (TPO), and 1.1 mm (60 mil) nominal thickness for fully adhered application. Width and length of membrane sheets shall be as recommended by the manufacturer. Color shall be white. The membrane sheet shall have the following values when tested for the listed properties in accordance with the listed test methods:

Property	Value	Test Method Designation
Thickness, min., mm	1.02 +/- 10%	ASTM D 75
Breaking Strength, min., N	61 kN/m	ASTM D 751 A-Grab Method
Elongation at break, min., percent	30%	ASTM D 751 A-Grab Method
Tear Strength, min., N (Tongue tear 200 by 200 mm sample)	232 N	ASTM D 751
Low Temperature Bend at-40 degrees C	Pass	ASTM D 2136
Linear Dimension Change, max. percent (1 hour at 100 degrees C)	2.0	ASTM D 1204
Ply Adhesion, min., N/m	.452	ASTM D 413 Machine Method
Hydrostatic Resistance, min., MPa	1.21	ASTM D 751 Method A
Ozone Resistance (2 x Magnification)	No cracks	ASTM D 1149 Bent Loop Method, Method B Exposure Method D5181
Accelerated Weather Resistance, 5,000 Hours (7 x Magnification)	No cracking or crazing, or discoloration negligible	ASTM D 2565 Type BH2 or ASTM G 53 Type UVB3
Permeance, max., perms	0.055	ASTM E 96, Procedure BW

AUXILIARY MATERIALS.--

Bonding Adhesive.--Bonding adhesive shall be manufacturer's standard water based type for membrane, and solvent-based type for base flashings.

Flashing and flashing accessories.--Flashings, including perimeter flashings, and flashings around roof penetrations, shall be thermoplastic alloy coated metal, thermoplastic membrane, or membrane premolded corners or boots for use around penetrations as recommended as standard by the membrane sheet manufacturer's printed instructions. Thermoplastic alloy coated metal base flashings shall be field fabricated where required. Sheet metal base flashings that will contact the membrane shall be turned under 13 mm to form a hem.

Miscellaneous accessories.--Miscellaneous items shall include but not be limited to pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, fasteners, cover strips and pressure treated nailer strips.

Rigid roof insulation.--Rigid roof insulation shall be multilayer, preformed board roof insulation having thermal resistance or thickness as shown on the plans. Insulation shall be glass fiber board conforming to ASTM Designation: C 726, or expanded perlite board conforming to ASTM Designation: C 728, or wood fiber board conforming to ASTM Designation: C 208.

Composite Boards.--Composite boards shall conform to ASTM C 1289; Type III, polyisocyanurate insulation board faced one side, fibrous felt or glass fiber mat membrane on other side; Type V, oriented strand board or wafer board on one side and fibrous felt or glass fiber mat membrane on the other.

Insulation tape.-- Insulation tape shall be as recommended by the insulation manufacturer.

Wood nailers.-- Wood nailers shall be douglas fir, pressure treated.

PART 3.- EXECUTION

PREPARATION.--

General.--The roof deck substrate shall be completely installed prior to installation of the roofing membrane. The roof deck surface shall be swept clean and be free of sharp edges, cracks, debris, oil and grease and otherwise suitably prepared to accept the roofing membrane.

EXAMINATION.--

The Contractor shall examine substrates, areas, and conditions, with installer present, for compliance with the following requirements and other conditions affecting performance of roofing system.

Verification shall be made that 1) roof openings and penetrations are set and braced in place, and that roof drains are securely clamped in place; 2) wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations, and that nailers match thickness of insulation; and 3) surface plane flatness and fastening of wood deck comply with requirements in Section 12-6, "Rough Carpentry" of these special provisions.

INSTALLATION.--

Insulation installation.--The Contractor shall coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

The Contractor shall comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

One or more layers of insulation shall be installed under area of roofing to achieve required thickness. Where overall insulation thickness is 50°mm or greater, the Contractor shall install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer, a minimum of 150°mm in each direction.

Surface of insulation shall be trimmed where necessary at roof drains so completed surface is flush and does not restrict flow of water.

Long joints of insulation shall be installed in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Gaps exceeding 6°mm shall be filled with insulation.

The Contractor shall cut and fit insulation within 6°mm of nailers, projections, and penetrations.

Mechanically Fastened Insulation.--Each layer of insulation shall be installed and secured to the deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

Insulation shall be fastened according to requirements in FMG's "Approval Guide" for specified performance requirements.

Insulation shall be fastened to resist uplift pressure at corners, perimeter, and field of roof.

Bonding Adhesive.--Bonding adhesive shall be applied to the substrate and to the underside of the roofing membrane at a rate required by manufacturer. The adhesive shall be allowed to partially dry before installing the roofing membrane. Bonding adhesive shall not be applied to side laps or end laps of the roofing membrane.

Roofing membrane shall be securely fastened with adhesive at terminations, penetrations, and perimeter of roofing.

Roofing membrane shall be applied with side laps shingled with slope of roof deck where possible.

All lapped seams shall be cleaned and hot-air welded according to the manufacturer's written instructions to ensure a watertight seam installation.

The seams shall be tested with a probe to verify seam weld continuity. Lap sealant shall be applied to seal all cut edges of the roofing membrane.

Field strength of seams shall be verified a minimum of twice daily and all seam sample areas shall be repaired.

Tears, voids, and defective lapped seams shall be repaired.

Sealant or mastic bed shall be spread over deck drain flange at deck drains, and securely seal roofing membrane shall be securely sealed in place with clamping ring.

Flashing installation.--Thermoplastic alloy coated metal base shall be installed prior to installing thermoplastic membrane. Flashing shall be installed in accordance with the printed application instructions of the membrane roofing manufacturer. The membrane base flashing shall be fully adhered to the substrate using bonding adhesive. The base flashing shall be extended not less than 200 mm above the roofing surface. Where membrane flashing terminates under a metal reglet, the reglet shall be caulked with polyurethane or poly sulfide sealant. Premolded corners shall be provided to complete flashings of curbs, parapets, and other vertical surfaces and prefabricated pipe boots for pipe penetrations where possible. Pitch pockets shall not be used.

Expansion joints installation.--Prefabricated covers or membrane flashing shall be installed over the expansion joints in accordance with membrane sheet manufacturer's printed instructions.

FIELD QUALITY CONTROL.--

Final Roof Inspection.--The membrane roofing system manufacturer's technical personnel shall inspect the roofing installation upon completion of the system installation and submit a report to the Engineer. The Engineer shall be notified a minimum of 48 hours in advance of performing this inspection.

When test results or inspections indicate that components of the membrane roofing system do not comply with specified requirements, they shall be repaired or removed and replaced.

Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.

7.05 ROOF SPECIALTIES

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing roof specialties in accordance with details shown on the plans and these special provisions.

Roof specialties shall include hatch-type heat and smoke vents, dome-type heat and smoke vents, roof hatches, prefabricated ridge ventilators, and prefabricated curb and equipment support units.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, rough-in diagrams, installation instructions and general product recommendations shall be submitted for approval.

Samples.--Two samples, minimum 200 mm square, of each exposed metal and plastic sheet materials, and 2 samples, minimum 600 mm long, of formed or extruded metal member each color and finish specified shall be submitted for approval.

Coordination drawings.--Coordination drawings for items interfacing with or supporting mechanical or electrical equipment, ductwork, piping or conduit, shall be submitted for approval. Drawings shall indicate dimensions and locations of items provided in this special provision, together with relationship and methods of attachment to adjacent construction and to mechanical and electrical items.

QUALITY ASSURANCE.--

Labels.--Units shall be provided which have been tested, listed, and bear the label of UL, FM or other recognized testing agency.

Codes and standards.--Prefabricated units shall conform to the requirements of SMACNA, "Architectural Sheet Metal Manual," details for fabrication of units, including flanges and cap flashing to coordinate with types of roofing involved.

PART 2.- PRODUCTS

General.--Manufacturer's standard units, modified as necessary, shall be provided to comply with the contract requirements. Each unit shall be shop fabricated to the greatest extent possible.

MATERIALS.--

Sheet steel.--

Sheet steel shall be structural quality conforming to the requirements of ASTM Designation: A 570.

Galvanized sheet metal.--

Galvanized sheet metal shall be commercial quality, conforming to the requirements of ASTM Designation: A 446, G90 hot dipped galvanized, and mill phosphatized.

Stainless steel.--

Stainless steel shall conform to ASTM Designation: A 167, Type 302/304, with annealed finish. Stainless steel shall be tempered as required for forming and performance.

Aluminum sheet.--

Aluminum sheet shall conform to the requirements of ASTM Designation: B 209, tempered as required, anodized finish, except furnish mill finish where field painting is required.

Extruded aluminum.--

Extruded aluminum shall be the manufacturer's standard extrusions of sizes and profiles required, clear anodized finish unless otherwise shown.

Insulation.--

Insulation shall be the manufacturer's standard rigid or semi-rigid board of glass fiber and shall be the thickness required.

Wood nailers.--

Wood nailers shall be softwood, pressure treated with copper naphthenate, pentachlorophenol, or water-borne arsenicals (ACA, CCA or ACZA); not less than 50 mm nominal thickness.

Fasteners.--

Fasteners shall be the same metal as the metal to be fastened, or other non-corrosive metal as recommended by the unit manufacturer. Finish of the fastener shall be the same finish as the metal being fastened.

Bituminous coating.--

Bituminous coating shall be as recommended by the unit manufacturer for the use specified.

Gaskets.--

Gaskets shall be tubular or fingered design of neoprene or polyvinyl chloride as recommended by the unit manufacturer.

PREFABRICATED HEAT/SMOKE VENTS.--

General.--Units shall be custom fabricated only to the extent necessary for compliance with the dimensions shown on the plans or other requirements. External loading shall be not less than 200 kilograms live load per 0.9 square meter and internal loading shall be not less than 100 kilograms per 0.9 square meter.

Units shall be fabricated from metal, with manufacturer's standard welded or sealed mechanical corner joints, including cap flashing.

Curb shall be double wall construction with cant strips and one inch insulation of height shown on plans or, unless otherwise noted, for mounting with height of 230 mm above line of roofing. Vents shall have roof flange for attachment to roof deck.

Where roof slopes more than 2%, tapered curb heights shall be furnished to match the slope and the resulting top of unit shall be level.

PREFABRICATED ROOF HATCHES.--

General.--Cover for roof hatch or scuttle shall be aluminum, welded to support a live load of 200 kilograms per square meter and beaded flange. Insulation shall be glass fiber, not less than 25 mm in thickness, fully covered by metal liner. Unit shall have a roof flange for attaching to roof deck. Curb insulation shall be fiberboard or glass not less than 25 mm thick. Unit shall be equipped with hinges, positive latch with turn handles, inside and outside, and padlock hasp on inside, with gaskets. Cover shall be equipped with automatic hold open arm with handle to permit easy release.

Curb height shall be not less than 230 mm, except where slope of roof exceeds 2%, curb shall be tapered to result in level top installation.

PREFABRICATED CURB AND EQUIPMENT SUPPORTS.--

General.--Curb and equipment support shall conform to the loading and strength requirements of the equipment to be supported. Dimensions shall conform to the dimensions shown on the coordination drawings of equipment to be supported. Unit shall be fabricated from sheet steel conforming to ASTM Designation: A 570 and galvanized after fabrication.

Units shall be fabricated with welded or sealed mechanical corner joints, complete with cant strips and base profile coordinated with roof insulation thickness. Wood nailers shall be provided at top of curb tapered as necessary to compensate for roof slopes of 2%.

Where roof slope is more than 2%, curb or equipment supports shall be fabricated with height tapered to provide a level installation.

PART 3.- EXECUTION

INSTALLATION.--

General.--Prefabricated units shall be installed in accordance with the manufacturer's instructions and approved coordination drawings.

Installation of the units shall be coordinated with installation of the roof decking and other substrates to receive accessory units, vapor barriers, insulation, roof and flashing materials.

Units shall be securely fastened to supporting members, adequate to withstand all lateral, inward or outward loading pressures.

Where metal surfaces are to be installed in contact with non-compatible metals or other corrosive substrates, including wood decking, bituminous coatings shall be applied to metal surfaces.

Except as noted above, roof flanges shall be set in a thick bed of roofing cement to form a watertight seal.

Operational testing.--Units with operational components shall be fully tested. Joints and hardware shall be cleaned and lubricated. All units shall be adjusted for proper operation.

CLEANING AND PROTECTION.--

General.--All exposed metal and plastic surfaces shall be cleaned in accordance with the manufacturer's instructions. Damaged metal coatings shall be repaired.

7.06 JOINT SEALANT

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of preparing and placing a joint sealant in accordance with the details shown on the plans and these special provisions.

The sealed joint shall consist of tempered hardboard, expanded polystyrene and a pourable joint seal.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, specifications and installation instructions shall be submitted to the Engineer at the jobsite for approval.

PART 2.- PRODUCTS

Tempered hardboard.--

Tempered hardboard shall be 3 mm minimum thickness, commercial quality suitable for the use intended. Other facing materials may be used provided they furnish equivalent protection.

Expanded polystyrene.--

Expanded polystyrene shall be commercially available polystyrene board.

Polyethylene foam.--

Polyethylene foam shall be commercial quality, with a continuous, impervious, glazed top surface, suitable for retaining the liquid sealant in the joint while hardening.

Primer.--

Primer shall be as recommended by the sealant manufacturer.

Joint sealant.--

Joint sealant shall be a commercial quality, 2 component polyurethane sealant, which shall be self-leveling and withstand up to 25 percent movement.

PART 3.- EXECUTION

PREPARATION.--

Forming.--Groove for joint seal shall be formed to a uniform width and depth and to the alignment shown on the plans or as ordered by the Engineer. The completed groove shall have a top width within 3 mm of the width shown on the plans and the bottom width shall not vary from the top width by more than 2 mm.

At least 24 hours prior to installing the joint seal, the Contractor shall repair all spalls, fractures, breaks, or voids in the concrete surfaces of the joint groove.

The lip of the joint shall be beveled by grinding as shown on the plans.

Cleaning.--Prior to sealing joints, expanded polystyrene, hardboard, concrete spillage and all foreign material shall be removed from the deck to the bottom of the formed joint.

Prior to placing the joint seal, the joint shall be cleaned by a method which shall include abrasive blast cleaning and then be cleaned with a high pressure air jets to remove all residue and foreign material.

INSTALLATION.--

Materials.--No material shall be used which has skinned over or which has settled in the container to the extent that it cannot be easily redispersed by hand stirring to form a smooth uniform product.

Each container of material shall be clearly labeled or each delivery of material in the tanks of 2-component equipment shall be accompanied with a ticket showing designation (Component A or B), the manufacturer's name, lot or batch number, date of manufacture, date of packaging, and date, if any, beyond which the sealant shall not be used.

Primer.--A primer shall be applied to the sides of the groove and all exposed vertical surfaces in the joint prior to placing the sealant. Primer shall be dry at the time of placing the sealant. Contaminated primer shall be removed and replaced.

Joint sealant.--The 2-component sealant shall be mixed and placed in the groove in accordance with manufacturer's instructions. Unmixed liquid components which have been exposed to the atmosphere for more than 24 hours, shall not be used.

7.07 SEALANTS AND CAULKING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and applying sealants and caulking which are required for this project, but not specified elsewhere, in accordance with the details shown on the plans and these special provisions.

Related work.--Pourable polyurethane joint sealant shall conform to the requirements under "Joint Sealant" elsewhere in this Division 7.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of compliance shall be furnished for the sealants and caulking in accordance with the requirements specified in Section 4-1.04, "Certificates of Compliance," of the General Conditions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions for all sealants shall be submitted for approval.

Samples.--Color samples of all sealants shall be submitted for approval. Unless otherwise shown on the plans, colors will be selected by the Engineer from the manufacturer's standard colors.

PART 2.- PRODUCTS

MATERIALS.--

General.--All sealants, primers and accessories shall be non-staining to adjacent exposed surfaces. Products having similar applications and usage shall be of the same type and same manufacturer. Gun consistency compound shall be used unless otherwise required by the job conditions.

Acrylic sealant.--

Acrylic sealant shall be one compound, solvent release acrylic sealant.

Butyl sealant.--

Butyl sealant shall be one component, skinning type.

Silicone sealant.--

Silicone sealant shall be one component, low modulus building sealant. Sealant shall be tack-free in one hour, shall not sag or flow, shall be ozone resistant and capable of 100 percent extension without failure.

Joint sealant.--

Joint sealant shall be a two-part, non sag polysulfide base, synthetic rubber sealant formulated from liquid polysulfide polymer.

Backer rod.--

Backer rod shall be round, open or closed cell polyurethane. Backer rod shall be sized such that it must be compressed between 25 and 75 percent of its uncompressed diameter during installation in the joint.

Neoprene.--

Neoprene shall conform to the requirements of ASTM Designation: C 542.

PART 3.- EXECUTION

APPLICATION.--

General.--Unless otherwise shown on the plans, sealants shall be applied in accordance with the manufacturer's instructions.

Silicone sealants shall not be used in locations where painting is required.

Butyl sealants shall not be used in exterior applications, and acrylic sealants shall not be used in interior applications.

Sealants shall be applied in a continuous operation for the full length of the joint. Immediately following the application of the sealant, the sealant shall be tooled smooth using a tool similar to that used to produce concave masonry joints. Following tooling, the sealant shall remain undisturbed for not less than 48 hours.

DIVISION 8. DOORS AND WINDOWS

8.01 HINGED DOORS

GENERAL.--This work shall consist of furnishing and installing hinged doors and frames in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions for fire rated assemblies and a door schedule shall be submitted for approval. The door schedule shall include a description of the type, location and size of each door and frame.

PRODUCTS.--

Metal door.--

Metal door shall be flush, seamless steel door factory prepared and reinforced to receive hardware and having cold rolled stretcher leveled sheet steel face sheets not less than 1.2 mm thick (18-gage). Face sheets shall be bonded with thermosetting adhesive to rigid board honeycomb or precured foam core; or face sheets shall be welded to all parts of an assembled grid of cold formed pressed metal stiffeners and framing members located around edges, ends, openings and at all locations necessary to prevent buckling of face sheets. Seams shall be tack welded, filled and ground smooth. Bottom edge and internal stiffeners of grid type core shall have moisture vents. Welds on exposed surfaces shall be ground smooth. Louvered or glazed openings shall be provided where shown on the plans.

Where fire rated doors are required, doors shall be listed and labeled for the fire rating shown on the plans.

Active leaf of double door shall have a full height astragal of 3 mm flat bar or folded sheet strip, not less than 1.5 mm thick (16-gage), welded on the outside of the active leaf.

Door shall be cleaned and treated by the bonderized process or approved phosphatizing process and then given one factory application of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

Aluminum door.--

Aluminum door shall be glazed door with medium stiles of not less than 3 mm nominal wall thickness, clear anodized, thermally treated and artificially aged 6061 or 6063 extruded aluminum alloy tubing reinforced to receive hardware.

Glazing for doors.--

Glazing for doors shall be safety glass as specified under "Glazing" in Division 8, "Doors and Windows," of these special provisions. Glazing shall be not less than 5 mm thick.

Pressed metal frame.--

Pressed metal frame shall be not less than 1.5 mm thick (16-gage) sheet steel with integral stop, mitered corners, face welded and ground smooth corners. Frames shall be reinforced for all hardware and shall be cleaned and treated by the bonderized process or an approved phosphatizing process and then given one factory application of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

Frames for fire rated doors shall be listed for the same rating shown on the plans for fire rated doors.

Aluminum frame.--

Aluminum frame shall be manufactured by aluminum door manufacturer of clear anodized thermally treated and artificially aged 6061 or 6063 aluminum alloy extrusions with minimum nominal wall thickness of 3 mm. Frame shall be reinforced to receive hardware.

Sealants.--

Sealants shall be ultraviolet and ozone resistant, gun grade polysulfide or polyurethane, multicomponent, Federal Specification: TT-S-227.

EXECUTION.--

INSTALLATION.--Doors and frames shall be installed rigidly, securely, plumb and true and in such a manner that the doors operate freely without rubbing or binding. Clearance between frame and door shall be not more than 3 mm. The exterior frame shall be sealed weathertight.

Pressed metal frames shall be secured with clips and anchors as shown on the plans.

Fire rated assemblies shall be installed according to the manufacturer's recommendations.

Fire rated assemblies shall include doors, door frames, automatic smoke-actuated closers, self-closing mechanisms, panic hardware, wire glass, and fire rated louvers. Assemblies shall be approved by the California State Fire Marshal.

PAINTING.--Except for the primer application specified herein, doors and frames shall be cleaned, prepared and painted in accordance with the requirements specified under "Painting" in Division-9, "Finishes," of these special provisions.

8.02 ACCESS DOORS

GENERAL.--This work shall consist of furnishing and installing access doors in accordance with the details shown on the plans and these special provisions

SUBMITTALS.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PRODUCTS.--

Access doors.--

Access doors shall be factory assembled and factory prime painted steel. Door panel shall be 1.90 mm thick (14-gage) and door frame shall be 1.5 mm thick (16-gage) . The door and frame assembly shall have standard screw driver operated cam locks, concealed springs or continuous piano hinge and inside release handle. Access doors shall be by Babcock-Davis Hatchways, Bar-Co Access Doors, Inryco-Milcor, J.L. Industries, or equal.

EXECUTION.--

INSTALLATION.--Access doors shall be installed in accordance with the manufacturer's recommendations. The access door assemblies shall be painted to the match the color of the adjacent surrounding surfaces.

8.03 FINISH HARDWARE

PART 1.- GENERAL

SUMMARY.--

This work shall consist of furnishing and installing hardware items for doors in accordance with the details shown on the plans and these special provisions.

Hardware for special doors and frames, if required, shall be as specified under "Hinged Doors" in Division 8, "Doors and Windows," of these special provisions.

Hardware assemblies shall comply with the fire code and the disabled accessibility requirements indicated on the plans and specified in these special provisions.

SUBMITTALS.--

Manufacturer's technical information and catalog cuts for each item of door hardware and a door hardware schedule shall be submitted for approval prior to installation.

Manufacturer's catalog cuts shall include catalog numbers, material, grade, type, size, function, design, quality and finish of hardware.

The door hardware schedule shall indicate the location and size of door opening, the door and frame material, and the size, style, finish and quantity of the hardware components required.

FINISHES.--

Hardware shall be provided with standard US 26D metal plated finish.

KEYING INSTRUCTIONS.--

New locks shall be compatible with the master key system of the existing facility and shall be keyed to the Primus lock system in use.

Locks and cylinders shall be provided with seven pin "O" cylinders and blank keys. Cylinders and blank keys shall be delivered to the Engineer for combining of cylinders and cutting of keys.

The Contractor shall provide cylinders for use during construction. Construction cylinders shall remain in place until permanent cylinders are installed. Construction cylinders shall remain the property of the Contractor.

Key bows shall be stamped "State of California" and "Do Not Duplicate."

PART 2.- PRODUCTS

GENERAL.--

Door hardware equal in material, grade, type, size, function, design, quality and manufacture to that specified herein may be submitted for approval.

Butt hinges.--

Butt hinges shall be steel, 1 1/2-pair per door unless otherwise specified or shown on the plans. Nonremovable pins shall be provided at outswing exterior doors. Hinge size shall be 114 mm x 114 mm unless otherwise noted.

Standard weight hinges shall be:

Hager	BB 1279
McKinney	TB 2714
Stanley	BB 179
or equal.	

Heavy weight hinges shall be:

Hager	BB 1168
McKinney	T4B 37869
Stanley	BB 168
or equal.	

Mortise locksets, latchsets and privacy sets.--

Mortise locksets, latchsets and privacy sets shall be steel case with 32 mm x 203 mm face plate and 70 mm backset. Door and frame preparation for mortise locksets, latchset and privacy sets shall conform to ANSI A115.1.

Lever operated lockset shall be:

Best	35H 6FW 15H
Falcon	LM521 DG
Schlage	L9453R x 06
or equal.	

Lever operated latchset:

Best	35H 0N 15H
Falcon	LM101 DG
Schlage	L9010 x 06
or equal.	

Lever operated privacy set:

Best	35H 0L 15H
Falcon	LM311 DG
Schlage	L9040 x 06
or equal.	

Cylindrical locksets, latchsets and privacy sets.--

Cylindrical locksets, latchsets and privacy sets shall be steel chassis, 54 mm diameter, 70 mm backset. Door and frame preparation for cylindrical lockset, latchsets and privacy sets shall conform to ANSI A115.1.

Lever operated lockset shall be:

Best	93K6 AB 9C
Schlage	D53RD RHO
Falcon	LY501 DG
or equal.	

Lever operated latchset shall be:

Best	93K ON 9C
Falcon	LY101 DG
Schlage	D10S RHO
or equal.	

Lever operated privacy set shall be:

Best	93K OL 9C
Falcon	LY301 DG
Schlage	D40S RHO
or equal.	

Cylindrical dead locks.--

Cylindrical dead locks shall have 25 mm throw bolt with concealed hardened steel inserts and 25 mm diameter bolt housing, 70 mm backset.

Single cylinder dead lock with inside thumb turn shall be:

Best	83T 7K
Falcon	D441
Schlage	B460R
or equal.	

Double cylinder dead lock shall be:

Best	83T 7M
Falcon	D431
Schlage	B462R
or equal.	

Flush bolts.--

Flush bolts shall be installed at the top and bottom of the inactive leaf of pairs of doors. Provide automatic bolts on UL rated pairs of doors.

Flush bolts for manual operation shall be:

Trimco	3915
Glynn Johnson	FB6
H.B. Ives	457
or equal.	

Flush bolts for automatic operation shall be:

Door Control	840
Glynn Johnson	FB7
H.B. Ives	559
or equal.	

Coordinators.--

Coordinators shall be installed at pairs of UL rated doors and at pairs of doors having panic devices.

Coordinators shall be:

Door Control	600
Glynn Johnson	GJCOR
H.B. Ives	936
or equal.	

Door closers.--

Parallel arms for closers shall be installed at outswing exterior doors. Closers shall have sprayed finish to match other hardware on door.

Door closers shall be:

LCN	4040
Norton	3501-BF
Dorma	7800
or equal.	

Panic devices.--

Rim type panic devices shall be installed at single doors and on the active leaf of pairs of doors, unless indicated otherwise. A vertical rod device shall be provided for the inactive leaf of pairs of doors. Dogging devices shall be omitted at UL rated door openings.

Panic devices with outside key operation shall be:

Corbin	3727
Monarch	XX-R-T
Von Duprin	88TP
or equal.	

Panic devices with exit only operation shall be:

Corbin	3729
Monarch	XX-R-BA
Von Duprin	88EO
or equal.	

Panic devices with vertical rod operation shall be:

Corbin	3120
Monarch	XX-V-N
Von Duprin	8827
or equal.	

Kickplates.--

Kickplates shall be 254 mm in height x 51 mm less than door width x 1.52 mm (16-gage).

Kickplates shall be:

Builders Brass	37X
Quality	48
Trimco	K0050
or equal.	

Mop plates.--

Mop plates shall be stainless steel, 1.52 mm (16-gage), 152 mm in height x 51 mm less than the door width.

Mop plates shall be:

Trimco
Ives
or equal.

Floor mounted stops.--

Floor mounted stops shall be dome type. The floor stops shall not be located in the path of travel and 95 mm maximum from walls. The height of the stop shall be determined by the clearance required when a threshold is used or not used.

Stops for openings without thresholds shall be:

Builders Brass	8061
Quality	331
Trimco	1210
or equal.	

Stops for openings with thresholds shall be:

Builders Brass	8063
Quality	431
Trimco	1213
or equal.	

Wall or door mounted door stop.--

Wall or door mounted door stop shall have a 95 mm projection and 3-point anchoring.

Wall or door mounted door stop shall be:

Builders Brass	W96
Quality	38
Trimco	1236-1/4-2
or equal.	

Wall mounted door stop and holder.--

Wall mounted door stop and holder shall be:

Builders Brass	W141X
Quality	36/136
Trimco	1207
or equal.	

Wall bumpers.--

Wall bumpers base diameter shall be 64 mm with a 25 mm projection.

Bumpers shall be:

Builders Brass	WC9
Quality	302
Trimco	1270CV
or equal.	

Automatic door bottom.--

Automatic door bottom shall be heavy duty, full mortise.

Bottom shall be:

Pemko	434 AR
Zero	360
or equal.	

Thresholds, rain drips, door sweeps and door shoes.--

Thresholds, rain drips, door sweeps and door shoes shall conform to the sizes and configurations shown on plans. Thresholds at door openings with accessibility requirements shall not exceed 13 mm in height.

Threshold, rain drip, door sweep and door shoe manufacturers shall be Pemko, Reese, Zero, or equal.

Threshold bedding sealant.--

Threshold bedding sealant shall conform to Federal Specification: SS-C-153.

Weatherstrip and draft stop.--

Weatherstrip and draft stop shall conform to the sizes and shapes shown on plans. Assemblies shall be UL listed and shall be provided where shown on the plans or as specified in these special provisions.

Weatherstrip and draft stop manufacturers shall be Pemko, Reese, Zero, or equal.

Door signs and name plates.--

Door signs and name plates shall be as specified under "Signs" in Division 10, "Specialties," of these special provisions.

PART 3.- EXECUTION

DOORS AND FRAMES.--Doors and frames shall be set square and plumb and be properly prepared before the installation of hardware.

INSTALLATION.--Hardware items shall be accurately fitted, securely applied, and adjusted and lubricated in accordance with the manufacturer's instructions. Installation shall provide proper operation without bind or excessive play.

Hinges shall be installed at equal spacing with the center of the end hinges not more than 244 mm from the top and bottom of the door. Pushplates and door pulls shall be centered 1118 mm from the finished floor. Locksets, latchsets, privacy sets and panic exit mechanisms shall be 1024 mm from the finished floor. Kickplates shall be mounted on the push side of the doors, 25 mm clear of door edges.

Thresholds shall be set in a continuous bed of sealant material.

Door controls shall be set so that the effort required to operate doors with closers shall not exceed 22.3 N maximum for exterior doors and 22.3 N maximum for interior doors. The effort required to operate fire doors may be increased above the values shown for exterior and interior doors but shall not exceed 66.7 N maximum.

The sweep period of the door closer shall be adjusted so that from an open position of 70°, the door will take at least 3 seconds to move to a point 75 mm from the latch, measured to the landing side of the door.

Door stops located on concrete surfaces shall be fastened rigidly and securely in place with expansion anchoring devices. Door stops mounted elsewhere shall be securely attached with wood screws or expansion devices as required.

Backing shall be provided in wall framing at wall bumper locations.

The location and inscriptions for door signs and name plates shall be as shown on the plans.

Hardware, except hinges, shall be removed from surfaces to be painted before painting.

Upon completion of installation and adjustment, the Contractor shall deliver to the Engineer all dogging keys, closer valve keys, lock spanner wrenches, and other factory furnished installation aids, instructions and maintenance guides.

DOOR HARDWARE GROUPS AND SCHEDULE.--Hardware groups specified herein shall correspond to those shown on the plans:

GROUP 1

- 3 pair butt hinges
- 1 each lever operated mortise lockset
- 2 each automatic door closer
- 2 each kickplates
- 2 each floor mounted door stop
- 2 each smoke seal
- 2 each automatic door bottom
- 1 each threshold

GROUP 2

3 pair butt hinges
1 coordinator required
1 each lever operated cylindrical lockset
2 each door closer
2 each kickplate
2 each wall mounted door stop
2 each smoke seal
1 each automatic flush bolt on inactive leaf
1 each threshold

GROUP 3

1 1/2-pair butt hinges
1 each lever operated cylindrical lockset
1 each door closer
1 each kickplate
1 each wall mounted door stop
1 each smoke seal
1 each threshold

GROUP 4

3 pair butt hinges
1 each lever operated mortise lockset
2 each door closer
2 each kickplates
2 each floor mounted door stop
1 each flush bolt on inactive leaf

GROUP 5

Hardware per manufacturer

GROUP 6

1 1/2-pair butt hinges
1 each kickplate
1 each pushplate
1 each pullplate
1 each wall bumper
1 each door closer

GROUP 7

Add smoke seal at perimeter of existing door frame
Add 1 each new threshold
All other existing door hardware to remain

GROUP 8

Add 1 each automatic door opener
Add 1 each 254 high aluminum kickplate
All other existing door hardware to remain

GROUP 9

Add 1 each lever operated cylindrical lockset
All other existing door hardware to remain

GROUP 10

Add 1 each door closer
All other existing door hardware to remain

GROUP 11

Replace existing damaged lever operated cylindrical lockset with new lever operated cylindrical lockset
All other existing door hardware to remain

GROUP 12

1 each automatic door opener at doors 275 & 318b
Replace existing knob operated lockset with new lever operated cylindrical lockset
Add 1 each door closer at door 232 only
Add 1 each smoke seal and threshold at perimeter of existing door frame at door B4 and 116a
All other existing door hardware to remain

GROUP 13

Replace existing knob operated lockset with new lever operated cylindrical lockset
Adjust existing door closer pressure to have 22.3 N max effort
All other existing door hardware to remain

GROUP 14

Replace existing knob operated latchset with new lever operated latchset
Adjust existing door closer pressure to have 22.3 N max effort at doors 269, 302, and H7b only
All other existing door hardware to remain

GROUP 15

Add smoke seal and threshold at perimeter of existing door frame at door 116 only
Adjust existing door closer pressure to have 22.3 N max effort
All other existing door hardware to remain

GROUP 16

Repair existing door lever
Adjust existing door closer pressure to have 22.3 N max effort at door 138 only
All other existing door hardware to remain

GROUP 17

Existing knob to be retrofitted with lever
All other existing door hardware to remain

8.04 GLAZING

PART 1.- GENERAL

SUMMARY.---

This work shall consist of furnishing and installing glazing in accordance with the details shown on the plans and these special provisions.

Glazing shall consist of glass and acrylic sheets for windows, doors and other glazed openings.

All glass shall conform to ASTM Designation: C 1036 and the classifications specified herein and shall be clear glass except as noted.

All acrylic sheets shall conform to ASTM Designation: D 702, Type III, Grade 3.

Safety glass shall be furnished and installed at all locations designated in Consumer Product Safety Commission's Safety Standard For Architectural Glazing Materials 16 CFR 1201.

SUBMITTALS.--

A detailed list of glazing materials including glass, sheet, sealants, tapes, setting blocks, shims, compression seals, and glazing channels shall be submitted for approval. The list shall include a schedule of the materials to be used at each location.

LABELS.--

Each individual pane of heat strengthened or fully tempered glass shall bear an identification label in accordance with ASTM Designation: C 1048.

PART 2.- PRODUCTS

Sheet glass, float glass, or plate glass.--

Sheet glass, float glass, or plate glass shall be Type I, Class 1, Quality q4 or better, double strength for panes to 0.93 m^2 , 5 mm thick for panes between 0.93 m^2 and 2.6 m^2 , and 6 mm thick for panes over 2.6 m^2 , except as otherwise shown on the plans.

Tempered glass.--

Tempered glass shall conform to ASTM Designation: C 1048, Kind FT, Condition A, Type 1, Quality q4 or better.

Wire glass.--

Wire glass shall be Type II, Class 1, Form 1, Mesh m1; 6 mm thick clear polished wire glass with diamond mesh.

Seals, caulks, putties, setting blocks, shims, tapes, compression seals, felt, spacers, and channels.--

Seals, caulks, putties, setting blocks, shims, tapes, compression seals, felt, spacers, and channels shall be top grade, commercial quality, as recommended by the glass or sheet manufacturer and shall conform to the requirements in the publications of the Flat Glass Marketing Association.

PART 3.- EXECUTION

INSTALLATION.--

Glazing shall conform to the general conditions and applicable details in the publications of the Flat Glass Marketing Association.

Cut edges of tinted glass shall conform to the recommendations of the glass manufacturer. The glazier shall inspect each edge of tinted glass. Panes with edges that do not conform to the manufacturer's standards for tinted glass edges for sunny elevations shall not be used.

Panes shall be bedded fully and evenly, set straight and square within panels in such a manner that the pane is entirely free of any contact with metal edges and surfaces.

For all panes on the exterior of the building, the glazing on both sides of window panes shall provide a watertight seal and watershed. Seals shall extend not more than 2 mm beyond the holding members. A void shall be left between the vertical edges of the panes and the glazing channel. Weep systems shall be provided to drain condensation to the outside.

Panes in assemblies using extruded gasket glazing shall be set in accordance with the assembly manufacturer's instructions using gaskets and stops supplied by the manufacturer.

Whenever welding or burning of metal is in progress within 4.6 m of glazing materials, a protective cover shall be provided over exposed surfaces.

REPLACEMENT AND CLEANING.--

All broken or cracked glass and glass with scratches which reduce the strength shall be replaced before completion of the project.

Panes shall be kept clean of cement and plaster products, cleansers, sealants, tapes and all other foreign material that may cause discoloration, etching, staining, or surface blemishes to the materials.

Excess sealant left on the surface of the glass or surrounding materials shall be removed during the work life of the sealant.

Solvents and cleaning compounds shall be chemically compatible with materials, coatings and glazing compounds to remain. Cleaners shall not have abrasives that scratch or mar the surfaces.

All panes shall be cleaned just before the final inspection. All stains and defects shall be removed. Paint, dirt, stains, labels (except etched labels), and surplus glazing compound shall be removed without scratching or marring the surface of the panes or metal work.

DIVISION 9. FINISHES

9.01 GYPSUM WALLBOARD

GENERAL.--This work shall consist of furnishing, installing and finishing gypsum wallboard in accordance with the details shown on the plans and these special provisions.

Where assembly fire ratings are indicated on the plans, construction shall provide the fire resistance in accordance with the applicable standards in the Fire Resistance Design Manual published by the Gypsum Association.

Wallboard backing for use in restroom and shower areas shall be water-resistant gypsum backing board.

PRODUCTS.--

Gypsum wallboard.--

Gypsum wallboard shall conform to ASTM Designation: C 36/C 36M.

Gypsum backing board.--

Gypsum backing board shall conform to ASTM Designation: C 442/C 442M.

Water-resistant gypsum backing board.--

Water-resistant gypsum backing board shall conform to ASTM Designation: C 630/C 630M.

Gypsum sheathing board.--

Gypsum sheathing board shall conform to ASTM Designation: C 79/C 79M.

Exterior gypsum soffit board.--

Exterior gypsum soffit board shall conform to ASTM Designation: C 931/C 931M.

Joint tape and joint and finishing compound.--

Joint tape and joint and finishing compound shall conform to ASTM Designation: C 475.

Corner beads, metal trim and control joints.--

Corner beads, metal trim and control joints shall be galvanized steel of standard manufacture.

Resilient metal channel.--

Resilient metal channel shall be galvanized sheet steel channels of standard manufacture for reducing sound transmission in wood frame partitions.

Fasteners.--

Fasteners shall be gypsum wallboard nails conforming to ASTM Designation: C 514 or steel drill screws conforming to ASTM Designation: C 1002.

EXECUTION.--

DELIVERY AND STORAGE.--Materials shall be delivered in original packages, containers or bundles bearing brand name, applicable standard of manufacture, and name of manufacturer or supplier and shall be kept dry and fully protected from weather and direct sunlight exposure. Gypsum wallboard shall be stacked flat with adequate support to prevent sagging or damage to edges, ends and surfaces.

INSTALLATION.--Wallboard panels to be installed on ceilings and soffits shall be installed with the long dimension of the panels perpendicular to the framing members. Wallboard panels to be installed on walls may be installed with the long dimension of the panels either parallel or perpendicular to the framing members. The direction of placing the panels shall be the same on any one wall or partition assembly.

Edges of wallboard panels shall be butted loosely together. All cut edges and ends shall be smoothed as needed for neat fitting joints.

All edges and ends of gypsum wallboard panels shall coincide with the framing members, except those edges and ends which are perpendicular to the framing members. End joints on ceiling and on the opposite sides of a partition assembly shall be staggered.

Except where closer spacings are shown on the plans, the spacing of fasteners shall not exceed the following:

Nails	175 mm
Screws	300 mm
Screws at perimeter of panels for fire resistive assemblies having metal framing	200 mm

Type S steel drill screws shall be used to fasten wallboard to metal framing. Nails or Type W steel drill screws shall be used to fasten wallboard to wood framing. Except as shown on the plans, screws shall not be used in fire resistive assemblies.

Adhesives shall not be used for securing wallboard to framing.

Gypsum wallboard panels shown on the plans for shear wall sheathing or for fire resistive assemblies shall be fastened to all framing members. Gypsum wallboard panels at other locations and gypsum wallboard finish over plywood sheathed shear walls shall be fastened to all framing members except at the following locations:

At internal angles formed by ceiling and walls; ceiling panels shall be installed first with the fasteners terminating at a row 175 mm from the walls, except for walls parallel to ceiling framing. Wall panels shall butt the ceiling panels. The top row of wall panel fasteners shall terminate 200 mm from the ceiling.

At internal vertical angles formed by the walls; fasteners shall not be installed along the edge or end of the panel that is installed first. Fasteners shall be installed only along the edge or end of the panel that butts and overlaps the panel installed first.

Fasteners shall be located at least 10 mm from wallboard panel edges and ends. Nails shall penetrate into wood framing at least 30 mm. Screws shall penetrate into wood framing at least 20 mm. All metal fasteners shall be driven slightly below surface level without breaking the paper or fracturing the core.

Metal trim shall be installed at all free edges of panels, at locations where wallboard panels abut dissimilar materials and at locations shown on the plans. Corner beads shall be installed at external corners. Control joints shall be installed at the locations shown on the plans.

Joints between face panels, the internal angles formed by ceiling and walls and the internal vertical angles formed by walls shall be filled and finished with joint tape and at least 3 coats of joint compound. Tape in the corners shall be folded to conform to the angle of the corner. Tape at joints and corners shall be embedded in joint compound.

Dimples at nail and screw heads, dents, and voids or surface irregularities shall be patched with joint compound. Each patch shall consist of at least 3 coats and each coat shall be applied in a different direction.

Flanges of corner beads, control joints and trim shall be finished with a least 3 coats of joint compound.

Each coat of joint compound shall be feathered out onto the panel surface and shall be dry and lightly sanded before applying the next coat. The finished surfaces of joint compound at the panel joints, internal angles, patches and at the flanges of trim, corner beads and control joints shall be flat and true to the plane of the surrounding surfaces and shall be lightly sanded.

Good lighting of the work area shall be provided during the final application and sanding of the joint compound.

Gypsum wallboard used as backing boards for tile or rigid sheet wall covering or wainscoting shall be water resistant. Joints in backing board shall not be taped or filled and dimples at the fastener heads shall not be patched. Edges of cuts and holes in backing board shall be sealed with a primer or sealer that is compatible with the wall covering or wainscoting adhesive to be used.

Surfaces of wallboard to be textured shall receive an orange peel texture, unless otherwise shown on the plans.

9.02 CERAMIC TILE

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing ceramic tile in accordance with the details shown on the plans and these special provisions.

Ceramic tile shall match existing tile and shall include setting materials, grouts and such other materials as maybe required for a complete installation.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, a list of materials to be used, and installation instructions for all materials required for the work shall be submitted for approval.

Manufacturer's descriptive data shall be submitted for each type of tile, mortar bed materials, bond coat materials and additives, and grout materials and additives.

Materials list and installation instructions shall include all products and materials to be incorporated into the work.

Friction reports shall be submitted for tile products to be used on floors and other pedestrian surfaces.

Samples.--Samples shall include 2 individual samples of each type and color of tile and trim to be installed and shall be of the same size, shape, pattern and finish as the tile and trim to be installed.

QUALITY ASSURANCE.--

Single source responsibility.--Each type and color of tile, grout and setting materials shall be obtained from a single source.

Master Grade Certificates.--Each shipment of tile to the project site shall be accompanied by a Master Grade Certificate issued by the tile manufacturer.

Certificates of Compliance.--Certificates of compliance shall be furnished for bond coat materials, setting bed materials and grout in accordance with the requirements specified in Section 4-1.04, "Certificates of Compliance," of the General Conditions.

DELIVERY, STORAGE AND HANDLING.--

Delivery.--Tile and packaged materials shall be delivered to the job site in sealed, unbroken, unopened containers with the labels intact. Tile containers shall bear the Standard Grade label.

Storage and handling.--Materials shall be stored and handled in such a manner as to prevent damage or contamination by water, freezing or foreign matter.

PROJECT CONDITIONS.--

Protection.--Tile work shall be protected and environmental conditions maintained during and after installation to comply with the reference standards and manufacturer's printed instructions.

Temperatures.--Unless otherwise specified in the manufacturer's installation instructions, the ambient temperature shall be maintained at not less than 10°C nor more than 38°C in tiled areas during installation and for 7 days after completion. Exterior work areas shall be shaded from direct sunlight during installation.

Tile shall not be installed when the temperature of the substrate is greater than 32°C or is frost covered.

Illumination.--Interior work areas shall be illuminated to provide the same level and angle of illumination as will be available during final inspection.

PART 2.- PRODUCTS

MANUFACTURERS.--

Available manufacture's.--Subject to compliance with the specifications, tile shall be American Olean Tile Co., Inc.; Summitville Tiles, Inc.; United States Ceramic Tile Co.; or equal.

GENERAL.--

Ceramic tile.--Ceramic tile shall conform to the requirements in ANSI Standard: A137.1, "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated.

Ceramic tile shall conform to the "Standard Grade" requirements.

Tile installation materials.--Tile installation materials shall conform to the requirements in ANSI standard referenced with products and materials indicated for setting and grouting.

Tile color and size.--Tile color shall be as shown on the plans; tile size shall be as indicated in the Schedule elsewhere in this special provision.

Slip resistant tile.--Slip resistant tile shall have sufficient abrasives added such that the static coefficient of friction, wet or dry, shall be not less than 0.6 for walking surfaces and 0.8 for ramps when tested in accordance with ASTM Designation: C 1028.

SETTING MATERIALS.--

Portland cement mortar installation materials.--

Materials for portland cement mortar installation shall conform to the requirements in ANSI Standard: A108.1 as required for installation method designated, unless otherwise indicated.

Membrane.--Membrane shall be asphalt impregnated felt conforming to ASTM Designation: D 226, Type I, or polyethylene film conforming to ASTM Designation: C 171, Type 1.1.2. Polyethylene film shall not be less than 0.1 mm thick.

Reinforcement.--Reinforcement shall be galvanized welded wire fabric with 50 mm x 50 mm - 1.6 mm x 1.6 mm conforming to ASTM Designations: A 82 and A 185 except for minimum wire size. Reinforcement shall be provided in flat sheets.

Metal lath.--Metal lath shall be self furring, galvanized, conforming to ASTM Designation: C 847, flat expanded type weighing not less than 1.4 kg/m². Factory assembled metal lath and paper backing may be used where reinforcement over paper is shown on the plans.

Tile bond coat.--

Tile bond coat shall be latex-portland cement bond coat.

Latex-portland cement mortar bond coat shall be a prepackaged mortar mix, conforming to ANSI Standard: A118.4, incorporating a dry acrylic resin, and to which only water is added at the job site. Mortar shall be suitable for exterior use and be labeled for the type of tile to be installed.

Epoxy bond coat.--

Epoxy bond coat shall be a 2 part prepackaged epoxy mortar conforming to ANSI Standard: A118.3, suitable for exterior use. Mortar shall be labeled for the type of tile to be installed.

GROUTING MATERIALS.--

Tile grout.--

Tile grout shall be latex-portland cement grout.

Latex-portland cement grout shall be a prepackaged grout mix, conforming to ANSI Standard: A118.6, incorporating a dry acrylic resin, and to which only water is added at the jobsite. Grout shall be suitable for exterior use and labeled for the type of tile to be installed.

Epoxy grout.--

Epoxy grout shall be a 2 part prepackaged epoxy grout conforming to ANSI Standard: A118.3 and suitable for exterior use. Grout shall be labeled for the type of tile to be used.

Grout pigment.--

Grout pigment shall be chemically inert, fade resistant mineral oxide or synthetic type. Color shall be as shown on the plans.

SEALANTS.--

Sealant.--

Sealant for vertical expansion joints shall be a medium modulus silicone or polyurethane. Sealant for horizontal joints shall be a 2-part polyurethane type material with a Shore Hardness of 35 to 45.

Color of exposed sealants shall match color of grout in tile adjoining sealed joints.

MORTAR BEDS.--

Cement mortar bed.--

Cement mortar bed for walls shall be proportioned of one part cement, 1/2 part hydrated lime, 6 parts damp sand by volume and only enough water to provide the necessary workability. Ingredients shall be dry mixed, water added, and materials blended to produce a stiff mix. Mortar bed shall be not less than 20 mm in thickness.

Cement mortar bed for floors shall be proportioned of one part cement, 1/10 parts hydrated lime, 5 parts damp sand by volume and only enough water added to provide the necessary workability. Ingredients shall be dry mixed, water added, and materials blended to produce a stiff mix. Mortar bed shall be not less than 32 mm in thickness.

MISCELLANEOUS MATERIALS.--

Sand.--

Sand shall be a natural or manufactured sand conforming to ASTM Designation: C 144, except that no more than 10 percent shall pass the No. 150 μm sieve.

Sealers.--

Sealer for unglazed quarry tile shall be water repellent, clear solution of ammonium cementitious compound, silicone base material, or other commercially manufactured sealer.

Sealer for grout shall be a penetrating proprietary compound designed for sealing grout. Silicone sealers shall not be used.

Cement.--

Cement shall conform to ASTM Designation: C 150, Type I.

Hydrated lime.--

Hydrated lime shall conform to ASTM Designation: C 206, Type S, or ASTM Designation: C 207, Type S.

Water.--

Water shall be clean and potable.

Metal edge strips.--

Metal edge strips shall be stainless steel terrazzo strips, 3 mm wide at top edge with integral provision for anchorage to mortar bed or substrate.

Cementitious tile backer board.--

Cementitious backer board shall be a backing and underlayment panel composed of a concrete core with glass mesh reinforcing on both faces and conforming to the requirements of ANSI Standard: A118.9.

MIXING MORTAR AND GROUT.--

Mixing.--Mortar and grout shall be mixed to comply with the requirements of referenced standards and manufacturers for accurately proportioning of materials, water or additive content, mixing equipment and mixer speeds, mixing containers, mixing time, and other procedures need to produce mortars and grout of uniform quality with optimum performance characteristics for application intended.

PART 3.- EXECUTION

PREPARATION.--

General.--Concrete, mortar, or masonry substrate surfaces which are to receive a mortar bed shall not vary more than 5 mm in 2.4 m from the required plane and shall be true, plumb at vertical surfaces, and square at intersection edges.

Surfaces to receive a mortar setting bed or a bond coat shall be cleaned adequately to assure a tight bond to the applied material. Such cleaning shall leave the surface thoroughly roughened and free from laitance, coatings, oil, sand, dust and loose particles.

The cleaned surfaces which are to receive a mortar bed shall be saturated with water just prior to placing mortar or the cleaned surfaces shall be coated with fresh neat cement slurry. If the surface is saturated with water, excess water shall be removed and the wetted surfaces uniformly dusted with portland cement. The slurry or wetted cement dust shall be broomed to completely coat the surface with a thin and uniform coating just prior to placing the mortar.

Substrates shall be inspected to insure that grounds, anchors, plugs, recessed frames, bucks, drains, electrical work, mechanical work, and similar items in or behind the tile have been installed before proceeding with installation of the tiles.

INSTALLATION.--

General.--Tile installation shall conform to applicable parts of ANSI 108 Series of the tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" and Tile Council of American, "Handbook for Ceramic Tile Installation."

All tile shall be installed on a bond coat over a setting bed. The setting bed shall be a cured cement mortar bed or a prepared, dimensionally stable substrate of concrete, masonry, cementitious backer board, or other cementitious material.

The back face of the tile shall be free of paper, adhesives, fiber mesh, resins, or other materials affecting the bond of the tile to the bedding material.

Tile sheets shall have permanent edge bonding or temporary mounting materials on the exposed face. Water soluble or absorbent adhesives shall not be used for edge bonding. Temporary mounting materials shall allow observation during tile setting operations.

Tile work shall extend into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as shown on the plans. Work shall be terminated neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

Intersections and returns shall be accurately formed. Cutting and drilling of tile shall be performed without marring visible surfaces. Cut edges of tile abutting trim, finish or built-in items shall be carefully ground to produce straight aligned joints. Tile shall be closely fit to electrical outlets, piping, fixtures and other penetrations such that plates, collars, or covers overlap the tile.

Mortar bed placement.--The mortar bed, with or without reinforcement as shown on the plans, shall be placed, consolidated, and finished to the required thickness.

The surface of the mortar bed shall be true and pitched as shown on the plans, without high or low spots. The mortar bed surface shall not vary more than 3 mm in 2.4 m from a plane parallel to the finished tile surface when tile is installed on a cured mortar bed.

In no case shall the allowed tolerances result in offsets between adjoining tiles, low spots on finished tile surfaces than can pond water, or finished tile surfaces that are not plumb or not true.

Cement mortar beds to receive a tile bond coat shall be damp cured under cover for a minimum of 48 hours at a temperature of not less than 21°C.

Cement mortar beds to receive an epoxy bond coat shall be damp cured under cover for a minimum of 96 hours at a temperature of not less than 21°C and allowed to dry thoroughly prior to setting tile.

Cementitious backer board.--Cementitious backer board shall be installed in accordance with the provisions of ANSI Standard: A118.11.

Tile bond coat.--The tile bond coat mortar shall be mixed according to the manufacturer's recommendations. The consistency of the mixture shall be such that ridges formed with the recommended notched trowel shall not flow or slump. Reworking will be allowed provided no water or materials are added. The setting bed surfaces shall be dampened before placing the bond coat as necessary tile installation, but the setting bed shall not be soaked. The setting bed surfaces for epoxy bond coat shall be dry.

The bond coat shall be floated onto the cured mortar bed surface with sufficient pressure to cover the surface evenly with no bare spots. The surface area to be covered with the bond coat shall be no greater than the area that can be tiled while the bond coat is still plastic. The bond coat shall be combed with a notched trowel as recommended by the manufacturer within 10 minutes before installing tile. Tile shall not be installed on a skinned over bond coat.

Installing tiles.--Tile shall be installed in accordance with the manufacturer's instructions and shall be set solid and shall be well bonded to the substrate.

Tile set on a tile bond coat shall be installed in accordance with ANSI Standard: A108.5, and tile set on an epoxy mortar shall be installed in accordance with ANSI Standard: A108.6.

If tiles are cut, the cuts shall be made with saws. Cut edges shall be rubbed with an abrasive stone to bring the edge of the glaze slightly back from the body of the tile. Cuts shall be accurately made to neatly fit the tile in place. Cut edges shall not be butted against other tile. Cut tile shall be at least half the size of a full size tile.

Tile shall completely cover wall areas behind mirrors and fixtures.

Tile shall be installed so that the finished tile surface does not vary more than 3 mm in 2.4 m from the finished tile surface shown on the plans. In no case shall there be offsets in adjoining tiles, low spots on finished tile surfaces that can pond water, or finished tile surfaces that are not plumb or true in the completed tile work.

Tiles shall be firmly pressed into the freshly notched bond coat. Tile on interior surfaces shall be tapped and beat into a true surface and to obtain at least 80 percent coverage by the mortar on the back of each tile. Tile on exterior surfaces shall have 100 percent coverage and shall be back-buttered immediately prior to setting the tile.

If tile is face mounted, the paper and glue shall be removed within one hour after tile is installed and all tiles that do not meet the requirements for joints and surface tolerance shall be adjusted or replaced.

Mortar that exudes into the grout spaces between tiles shall be removed to the bottom of tile.

Joints.--Joints between tile shall be continuous both vertically and horizontally. Joints shall be straight and of uniform and equal width. Where tiles on adjoining surface are the same size, the joints shall align, one with the other. Joint width shall be as recommended by the tile manufacturer.

Grouting tile.--Grout shall be mixed, applied and cured in accordance with the manufacturer's recommendations and ANSI Standard: A108.10 for cement grout and ANSI Standard: A108.9 for epoxy grout.

Spacers, strings, ropes, pegs, glue, paper, and face mounting material shall be removed before grouting. Joints between glazed wall tile shall be wetted if they have become dry. Joints for epoxy mortar shall be dry.

Grouting shall not begin until at least 48 hours after installing tile.

A maximum amount of grout shall be forced into the joints between tiles in accordance with the manufacturer's recommendations. The grout shall be finished to the depth of the cushion for cushion edge tile and finished flush with the surface for square edge tile. All gaps and skips in the grout spaces shall be filled.

Mortar or mounting mesh shall not show through the grouted joints.

The finished grout shall have a uniform color and shall be smooth without voids, pinholes or low spots.

Expansion joints shall be kept free of grout or mortar.

Grout shall be protected from freezing or frost for a least 5 days after installation.

Expansion joints.--Expansion joints shall be installed at the perimeter of all tile floors and at all substrate control joints and changes in the substrate material. Exterior expansion joint spacing shall not exceed 5 m in any direction.

All expansion joints shall be made with sealant over backer rods. The thickness of sealant at the center of expansion joints shall not exceed the width of the joint. Joint edges shall be primed as recommended by the sealant manufacturer.

Edge strips.--Edge strips shall be installed at openings where the threshold has not been shown on the plans, but where tile floor abuts other flooring materials at the same level. Edge strips shall be installed centered under the closed door, or where there is no door, centered in the opening.

Sounding tile.--Tiled surfaces shall be sounded with a metal bar or chain for improperly bonded tile or setting bed. Tile or setting bed that emits a hollow sound shall be replaced.

Replacement.--Cracked, chipped, broken, or otherwise defective tiles shall be removed and replaced. All tiles which differ more than 2 mm in elevation from adjacent tile edges shall be removed and replaced.

Curing.--After the installation of tile and the grouting of joints, the tile and grout shall be cured by keeping the surface continuously damp for at least 72 hours after grouting. Curing materials shall not stain the tile or grouted joints. Curing methods shall not erode away the grout.

After grouting, horizontal tiled surfaces shall be closed to traffic, and all tiled surfaces shall be kept free from impact, vibration or shock, for at least 72 hours.

Sealing unglazed quarry tile.--Sealer shall be applied to unglazed quarry tile only. The sealer shall be applied in accordance with the manufacturer's recommendations.

CLEANING AND PROTECTION.--

Cleaning tile surfaces.--All exposed tile surfaces shall be cleaned of all grout haze upon completion of grouting. Acids and chemicals used to clean tile shall conform to the tile manufacturer's recommendations. Cleaners shall not be harmful to materials on surfaces of abutting floors, walls, and ceilings. Tile work shall be rinsed thoroughly with clean water before and after using acid or chemical cleaners. After cleaning and rinsing, tile surfaces shall be polished using a soft cloth.

Tile work shall be cleaned and polished again immediately prior to completion of the contract. All dirt, grime, stains, paints, grease, and other discoloring agents or foreign materials shall be removed.

Protection.--After grouting, horizontal tiled surfaces shall be closed to traffic, and all tiled surfaces shall be kept free from impact, vibration or shock, for at least 72 hours after.

Tile surfaces damaged by construction operations shall be retiled.

SCHEDULES.--

Wall tile.--

Wall tile shall be nominal 102 mm x 102 mm glazed wall tile.

Installation on mortar bed, using a tile bond coat and grout, shall conform to the requirements of Method W 222, "Handbook for Ceramic Tile Installation."

Installation on gypsum wallboard, using a tile bond coat and grout, shall conform to the requirements of Method W 243, "Handbook for Ceramic Tile Installation."

Installation on cementitious backer board, using a tile bond coat and grout, shall conform to the requirements of Method W 244, "Handbook for Ceramic Tile Installation."

Installation on concrete and masonry shall be on a mortar bed using tile bond coat and grout, and shall conform to the requirements of Method W 211, "Handbook for Ceramic Tile Installation."

Floor tile.--

Floor tile shall be nominal 102 mm x 102 mm matte porcelain tile installed on a mortar bed using a tile bond coat and grout and shall conform to the requirements of Method F

9.03 RESILIENT BASE

GENERAL.--This work shall consist of furnishing and installing resilient base in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions, color palette, and samples of resilient base shall be submitted for approval. Samples shall be not less than 50 mm in length.

PRODUCTS.--

Resilient base.--

Resilient base shall be manufacturer's best grade, rubber or vinyl base, with premolded internal and external corner pieces. The height and color shall be as shown on the plans.

Adhesive.--

Adhesive shall be as recommended by base manufacturer.

EXECUTION.--

INSTALLATION.--Bases shall be firmly and totally attached to walls with adhesive and shall be accurately scribed to trim, molding and cabinets. All joints shall be tight fitting. Bases between premolded corners or other termini may be installed continuous or installed using one m minimum standard manufactured lengths. Filler pieces shall be not less than 0.5 m.

9.04 VINYL COMPOSITION TILE

GENERAL.--This work shall consist of furnishing and installing vinyl composition tile in accordance with the details shown on the plans and these special provisions.

Vinyl composition tile shall consist of vinyl composition tile, edger strips, floor wax and tile manufacturer's recommended primers and adhesives.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions, color and pattern samples shall be submitted for approval. Samples of tile shall be 305 mm x 305 mm in size.

PRODUCTS.--

Vinyl composition tile.--

Vinyl composition tile shall be semi-flexible, 2.38 mm minimum thick, 305 mm x 305 mm tile conforming to Federal Specification: SS-T-312, Type IV. Color and pattern shall be as shown on the plans. The coefficient of friction shall be at least 0.6 per ASTM C1028.

Primer, leveling compound crack filler and adhesives.--

Primer, leveling compound crack filler and adhesives shall be waterproof types as recommended by the tile manufacturer.

Wax.--

Wax shall be water emulsion, self-polishing type containing not less than 16 percent wax solids, wetting agents, and a nonslip agent. The wax shall meet UL antislip standards.

Edger strips.-- Edger strips shall be commercial quality, stainless steel or aluminum.

EXECUTION.--

PREPARATION.--Before placing adhesives, all surfaces to receive vinyl composition tile shall be made free of localized depressions or bumps. Bumps shall be ground flat. Holes, depressions and cracks shall be filled with crack filler or leveling compound.

Immediately prior to application of the tile flooring, the surface to be covered shall be thoroughly dry, free of paint, oil, grease, mortar, plaster droppings, scaly surfaces or other irregularities and shall be broom clean. Primer, when recommended, shall be thoroughly brushed on the surface at the rate recommended by the adhesive manufacturer and shall be completely dry before the application of adhesives.

The rooms where tile is to be installed shall be maintained at a temperature of at least 21°C for not less than 72 hours before installation, during installation and for 5 days after installation.

APPLICATION.--Tile shall be laid to a true, straight, smooth and even finished surface in accordance with the manufacturer's instructions. Joints shall be tight fitting. Floor covering shall be placed before floor mounted fixtures are installed. After tile has been set, the finished surface shall be rolled and crossrolled with a roller weighing 50 kg or more.

Edger strips shall be installed at free edges.

Where tile patterns between rooms differ, the pattern break at openings shall occur at the centerline of the common wall.

Upon completion of the tile application, all stains, surplus adhesive, dirt and debris resulting from the work shall be removed and the floor left broom clean. Tile shall be protected from damage at all times during construction. As a last order of work, tile shall be washed with soap and warm water, rinsed, and then waxed in accordance with the tile manufacturer's printed instructions. Not less than 2 applications of wax shall be placed on the tile flooring.

PATCHING EXISTING TILED FLOORS.--Tile for patching existing floors shall closely match the color and pattern of the existing adjacent floor tile, except tile of contrasting color and pattern may be use when approved by the Engineer.

If the size of existing tile on floors which are to be patched can not be matched, enough existing tile shall be removed to permit the installation of full sized 305 mm x 305 mm tiles. The limits of existing tile removal and new tile installation shall be approved by the Engineer.

REPLACEMENT OF EXISTING TILE.--Replacement of existing tile flooring where ordered by the Engineer will be paid for in accordance with the requirements specified in Section 3-1.01 of the General Conditions.

9.05 PAINTING

PART 1.- GENERAL

SUMMARY.--This work shall consist of preparing surfaces to receive coatings, and furnishing and applying coatings, in accordance with the schedules and details shown on the plans, and these special provisions.

The coatings specified in this section are in addition to any factory finishes, shop priming, or surface treatment specified elsewhere in these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, a materials list, and color samples shall be submitted for approval.

Product descriptive data shall include product description, manufacturer's recommendations for product mixing, thinning, tinting, handling, site environmental requirements, product application and drying time.

Materials list shall include manufacturer's name, trade name, and product numbers for each type coating to be applied.

Color samples shall be manufacturer's color cards, approximately 50 mm x 75 mm, for each color of coating shown on the plans. Color samples for stains shall be submitted on wood of the same species, color, and texture as the wood to receive the stain.

REGULATORY REQUIREMENTS.--Coatings and applications shall conform to the rules for control of volatile organic compound emissions adopted by the air quality control district in the air basin in which the coatings are applied.

SITE ENVIRONMENTAL REQUIREMENTS.--Coatings shall not be applied when the air temperature is below 10°C (20°C for varnishes) or when the relative humidity exceeds 75 percent.

The surface to be coated shall be maintained at a minimum temperature of 7°C for a period of 24 hours prior to, and 48 hours after the application of the coating. Heating facilities shall be provided when necessary.

Continuous ventilation shall be provided during application of the coatings.

A minimum lighting level of 865 lux, measured 1 m from the surface to be coated, shall be provided while surfaces are being prepared for coatings and during coating applications.

DELIVERY, STORAGE, AND HANDLING.--Products shall be delivered to the site in sealed, labeled containers and stored in a well ventilated area at an ambient air temperature of not less than 7°C. Container labeling shall include manufacturer's name, type of coating, trade name, color designation, drying time, and instructions for tinting, mixing, and thinning.

MAINTENANCE STOCK.--Upon completion of coating work, a full 3.8 liter container of each type and color of finish coat and stain used shall be delivered to the location at the project site designated by the Engineer. Containers shall be tightly sealed and labeled with color, texture, and room locations where used, in addition to the manufacturer's standard product label.

PART 2.- PRODUCTS

GENERAL.--The products shall be the best quality grade coatings of the specified types as regularly manufactured by nationally recognized paint and varnish manufacturers that have not less than 10 years experience in manufacturing paints and varnishes. Products that do not bear the manufacturer's identification as the best quality grade product shall not be used. Products for each coating system shall be by a single manufacturer and shall not contain lead type pigments.

Thinners, shellac, fillers, patching compounds, coloring tint, and other products required to achieve the specified finish shall be the manufacturer's best quality and shall be used as recommended.

PART 3.- EXECUTION

INSPECTION.--Surfaces to be coated at the jobsite shall be approved by the Engineer prior to the application of coatings. The Contractor shall notify the Engineer at least 3 working days prior to the application of coatings.

SURFACE PREPARATION.--Surfaces scheduled to be coated shall be prepared in accordance with the following, except that the surfaces not specified herein shall be prepared as recommended by the coating manufacturer.

GENERAL.--Hardware, cover plates, light fixture trim, and similar items shall be removed prior to preparing surfaces for coating. Following the application of the finish coating, the removed items shall be reinstalled in their original locations.

WOOD.--Oil and grease shall be removed by solvent wash. Mildew shall be removed by mildew wash. Surfaces to be coated shall be cleaned of all dirt, excess material, or filler by hand cleaning. Smooth surfaced wood shall be sanded lightly.

A sealer composed of equal parts of shellac and alcohol shall be spot applied to knots, sap, pitch, tar, creosote, and other bleeding substances.

After the application of the prime coat, all nail holes, cracks, open joints, dents, scars, and surface irregularities shall be filled, hand cleaned, and spot primed to provide smooth surfaces for the application of finish coats.

Irregularities in wood surfaces to receive a transparent stain finish shall be filled and hand cleaned after the first coat of stain has been applied. The color of the filler shall match the color of the stained wood.

Irregularities in wood surfaces to receive a clear finish shall be filled and hand cleaned before the application of coatings. The color of the filler shall match the color of the coated wood.

GALVANIZED METAL.--Oils, grease, and fabrication lubricants shall be removed by solvent wash. Surfaces shall be cleaned of remaining surface treatments by hand cleaning. New surfaces shall be roughened by hand cleaning or light abrasive blasting.

Abraded or corroded areas shall be hand cleaned and spot coated with one coat of vinyl wash pretreatment. Abraded or corroded areas on new surfaces not scheduled to be painted shall be cleaned by solvent wash, hand cleaned, and given 2 spot applications of zinc rich paint.

STEEL AND OTHER FERROUS METALS.--Oils, grease, and fabrication lubricants shall be removed by solvent wash. Dirt, water soluble chemicals, and similar surface contamination shall be removed by detergent wash or steam cleaning. Mill scale and rust shall be removed by hand cleaning or abrasive blasting.

GYPSUM BOARD.--Holes, cracks, and other surface imperfections shall be filled with joint compound or suitable filler prior to application of coatings. Taped joints and filled areas shall be hand sanded to remove excess joint compound and filler.

CEMENT PLASTER.--New plaster shall be cured a minimum of 14 days before coating. Cracks, holes, and surface imperfections shall be filled with patching plaster and hand textured to match adjacent surfaces.

CONCRETE AND CONCRETE UNIT MASONRY.--New material shall be cured a minimum of 14 days before coating. Surface dirt and dust shall be removed by brooming, air blast, or vacuum cleaner. Oil and grease shall be removed by steam cleaning. Form release agents, weak concrete, surface laitance, dirt, and other deleterious material shall be removed by sandblasting. Cracks and voids shall be filled with cement mortar patching material.

PREVIOUSLY COATED AND SHOP PRIMED SURFACES.--Dirt, oil, grease, or other surface contaminants shall be removed by water blasting, steam cleaning, or TSP wash. Minor surface imperfections shall be filled as required for new work. Mildew shall be removed by mildew wash. Chalking paint shall be removed by hand cleaning. The surfaces of existing hard or glossy coatings shall be abraded to dull the finish by hand cleaning or light abrasive blasting. Abrasive blasting shall not be used on wood or non-ferrous metal surfaces.

Chipped, peeling, blistered, or loose coatings shall be removed by hand cleaning, water blasting, or abrasive blasting. Bare areas shall be pretreated and primed as required for new work.

DEFINITIONS.--

DETERGENT WASH.--Removal of dirt and water soluble chemicals by scrubbing with a solution of detergent and water, and removal of all solution and residues with clean water.

HAND CLEANING.--Removal of dirt, loose rust, mill scale, excess base material, filler, aluminum oxide, chalking paint, peeling paint, or paint which is not firmly bonded to the surfaces by using hand or powered wire brushes, hand scraping tools, power grinders, or sandpaper and removal of all loose particles and dust prior to coating.

MILDEW WASH.--Removal of mildew by scrubbing with a solution of detergent, hypochlorite-type household bleach, and warm water, and removal of all solution and residues with clean water.

ABRASIVE BLASTING.--Removal of oil, grease, form release agents, paint, dirt, rust, mill scale, efflorescence, weak concrete, or laitance, by the use of airborne abrasives, and removal of loose particles, dust, and abrasives by blasting with clean air.

Abrasives shall be limited to clean dry sand, mineral grit, steel grit, or steel shot, and shall be graded to produce satisfactory results. Unwashed beach sand containing salt or silt shall not be used.

Abrasive blasting shall conform to the requirements of SSPC-SP6-85, Commercial Blast Cleaning, as defined in the Steel Structures Painting Council Manual.

Light abrasive blasting shall conform to the requirements of SSPC-SP7-85, Brush-Off Blast Cleaning, as defined in the Steel Structures Painting Council Manual.

SOLVENT WASH.--Removal of oil, grease, wax, dirt, or other foreign matter by using solvents, such as mineral spirits or xylol, or other approved cleaning compounds.

STEAM CLEANING.--Removal of oil, grease, dirt, rust, scale, or other foreign matter by using steam generated by commercial steam cleaning equipment, from a solution of water and steam cleaning compounds, and removal of all residues and cleaning compounds with clean water.

TSP WASH.--Removal of oil, grease, dirt, paint gloss, and other foreign matter by scrubbing with a solution of trisodium phosphate and warm water, and removal of all solution and residues with clean water.

WATER BLASTING.--High pressure, low volume water stream for removing dirt, light scale, chalking or peeling paint. Water blasting equipment shall produce not less than a 13 800 MPa minimum output pressure when used. Heated water shall not exceed 66°C. If a detergent solution is used, it shall be biodegradable and shall be removed from all surfaces with clean water.

PROTECTION.--The Contractor shall provide protective devices, such as tarps, screens or covers, as necessary to prevent damage to the work and to other property or persons from all cleaning and painting operations.

Paint or paint stains on surfaces not designated to be painted shall be removed by the Contractor at his expense and the original surface restored to the satisfaction of the Engineer.

APPLICATION.--

GENERAL.--Coatings shall be applied in accordance with the printed instructions and at the application rates recommended by the manufacturer to achieve the dry film thickness specified in these special provisions.

Mixing, thinning and tinting shall conform to the manufacturer's printed instructions. Thinning will be allowed only when recommended by the manufacturer.

Coatings shall be applied only when surfaces are dry and properly prepared.

Cleaning and painting shall be scheduled so that dust and other contaminants from the cleaning process will not fall on wet, newly coated surfaces.

Materials required to be coated shall have coatings applied to all exposed surfaces, including the tops and bottoms of wood and metal doors, the insides of cabinets, and other surfaces not normally visible from eye level.

APPLICATION SURFACE FINISH.--Each coat shall be applied to a uniform finish. Finished surfaces shall be free of surface deviations and imperfections such as skips, cloudiness, spotting, holidays, laps, brush marks, runs, sags, curtains, ropiness, improper cutting in, overspray, drips, ridges, waves, and variations in color and texture.

Each application of a multiple application finish system shall closely resemble the final color coat, except each application shall provide enough contrast in shade to distinguish the separate applications.

WORK REQUIRED BETWEEN APPLICATIONS.--Each application of material shall be cured in accordance with the coating manufacturer's recommendations before applying the succeeding coating. Enamels and clear finishes shall be lightly sanded, dusted, and wiped clean between applications.

Stain blocking primer shall be spot applied whenever stains bleed through the previous application of a coating.

TIMING OF APPLICATIONS.--The first application of the specified coating system shall be applied prior to any deterioration of the newly prepared surface. Metal surfaces shall be prepared and prime coated the same day that cleaning of bare metal is performed. Additional prime coats shall be applied as soon as drying time of the preceding coat permits.

Metal surfaces shall be prime coated within 12 hours of application of vinyl wash pretreatment.

Shellac sealer shall be allowed to dry at least 12 hours before applying the next coat.

Drying time between applications of water borne coatings shall be at least 12 hours.

APPLICATION METHODS.--Coatings shall be applied by brush, roller or spray. Rollers shall be of a type which do not leave a stippled texture in the paint film. Extension handles for rollers shall not be greater than 2 m in length.

If spray methods are used, surface deviations and imperfections such as, overspray, thickness deviations, lap marks, and orange peel shall be considered as evidence that the work is unsatisfactory and the Contractor shall apply the remainder of the coating by brush or roller, as approved by the Engineer.

DRY FILM THICKNESS.--

Vinyl wash pretreatment	0.007 mm to 0.13 mm, maximum.
Bituminous paint	0.1 mm, minimum.
Epoxy polyamide primer	0.1 mm, minimum.
Aliphatic polyurethane enamel	0.05 mm, minimum.
Other primers, undercoats, sealers, and coatings	As recommended by the manufacturer.

BACKPRIMING.--The first application of the specified coating system shall be applied to all wood surfaces (face, back, edges, and ends) of wood materials that are not factory coated, immediately upon delivery to the project site, except surfaces of interior finish woodwork that adjoin concrete or masonry shall be coated with one application of alkyd exterior wood primer before installation.

When clear or stain type coatings are required on millwork, trim, or paneling, varnish, reduced 25 percent by mineral spirits, shall be used for coating the back faces.

All primed metal surfaces in contact with concrete or concrete block exterior walls shall be coated with a bituminous paint on those surfaces in contact with the wall.

PATCHES IN PREVIOUSLY COATED SURFACES.--Where patches are made on surfaces of previously coated walls or ceilings, the entire surface to corners on every side of the patch shall be coated with a minimum of one application of the finish coat.

FINISHING MECHANICAL AND ELECTRICAL COMPONENTS.--Shop primed mechanical and electrical components shall be finish coated in accordance with the coating system entitled, "Shop Primed Steel." Louvers, grilles, covers, and access panels on mechanical and electrical components shall be removed and coated separately.

Interior surfaces of air ducts which are visible through grilles or louvers shall be coated with one application of flat black enamel, to limit of the sight line.

Exposed conduit, piping, and other mechanical and electrical components visible in areas shall be painted.

Both sides and all surfaces, including edges and back of wood mounting panels for electrical and telephone equipment shall be finish coated before installing equipment.

CLEANING.--Upon completion of all operations, the coated surfaces shall be thoroughly cleaned of dust, dirt, grease, or other unsightly materials or substances.

Surfaces marred or damaged as a result of the Contractor's operations shall be repaired, at his expense, to match the condition of the surfaces prior to the beginning of the Contractor's operations.

COATING SYSTEMS.--The surfaces to be coated shall be as shown on the plans and as specified elsewhere in these special provisions. When a coating system is not shown or specified for a surface to be finish coated, the coating system to be used shall be as specified for the substrate material. The number of applications specified for each coating system listed herein is a minimum. Additional coats shall be applied if necessary to obtain a uniform color, texture, appearance, or required dry film thickness.

SYSTEM 1- CEMENT PLASTER AND CONCRETE.--

- 1 prime coat: concrete and masonry primer
- 2 finish coats: acrylic, exterior enamel, semi-gloss

SYSTEM 2- CONCRETE UNIT MASONRY.--

- 1 pretreat coat: block filler
- 1 prime coat: concrete and masonry primer
- 2 finish coats: acrylic, exterior enamel, semi-gloss

SYSTEM 3- GALVANIZED METAL.--

1 pretreat coat: vinyl wash pretreatment
1 prime coat: galvanized metal primer
2 finish coats: acrylic, exterior enamel, semi-gloss

SYSTEM 4- GYPSUM BOARD.--

1 prime coat: PVA wall sealer
2 finish coats: acrylic, interior enamel, semi-gloss

SYSTEM 5- PREVIOUSLY COATED EXTERIOR SURFACES.--

1 prime coat : alkyd exterior enamel undercoat
2 finish coats: acrylic, exterior enamel, semi-gloss

SYSTEM 6- PREVIOUSLY COATED INTERIOR SURFACES.--

1 prime coat: alkyd interior wood primer
2 finish coats: acrylic, interior enamel, semi-gloss

SYSTEM 7- SHOP PRIMED STEEL.--

1 prime coat : red oxide ferrous metal primer
2 finish coats: alkyd, exterior enamel, semi-gloss

SYSTEM 8- STEEL AND OTHER FERROUS METALS.--

2 prime coats: red oxide ferrous metal primer
2 finish coats: alkyd, exterior enamel, semi-gloss

SYSTEM 9- STEEL, ALIPHATIC POLYURETHANE.--

1 prime coat: epoxy polyamide primer
2 finish coats: aliphatic polyurethane enamel, gloss

SYSTEM 10- WOOD, PAINTED.--

1 prime coat: alkyd, exterior wood primer
2 finish coats: acrylic, exterior enamel, semi-gloss

COLOR SCHEDULE.--Colors shall be as shown on the plans.

9.06 ACOUSTIC CEILING TILE

GENERAL.--This work consists of furnishing and installing acoustic tile on ceilings in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions and 2 samples of the acoustic tile shall be submitted for approval.

PRODUCTS.--

Acoustic tile.--

Acoustic tile shall be 305 mm x 305 mm x 15 mm minimum thickness, square edges, nondirectional natural fissured texture, factory applied, washable, off-white vinyl latex finish. Tile shall conform to ASTM Designation: E 1264, Type III, Form 2. Noise Reduction Coefficient (NRC) shall be minimum 0.65. Panels shall have a flame spread rating not exceeding 25.

Adhesives.--

Adhesives shall be as recommended by acoustic tile manufacturer.

EXECUTION.--

PREPARATION.--Surfaces to receive acoustic tile shall be clean, dry and level and shall be prepared in accordance with the adhesive manufacturer's recommendations.

INSTALLATION.--Tile shall be installed in accordance with the manufacturer's recommendations. Installation of tile shall be restricted to periods when the ambient room temperature is between 13°C and 35°C.

DIVISION 10. SPECIALTIES

10.01 METAL TOILET PARTITIONS

GENERAL.--This work shall consist of furnishing and installing metal toilet partitions in accordance with the details shown on the plans and these special provisions.

Metal toilet partitions shall consist of panels, doors, pilasters, headrails, urinal screens, fasteners, anchorages and hardware. Internal reinforcement shall be provided at all fasteners, anchorages, hardware and accessories.

Doors, panels, pilasters, and urinal screens shall have a factory applied, baked on enamel finish consisting of not less than one prime coat over a chemically pretreated base followed by at least one baked on enamel finish coat.

SUBMITTALS.--Manufacturer's descriptive data, standard color palette, installation instructions and shop drawings shall be submitted for approval.

Colors will be selected from the manufacturer's standard color palette by the Engineer after the award of the contract.

Shop drawings shall show the plan layout, door and panel elevations and all details required for the complete installation and anchorage of the partition system.

PRODUCTS.--

Doors and panels.--

Doors and panels shall be flush, 25 mm minimum thickness, formed of two 0.86 mm (22-gage) minimum thickness, galvanized steel sheets over a honeycomb core. Doors and panels shall have formed edges sealed with a continuous oval crown locking strip, and shall be mitered, welded and finished at the corners.

Doors shall have controlled action hinges, with vertical pintle and ball bearing roller operating on adjustable cams, or moving parts of nylon and stainless steel. Top pivots shall be recessed into edges of doors.

Doors shall be provided with slide bar latch and a combination coat-hat hook and door stop, except as otherwise specified.

Doors on stalls designed for use by the disabled shall be a slide bolt door latch, U-shape or wire pulls both sides of the door located directly beneath the latch, self closing hinges, and combination coat-hat hook and door stop. Door at front entry stalls shall have 813 mm minimum clear width when the door is open 90°. Door at side entry stalls shall have 864 mm minimum clear width when the door is open 90°.

Pilasters.--

Pilasters shall be 32 mm thick, of the same construction as the doors and panels, except the galvanized face sheets shall be 1.0 mm (20-gage) minimum thickness, and shall have an adjustable, leveling base.

Pilasters for floor supported partitions shall be 32 mm thick, of the same construction as the doors and panels, except face sheets shall be 1.3 mm for galvanized steel and 1.2 mm for stainless steel (18-gage), with adjustable, leveling base incorporating two 9.5 mm diameter stud expansion anchors with leveling nuts.

Headrails.--

Headrails shall be anodized aluminum, 25 mm x 38 mm minimum, with exposed ends capped.

Urinal screens.--

Urinal screens shall be wedge type, wall-mounted, and of the same construction as the doors and panels, except face sheets shall be 1.0 mm (20-gage) minimum thickness. All fasteners shall be concealed.

Fasteners and anchorages.--

Fasteners and anchorages shall be stainless steel with vandal resistant heads.

Hardware.--

Hardware shall be highly polished chromium plated, cast alloy, or heavy duty anodized aluminum.

Pilasters anchors.--

Pilasters anchors shall be integral stud anchor type or internally threaded expansion sleeve type with single cone expander. Self-drilling type anchorage shall not be used.

Pilaster shoes.--

Pilaster shoes shall be one-piece, stainless steel, with concealed hold down clips, and of sufficient height to completely cover the base and anchors.

EXECUTION.--

INSTALLATION.--Metal toilet partitions shall be installed rigidly, securely, plumb, and true and in accordance with the manufacturer's recommendations. Tops and bottoms of doors shall align with tops and bottoms of panels, and all horizontal lines shall be level.

Rigid backing shall be provided in walls to receive anchorages.

Panels shall be anchored with at least 3 brackets at each wall and pilaster. Two anchors shall be used to fasten each pilaster base to the floor.

Doors shall not bind during opening and closing. The clearance between the door edges and pilasters shall be uniform, equidistant, and shall not exceed 5 mm. Hinges shall be adjusted to hold doors ajar when unlatched. Doors on stalls designed for use by the disabled shall return to the closed position.

Drilling, cutting and fitting of wall and floor finishes shall be concealed by the completed installation.

CLEAN-UP.--Toilet partitions shall be cleaned, polished and free of all defects. Chipped, dented, scratched, or otherwise damaged work shall be replaced at the Contractor's expense.

10.02 SIGNS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing signs in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for sign materials, colors and graphics, and for fastening hardware and material shall be submitted for approval.

PART 2.- PRODUCTS

Plastic signs (permanent room identification).--

Plastic signs for permanent room identification for other than restrooms shall be scratch resistant, non-static, fire retardant, washable melamine laminate with a non-glare surface, not less than 3 mm thick. Letters and numbers shall be upper case Helvetica, 25 mm in height, 0.80 mm above and integral with sign material, accompanied by contracted Grade 2 Braille.

The characters on the signs shall have a width-to-height ratio of between 3:5 and 1:1 and a stroke width-to-height ratio of between 1:5 and 1:10.

All letters measured must be uppercase. After choosing a typestyle to test, begin by printing the letters I, X, and O at 25 mm height. Place the template's 1:1 square over the X or O, whichever is narrower. If the character is not wider than 25 mm, nor narrower than the 3:5 rectangle, the proportions are correct. Use the 1:5 rectangle to determine if the stroke of the I is too broad, and the 1:10 rectangle to see if it is too narrow. If all the tests are passed, the typestyle is compliant with proportion code.

Contracted Grade 2 Braille dots shall be 2.5 mm on centers in each cell with 5 mm space between cells. Dots shall be raised a minimum of 0.6 mm above the background.

Plastic sign (restroom).--

Plastic sign for restroom shall be not less than 6 mm acrylic plastic. Sign background shall be blue and shall conform to Federal Standard 595B, Color No. 15090. Male/female symbol and lettering shall be white and shall conform to Federal Standard 595B, Color No. 17886.

Male restroom identification shall be a male symbol on an equilateral triangle with edges 305 mm long and a vertex pointing upward.

Female restroom identification shall be a female symbol on a 305 mm diameter circle.

Unisex restroom identification shall be a male and female symbol on a 305 mm equilateral triangle superimposed on a 305 mm diameter circle.

Accessible building entrance sign.--

Accessible building entrance sign shall be not less than 3 mm acrylic plastic, not less than 152 mm x 152 mm , with the international symbol of accessibility.

Accessible building entrance sign shall be pressure sensitive decal, not less than 102 mm x 102 mm with the international symbol of accessibility.

Sign background shall be blue and shall conform to Federal Standard 595B, Color No. 15090. Symbol and border shall be white and shall conform to Federal Standard 595B, Color No. 17886.

Directional signs.--

Directional signs shall be scratch resistant, non-static, fire retardant, washable melamine laminate with a non-glare surface, not less than 3 mm thick. Letters and numbers shall be upper case Helvetica.

Contracted Grade 2 Braille dots shall be 2.5 mm on centers in each cell with 5 mm space between cells. Dots shall be raised a minimum of 0.6 mm above the background.

Assistive listening system.--

Assistive listening system shall be scratch resistant, non-static, fire retardant, washable melamine laminate with a non-glare surface, not less than 3 mm thick. Letters and numbers shall be upper case Helvetica.

No smoking sign.--

No smoking sign shall be scratch resistant, non-static, fire retardant, washable melamine laminate with a non-glare surface, not less than 3 mm thick. Letters and numbers shall be upper case Helvetica.

Colors of sign background and symbol shall be shown on the plans.

Sign housing shall be ABS molding. Faceplate shall be acrylic.

Fastening hardware and material.--

Fastening hardware and material shall be as recommended by the sign manufacturer. Fasteners shall be noncorrosive.

PART 3.- EXECUTION

Inscription.--Except for loft and exit signs, sign messages shall be as shown on the plans.

Installation.--Plastic signs for room identification and restrooms shall be fastened or secured to clean, finished surfaces in accordance with the sign manufacturer's instructions. Signs shall be installed at a location and height as shown on the plans.

Metal signs shall be attached securely with galvanized or cadmium plated fasteners.

Fastening hardware and material shall be installed within the sign as shown on the plans.

10.03 TOILET ROOM ACCESSORIES

GENERAL.--This work shall consist of furnishing and installing toilet room accessories in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions and details shall be submitted for approval.

PRODUCTS.--

Toilet seat cover dispenser.--

Toilet seat cover dispenser shall be stainless steel, lockable dispenser. Approximate dimensions: 380 mm x 290 mm x 60 mm deep. One dispenser per toilet stall.

Mirror, wall hung.--

Mirror, wall hung shall be Number 1 quality, 6 mm thick, electrolytically copper plated float or plate glass mirror with nonmoisture-absorbing filler. Mirror shall have a heavy gage galvanized steel back and stainless steel frame. The frame shall have a satin finish and shall be mitered and welded and the corners shall be ground smooth. Fasteners shall not penetrate surfaces of the frame exposed to view. Mirror shall conform to Federal Specification: DD-M-411b and shall be guaranteed against silver spoilage for not less than 10 years.

Grab bars and cane detection railings.--

Grab bars and cane detection railings shall be stainless steel, 38 mm diameter bars with integral mounting flanges concealed under integral escutcheons.

EXECUTION.--Toilet room accessories shall be installed in accordance with the manufacturer's recommendations. Fasteners for mounting toilet room accessories shall be concealed and vandal resistant.

Expansion anchors shall be used for mounting accessories on masonry or concrete walls.

Toilet room accessories shall be mounted after painting work has been completed.

All toilet room accessories shall be mounted plumb, secure and rigid. Grab bars shall be supported adequately so the bars will withstand an applied load of 113 kg at any point.

Toilet paper and feminine napkin dispensers located on the grab side of an accessible toilet room or stall shall not project more than the grab bar. The grab bar shall not project more than 75 mm into the 1219 mm minimum clear space in front of the water closet. The accessory shall not be located closer than 38 mm clear of the tangent point of the grab bar.

DIVISION 11. BLANK

DIVISION 12. BLANK

DIVISION 13. BLANK

DIVISION 14. CONVEYING SYSTEMS

14.01 WHEELCHAIR LIFTS

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a vertical platform lift in accordance with these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for all equipment, including installation instructions, shall be submitted for approval.

Submittals shall include, but not necessarily be limited to the following:

Assembly Drawings
Dimensional Drawings
Control Schematic Diagrams
Wiring Diagrams

CLOSEOUT SUBMITTALS.--

Operations and maintenance manuals--Prior to completion of the contract, 3 identified copies of the operation and maintenance instructions for the vertical platform lift shall be delivered to the Engineer at the jobsite. Manuals shall be bound and shall include the following:

Manufacturer's name
Name, address, and telephone number of factory authorized repair facility
Model and serial number
Service manual shall show:

Assembly drawings, parts list, and simplified system diagrams
Descriptions of all equipment and their basic operating features
Routine maintenance and service requirements
Troubleshooting and repair procedures
Accessories and their features and requirements

Inadequate or incomplete manuals will be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

WARRANTY.--

Warranties and guarantees.--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

PART 2.- PRODUCTS

MANUFACTURERS.--Acceptable manufacturers shall be as follows:

1. The National Wheel-0-Vator.
2. Thyssenkrupp Access.
3. Inclinator Company of America.
4. Or equal.

Platform.--

Platform shall be constructed of 12-gage minimum zinc clad steel with a non-skid surface. Platform shall be 991 mm by 1372 mm minimum. A grab rail shall be provided on the platform.

Platform side panels and door shall be minimum 18-gauge zinc clad steel. Side panels shall be a minimum of height of 1067 mm.

The configuration for the platform shall have the enter and exit on the same side, at 90°.

Door operation and clear opening width.--

The doors shall be power-operated and low –energy that remains open for 20 seconds minimum.

The end door shall be 815 mm minimum and the side door shall be 1065 mm minimum of clear opening width.

Rated Speed.--

The rated speed shall be 0.035 m/s minimum and 0.06 m/s maximum.

Power Supply.--

The power supply shall be 60 Hz, 120 volt, and single phase.

Emergency Operation.--

An emergency battery power system shall be provided to raise or lower units in case of malfunction or power loss.

An emergency stop or illuminated alarm switch shall be provided on the car as a means of signaling for assistance in the event of an emergency.

Flip Ramp.--

The flip ramp shall match the platform to provide transition from floor to lift platform at bottom landing.

FINISHES.--

All exposed steel surfaces shall be powder-coat finish. Immediately after cleaning and pre-treating, apply manufacturer's standard, thermosetting polyester or acrylic urethane powder coating with a cured film thickness not less than 0.04 mm.

Color shall be selected from manufacturer's standard color or optional colors.

PART 3.- EXECUTION**INSTALLATION.--**

General.--All equipment shall be installed in accordance with the vertical lift platform manufacturer's recommendations and the applicable codes.

FIELD QUALITY CONTROL.--**TESTS.--**

Acceptance tests.--Testing of the vertical platform lift shall be conducted by the Contractor in the presence of the Engineer. If the lift malfunctions or a failure develops, the parts causing the failure shall be replaced or repaired and the test repeated until the vertical platform lift performs satisfactorily.

The Contractor shall notify the Engineer in writing not less than 5 days prior to the time that the testing is scheduled.

DEMONSTRATION.--

Training.--The Contractor shall arrange instruction and training for up to 6 State personnel on the operation and maintenance of the equipment. Training shall be scheduled with the Engineer to occur within 2 weeks of the installation.

DIVISION 15. MECHANICAL

15.01 MECHANICAL WORK

GENERAL.--

Scope.--This work shall consist of performing mechanical work in accordance with the details shown on the plans and these special provisions.

Mechanical work shall include furnishing all labor, materials, equipment and services required for providing heating, ventilating, air conditioning, fume exhaust systems.

Earthwork, foundations, sheet metal, painting, electrical, and such other work incidental and necessary to the proper installation and operation of the mechanical work shall be in accordance with the requirements specified for similar type work elsewhere in these special provisions.

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of pipes, ducts, etc., and location of equipment is to be governed by structural conditions and obstructions. Equipment requiring maintenance and inspection is to be readily accessible.

Roof penetrations shall be flashed and sealed watertight in accordance with the requirements specified under "Sheet Metal Flashing" in Division 7, "Thermal and Moisture Protection," of these special provisions.

System identification shall be in accordance with the requirements specified under "System Identification" elsewhere in this Division 15.

SUBMITTALS.--

Product data.--A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions for plumbing fixtures, and component layout shall be included where applicable.

Manufacturer's descriptive data shall be submitted for the following:

- All mechanical equipments, machines, devices, etc
- All plumbing fixtures

CLOSEOUT SUBMITTALS.--

Operation and maintenance manuals.--Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be indexed and bound in a manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

Operation and maintenance manuals shall be submitted for the following equipment:

- All mechanical equipment, devices, controls, etc

QUALITY ASSURANCE.--

Codes and standards.--Mechanical work, including equipment, materials and installation, shall conform to the CBC,CMC, and to the California Code of Regulations, Title 8, Chapter 4, Division of Industrial Safety (DIS).

SEQUENCING.--

Replacement of the chilled water plant and hot water plant equipment shall be dictated by the construction timing, and shall not disrupt chilled or hot water distribution to the Structural Materials Building. Based upon the Contractor's work schedule and work progress, a chilled water and hot water equipment replacement proposal shall be submitted to the Engineer for approval. The proposal must also address the plan and procedures for providing interim conditioning for areas of the Main Building and Structural Materials Building that shall remain operational during the chilled and hot water equipment replacement.

The Contractor shall provide all interim, portable equipment required to condition the areas that are required to stay operational, full time or part time. In addition to, or in lieu of, providing interim, portable conditioning equipment, the Contractor may utilize or modify any part of the existing air handling systems, hot and chilled water equipment, hot and chilled water distributions systems and exhaust systems that are operational and which will be replaced as part of the contract. Air handling equipment or systems that are to remain operational during the contract and not be removed by the Contractor, shall not be used or modified for temporary conditioning requirements.

WARRANTY.--

Warranties and guarantees.--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

15.02 PIPE, FITTINGS AND VALVES

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing pipes, fittings and valves in accordance with the details shown on the plans and these special provisions. Pipe, fittings and valves shall include such plumbing and piping accessories and appurtenances, not mentioned, that are required for the proper installation and operation of the plumbing and piping systems.

All piping insulation and associated material shall be in accordance with the requirements specified under "Pipe Insulation," elsewhere in this Division 15.

Pipe hangers and supports shall be in accordance with the requirements specified under "Pipe Hangers and Supports," elsewhere in this Division 15.

The pipe sizes shown on the plans are nominal pipe size. No change in the pipe size shown on the plans shall be permitted without written permission from the Engineer.

The pipe and fitting classes and material descriptions shall be as specified herein. No change in class or description shall be permitted without written permission from the Engineer.

QUALITY ASSURANCE.--

Codes and standards.--Pipe, fittings and valves shall be installed in accordance with the requirements in the CPC, the manufacturer's recommendations and the requirements specified herein.

PART 2.- PRODUCTS

MATERIALS.--

PIPE AND FITTINGS --

Class Description

A1.--

Schedule 40 galvanized steel pipe conforming to ASTM Designation: A 53, with 1040 kPa galvanized malleable iron banded screwed fittings and galvanized steel couplings. The weight of the zinc coating shall be not less than 90 percent of that specified in ASTM Designation: A 53.

A2.--

Schedule 40 galvanized steel pipe conforming to ASTM Designation: A 53, with black cast iron recessed drainage fittings. For rainwater leaders, neoprene-gasket compression couplings, Smith Blair, Dresser, or equal, may be used. The weight of the zinc coating shall be not less than 90 percent of that specified in ASTM Designation: A 53.

A3.--

Schedule 5 steel pipe conforming to ASTM Designation: A 135 with pressfit fittings and couplings for service as designated.

A4.--

Pipe and fittings shall be UL or FM listed, ferrous (Schedule 20 minimum) or copper (Type L minimum), suitable for the working pressure involved but not less than 1210 kPa. Pipe and fittings shall be in accordance with National Fire Protection Association (NFPA 13-2002) Code requirements.

B1.--

Schedule 40 black steel pipe conforming to ASTM Designation: A 53, with screwed fittings suitable for working pressure involved, but not less than 1210 kPa. Fittings shall be listed for fire protection.

B2.--

Schedule 40 black steel pipe conforming to ASTM Designation: A 53, with 1040 kPa black malleable iron banded screwed fittings and black steel couplings.

Steel pipe coating, where required, shall be factory applied plastic. Pipe coating shall be Standard Pipe Protection, X-Tru-Coat (0.50 mm thick); Pipe Line Service Corporation, Republic; 3M Company, Scotchkote 205 (0.30 mm thick); or equal.

B3.--

Schedule 80 black steel pipe conforming to ASTM Designation: A 53 grade B, 50 mm and smaller shall be 20 700 kPa WOG socket welding fittings and couplings or 13 800 kPa WOG threaded forged steel, ASTM Designation: A 105. 65 mm and larger shall be extra strong weight butt welding fittings and couplings.

D1.--

Ductile iron push on joint pipe conforming to AWWA Designation: C151. Fittings shall be push on ductile iron conforming to AWWA Designation: C153. Joints shall be rubber gasketed and designed for a working pressure of 2420 kPa. Pipe and fittings shall be supplied with bituminous outer coating and cement lining. Pipe shall be listed for fire protection.

H1.--

Type DWV hard copper tubing conforming to ASTM Designation: B 306, with DWV drainage fittings, stop type couplings and threaded adapters.

H2.--

Type K hard copper tubing conforming to ASTM Designation: B 88, with wrought copper or cast bronze solder joint pressure fittings, stop type couplings and threaded adapters. Solder shall be lead-free.

H3.--

Type L hard copper tubing conforming to ASTM Designation: B 88, with wrought copper or cast bronze solder joint pressure fittings, stop type couplings and threaded adapters. Solder shall be lead-free.

P3.--

Polyvinyl chloride (PVC) standard weight pipe and fittings, Schedule 40, conforming to ASTM Designation: D 1785. Pipe shall meet or exceed requirements of National Sanitation Foundation Standard No. 14. Pipe shall have bell ends conforming to ASTM Designation: D 2672. For pipe sizes 75 mm and smaller, plain end pipe with solvent welded fittings conforming to ASTM Designation: D 2241, may be used.

Unions (for steel pipe).--

Unions (for steel pipe) shall be 1730 kPa, threaded malleable iron, ground joint, brass to iron seat, galvanized or black to match piping.

Unions (for copper or brass pipe).--

Unions (for copper or brass pipe) shall be 1040 kPa cast bronze, ground joint, bronze to bronze seat with silver brazing threadless ends or 860 kPa cast brass, ground joint, brass to brass seat with threaded ends.

Unions (for brass waste and flush pipes).--

Unions (for brass waste and flush pipes) shall be slip or flange joint unions with soft rubber or leather gaskets. Unions shall be placed on the fixture side of the traps.

Dielectric waterway.--

Dielectric waterway shall be a premanufactured unit that incorporates an insulated interior lining at least 75 mm in length between the 2 pipes being connected while maintaining metal to metal contact on the exterior surface. Dielectric water way shall be listed by IAPMO (International Association of Plumbing and Mechanical Officials).

Insulating union.--

Insulating union or flange as applicable shall be suitable for the service on which used. Connections shall be constructed such that the 2 pipes being connected are completely insulated from each other with no metal to metal contact. Insulating couplings shall not be used. Insulating union shall be F. H. Maloney; Central Plastics; EPCO; or equal.

Insulating connection (to hot water tanks).--

Insulating connection (to hot water tanks) shall be 150 mm minimum, flexible copper tubing with dielectric union at each end and designed to withstand a pressure of 1040 kPa and a temperature of 93°C.

VALVES.--**Gate valve (65 mm and smaller).--**

Gate valve (65 mm and smaller) shall be bronze body and trim, removable bonnet and non rising stem, Class 125 and same size as pipe in which installed. Gate valve shall be Crane, 438; Nibco Scott, T-113; Jenkins, 370; or equal.

Gate valve in nonferrous water piping systems may be solder joint type with bronze body and trim. Valve shall be Kitz, 59; Nibco Scott, S-113; Jenkins, 1240; or equal.

Gate valve (75 mm and larger, above ground).--

Gate valve (75 mm and larger, above ground) shall be iron body with bronze trim, removable bonnet and non-rising stem, class 125 and same size as pipe in which installed. Gate valve shall be Crane, 461; Nibco Scott, F-619; Jenkins, 326; or equal.

Gate valve (75 mm and larger, below ground).--

Gate valve (75 mm and larger, below ground) shall be AWWA double disc, hub or rubber ring type, removable bonnet and non-rising stem, equipped with operating nuts, 1380 kPa working pressure, and Tee handle wrench for each valve. Valve shall be Mueller, A-2380; American Valve, Model 28; or equal.

Ball valve.--

Ball valve shall be two piece, minimum 2760 kPa WOG, bronze body and chrome plated or brass ball with full size port. Valve shall be Nibco Scott, T-580; Watts, B-6000; Kitz, 56; or equal.

Check valve (40 mm and smaller).--

Check valve (40 mm and smaller) shall be silent spring loaded type, threaded bronze body, nylon or teflon disc, beryllium or stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed. Check valve shall be Nibco/Scott, T-480; CPV, 36; Kitz, 26; or equal.

Check valve (50 mm and larger).--

Check valve (50 mm and larger) shall be silent wafer type, full faced for installation between 860 kPa flanges, iron body with bronze trim, nylon or teflon disc, stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed. Check valve shall be APCO, Series 300; CPV, 10D; Metraflex, Series 900; or equal.

Pressure reducing valve (PRV).--

Pressure reducing valve (PRV) shall be direct acting, spring loaded diaphragm type control valve with balanced single seat, bronze body, bronze trim and screwed connection. PRV shall be completely self-contained and shall require no external sending pipes or outside control medium. The outlet pressure of the PRV shall be adjustable within a range of 170 kPa to 400 kPa.

FAUCET .--**Hose faucet.--**

Hose faucet shall be compression type, angle pattern, wall flange at exterior locations, tee handle, 20 mm female thread with hose end, rough chrome or nickel plated finish for locations inside building, rough brass finish for others. Hose faucet shall be supplied with an integral or nonremovable threaded outlet vacuum breaker which meets the requirements of the American Society of Sanitary Engineering (ASSE) Standard: 1011. Hose faucet shall be Nibco, No. 63VB; Chicago, No. 13T; or equal.

CLEANOUTS.--**Cleanout through wall.--**

Cleanout through wall shall be cast iron cleanout tee type with polished stainless access plates. Plug shall be countersunk brass or bronze with tapered threads. Cleanout shall be Wade, No. W-8460; Smith, No. 4532; Zurn, No. 1445; or equal.

Cleanout through floor.--

Cleanout through floor shall have nonslip scoriated nickel bronze access plate and adjustable frame with square pattern top for ceramic tile and round pattern top for other finishes. Where floors are constructed with a membrane, access frame shall be provided with membrane clamping flange. Plug shall be countersunk brass or bronze with tapered threads. Cleanout shall be Wade, W-7000 Series; Smith, 4023 Series; Zurn, No. 1400; or equal.

Cleanout through floors in exterior locations shall be heavy duty, floating pipe type with cast iron cover. Cleanouts shall be Wade, No. W-8300-HF; Smith, No. 4253; Zurn, No. 1474; or equal.

Cleanout to grade.--

Cleanout to grade shall be cast iron ferrule type. Plug shall be countersunk brass or bronze with tapered threads. Cleanout to grade shall be Wade, No. W-8450; Smith, 4420; Zurn, No 1440; or equal.

MISCELLANEOUS ITEMS.--**Water hammer arrestor.--**

Water hammer arrestor shall be stainless steel body with bellows or piston. Arrestor compression chambers shall be pneumatically charged. Water hammer arrestors shall be tested and certified in accordance with the Plumbing and Drainage Institute Standard: PDI-WH201 and sized as shown on the plans.

Access door.--

Access door shall be 1.52 mm prime coated steel, face mounting square frame, minimum 300 mm x 300 mm door with concealed hinge and screwdriver latch.

Compression stop (exposed).--

Compression stop (exposed) shall be metal full free waterway, angle type, ground joint union, non-rising stem, molded rubber seat and wheel handle.

Compression stop (concealed).--

Compression stop (concealed) shall be long neck, built-in compression stops for required wall thickness, loose key and exposed parts polished chromium plated. Supplies shall be Chicago, 1771; California Brass, No. 172; or equal.

Pressure gages (for PRV).--

Pressure gages (for PRV) shall have 0 to 700 kPa scale with 80 mm minimum diameter dial. Gages shall be installed within 150 mm of the inlet and outlet sides of the pressure reducing valve. Pressure gages shall be provided with a brass gage cock.

Wye strainer.--

Wye strainer shall be wye pattern, cast iron body and Type 304 stainless steel or monel strainer screen. The strainer screen shall have an open area equal to at least 3 times the cross sectional area of the pipe in which it is installed and shall be woven wire fabric with 20 mesh or perforated sheet with 850 micron maximum diameter holes.

Backflow preventer.--

Backflow preventer shall be factory assembled with 2 check valves, one pressure differential relief valve, 2 ball valves and 4 test cocks. Backflow preventers shall be of the approved type reduced pressure principle devices listed by the County of Los Angeles Department of Health Services, Cross-Connection and Water Pollution Control Section, 2525 Corporate Place, Monterey Park, California 91754, Telephone (213) 881-4140.

Floor, wall, and ceiling plates.--

Floor, wall, and ceiling plates shall be chromium plated steel or plastic plates having screw or spring clamping devices and concealed hinges. Plates shall be sized to completely cover the hole.

Roof drain.--

Roof drain shall be cast iron body, with integral flashing clamp and gravel stop with seepage openings, 400 mm nominal polyethylene low profile dome, 75 mm caulk or no-hub outlet and underdeck clamp. Roof drain shall be J. R. Smith, 1010; Zurn, Z-100; Wade, W-3500; or equal.

Floor drain.--

Floor drain shall be cast iron body and flashing collar, adjustable nickel bronze 150 mm strainer head with seepage openings and caulk or no-hub outlet. Floor drain shall be round or square as shown on the Architectural plans. Floor drain shall be J. R. Smith, 2005/2010; Wade, W-1100; Zurn, Z-415; or equal.

Pipe expansion fittings and loops.--

For pipes 65 to 100 mm in diameter, stainless steel hoses and double-braid, stainless steel sheaths with 2890 Kpa at 21 deg. C and 2170 Kpa at 232 deg C minimum pressure ratings.

PART 3.- EXECUTION

INSTALLATION.--

INSTALLATION OF PIPES AND FITTINGS.--

Pipe and fittings.--Pipe and fittings shall be installed in accordance with the following designated uses:

Designated Use	Pipe and Fitting Class
Domestic water (CW and HW) in buildings	H3 or A1
Domestic water underground within 1.5 m of the building	A1 or H2
Fire protection water, underground	B1,D1 or P4
Fire protection water riser	B1, D1 or H3
Fire protection sprinkler piping in building	A1, A3, A4 or B1
Sanitary drain piping above ground in building	H1
Sanitary vent piping above ground in building	A2, H1,
Rainwater leaders	A2
Equipment drains and relief valve discharge	H3 or A1

Installing piping.--Water piping shall be installed generally level, free of traps and bends, and arranged to conform to the building requirements.

Vitrified clay pipe shall be installed in accordance with ASTM Designation: C 12, Class C.

Piping installed underground shall be tested as specified elsewhere in these special provisions before backfilling.

Public use areas, offices, rest rooms, locker rooms, crew rooms, training rooms, storage rooms in office areas, hallway type rooms, and similar type use areas shall have concealed piping.

Warehouse rooms, equipment bays, and loft areas shall have exposed piping.

Piping shall not be run in floor fill, except as shown on the plans.

Piping shall be installed parallel to walls. All obstructions shall be cleared, headroom preserved and openings and passageways kept clear whether shown or not. Piping shall not interfere with other work.

Where pipes pass through exterior walls, a clear space around pipe shall be provided. Space shall be caulked water tight with silicone caulk.

Exposed supply and drain piping in rest rooms shall be chrome finished.

Piping and tubing for hydronic heating shall be installed in accordance with the requirements specified under "Hydronic Heating System," elsewhere in this Division 15.

Forty-five degree bends shall be used where offsets are required in venting. Vent pipe headers shall be sloped to eliminate any water or condensation.

Vent piping shall extend a minimum of 200 mm above the roof.

Horizontal sanitary sewer pipe inside buildings shall be installed on a uniform grade of not less than 2 percent unless shown otherwise on the plans.

Drainage pipe shall be run as straight as possible and shall have easy bends with long turns.

Wye fittings and 1/8 or 1/16 bends shall be used where possible. Long sweep bends and combination Wye and 1/8 bends may be used only for the connection of branch pipes to fixtures and on vertical runs of pipe.

Pipe sleeves.--The Contractor shall provide sleeves, inserts and openings necessary for the installation of pipe, fittings and valves. Damage to surrounding surfaces shall be patched to match existing.

PVC pipe sleeves shall be provided where each pipe passes through concrete floors, footings, walls or ceilings. Inside diameter of sleeves shall be at least 20 mm larger than outside diameter of pipe. Sleeves shall be installed to provide at least 10 mm space all around pipe the full depth of concrete. Space between pipes and pipe sleeves shall be caulked watertight.

Pipe penetrations in fire rated assemblies.--Where pipes pass through fire rated wall, floor or ceiling assemblies, the penetration shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping" in Division 7, "Thermal and Moisture Protection," of these special provisions.

Cutting pipe.--All pipe shall be cut straight and true and the ends shall be reamed to the full inside diameter of the pipe after cutting.

Damaged pipe.--Pipe that is cracked, bent or otherwise damaged shall be removed from the work.

Pipe joints and connections.--Joints in threaded steel pipe shall be made with teflon tape or a pipe joint compound that is nonhardening and noncorrosive, placed on the pipe and not in the fittings.

The use of thread cement or caulking on threaded joints will not be permitted. Threaded joints shall be made tight. Long screw or other packed joints will not be permitted. Any leaky joints shall be remade with new material.

Exposed polished or enameled connections to fixtures or equipment shall be made with special care, showing no tool marks or threads.

Cleaning and closing pipe.--The interior of all pipe shall be cleaned before installation. All openings shall be capped or plugged as soon as the pipe is installed to prevent the entrance of any materials. The caps or plugs shall remain in place until their removal is necessary for completion of the installation.

Securing pipe.--Pipe in the buildings shall be held in place by iron hangers, supports, pipe rests, anchors, sway braces, guides or other special hangers. Material for hangers and supports shall be compatible with the piping or neoprene isolators shall be used. Allowances shall be made for expansion and contraction. Steel pipe shall have hangers or supports every 3 m. Copper pipe 25 mm or smaller shall have hangers or supports every 2 m and sizes larger than 25 mm shall have hangers or supports every 3 m. Plastic pipe shall have hangers or supports every 1 m. Cast iron soil pipe with neoprene gaskets shall be supported at each joint. Vertical pipes shall be supported with clamps or straps. Horizontal and vertical piping shall be securely supported and braced to prevent swaying, sagging or flexing of joints.

See "Pipe Hangers and Supports" for additional requirements

Union.--Unions shall be installed where shown and at each threaded or soldered connection to equipment and tanks. Unions shall be located so piping can be easily disconnected for removal of equipment or tanks. Unions shall be omitted at compression stops.

Dielectric waterway.--Dielectric waterway shall be provided between metal pipes of different material, and between brass or bronze valves and steel piping.

Insulating union and insulating connection.--Insulating union and insulating connection shall be provided where shown and at the following locations:

1. In metallic water, gas and air service connections into each. Insulating connections shall be installed on the exterior of the building, above ground and after shut-off valve.
2. At points of connections of copper or steel water pipes to steel domestic water heaters and tanks.

Bonding at insulating connections.--Interior water piping and other interior piping that may be electrically energized and are connected with insulating connections shall be bonded in accordance with the CEC. Bonding shall all be coordinated with electrical work.

Compression stop.--Each fixture, including hose faucets, shall be equipped with a compression stop installed on water supply pipes to permit repairs without shutting off water mains. Ball valves may be installed where shown on the plans or otherwise permitted by the Engineer.

INSTALLATION OF VALVES.--

Pressure reducing valve.--A capped tee connection and strainer shall be installed ahead of the pressure reducing valve.

Exterior valves.--Exterior valves located underground shall be installed in a valve box marked "Water." Extensions shall be provided as required.

INSTALLATION OF FAUCETS.--

Hose faucet.--Faucets and hydrants shall be installed with outlets 0.5 m above finished grade.

INSTALLATION OF CLEANOUTS.--

Cleanouts.--A concrete pad 0.5 m long and 100 mm thick shall be placed across the full width of trench under cleanout Wye or 1/8 bend. Cast iron soil pipe (C1 or C2) and fittings shall be used from Wye to surface. Required clearance around cleanouts shall be maintained.

Cleanout risers outside of a building installed in a surface other than concrete shall terminate in a cleanout to grade. Cleanout to grade shall terminate in a valve box with cover marked "CO-SS". Top of box shall be set flush with finished grade. Cleanout plug shall be 100 mm below grade and shall be located in the box to provide sufficient room for rodding.

Cleanout risers installed in tile and concrete floors, including building aprons and sidewalks, shall terminate in a cleanout through floor.

INSTALLATION OF MISCELLANEOUS ITEMS.--

Water hammer arrestor.--Water hammer arrestor shall be installed so that they are vertical and accessible for replacement. Water hammer arrestor shall be installed with access door when in walls or there is no access to ceiling crawl spaces. Access door location shall be where shown on the plans or as approved by the Engineer.

Backflow preventer.--Backflow preventer assembly shall include a wye strainer, backflow preventer, fittings and pipe. Assembly components shall be the same size as the pipe in which they are installed unless otherwise shown on the plans.

Backflow preventer shall be installed a minimum of 300 mm above ground and shall be the same size as the pipe in which it is installed unless otherwise shown on the plans.

Flushing completed systems.--All completed systems shall be flushed and blown out.

Chlorination.--The Contractor shall flush and chlorinate all domestic water piping and fixtures.

Calcium hypochlorite granules or tablets, if used, shall not be applied in the dry form, but shall first be dissolved into a solution before application.

The Contractor shall take adequate precautions in handling chlorine so as not to endanger workmen or damage materials. All pipes and fittings shall be completely filled with water containing a minimum of 50 ppm available chlorine. Each outlet in the system shall be opened and water run to waste until a strong chlorine test is obtained. The line shall then be closed and the chlorine solution allowed to remain in the system for a minimum of 24 hours so that the line shall contain no less than 25 ppm chlorine throughout. After the retention period, the system shall be drained, flushed and refilled with fresh water.

PIPE EXPANSION FITTINGS AND LOOPS.—

Pipe bends and loops shall be cold sprung as required to absorb tension or compression produced during anticipated change in temperature.

Attach steel anchors by welding. Comply with ASME B31-9 and ASME Boiler and Pressure Vessel Code: Section IX, Welding and Brazing Qualifications.

Install expansion joints according to manufacturer written instructions.

Expansion joints shall be installed in hot and chilled water piping. Align joints to avoid end loading and torsion stress.

FIELD QUALITY CONTROL.--

Testing.--The Contractor shall test piping at completion of roughing in, before backfilling, and at other times as directed by the Engineer.

The system shall be tested as a single unit, or in sections as approved by the Engineer. The Contractor shall furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing. After testing, the Contractor shall repair all leaks and retest to determine that leaks have been stopped. Surplus water shall be disposed of after testing as directed by the Engineer.

The Contractor shall take precautions to prevent joints from drawing while pipes and appurtenances are being tested. The Contractor shall repair damage to pipes and appurtenances or to other structures resulting from or caused by tests.

General tests.--All piping shall be tested after assembly and prior to backfill, pipe wrapping, connecting fixtures, wrapping joints and covering the pipe. Systems shall show no loss in pressure or visible leaks.

The Contractor shall test systems according to the following schedule for a period of not less than 4 hours:

Test Schedule		
Piping System	Test Pressure	Test Media
Sanitary sewer and vent	3.0 m head	Water
Water	860 kPa	Water

During testing of water systems, valves shall be closed and pipeline filled with water. Provisions shall be made for release of air.

Sanitary sewers shall be cleared of obstructions before testing for leakage. The pipe shall be proved clear of obstructions by pulling an appropriate size inflatable plug through the pipe. The plug shall be moved slowly through the pipe with a tag line. The Contractor shall remove or repair any obstructions or irregularities.

Testing backflow preventers.--Backflow preventers installed by the Contractor shall be tested at the completion of the supply system installation for proper operation by a certified Backflow Preventer Tester.

The tester shall hold a valid certificate as a Backflow Preventer Tester from the county in which the device to be tested is located or, if the county does not have a certification program for Backflow Preventer Testers, the tester shall have a certificate from one of the following:

1. The American Water Works Association.
2. A county which has a certification program for Backflow Preventer Testers. The certification under which the tester has been certified shall be acceptable to the water purveyor and the local agency having jurisdiction.

Testing for proper operation shall conform to the procedures of the county in which the testing is being performed, or, if such procedures are not available in the county, such tests shall conform to the provisions in the latest edition of the Guidance Manual For Cross Connection Control Program, which is available from the California Department of Health Services, Division of Drinking Water and Environmental Management, 601 N 7th Street, P.O. Box 942732, Sacramento, CA 94234.

The Contractor shall notify the Engineer at least 5 days prior to testing backflow preventers. Such tests shall be satisfactorily completed after installation of the backflow preventer assemblies and before operation of the systems.

One copy of all test results for each backflow preventer shall be furnished to the Engineer.

Full compensation for providing the certified Backflow Preventer Tester and for testing the backflow preventers shall be considered as included in the lump sum price paid for building work and no additional compensation will be allowed therefor.

15.03 PLUMBING FIXTURES

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing plumbing fixtures in accordance with the details shown on the plans and these special provisions.

PART 2.- PRODUCTS

General.--Plumbing fixtures shall meet the following requirements:

Electronic flush valve.—

Electronic flush valve shall be diaphragm or piston type, concealed behind wall, with integral control stop, through the wall infrared sensor, and manual flush button. Flush valve shall have vacuum breaker and be suitable for use with 40 mm top spud bowl. For the water closets that have an accessible plumbing chase, wall cover plates (for 2-gang electrical box) with vandal resistant screws shall be used. For the water closets without access, wall boxes with stainless steel access panels shall be used.

Electric water cooler (disabled accessible, wall mounted).--

Electric water cooler shall be wall mounted, wheelchair accessible, and shall produce a minimum of 28 liters of 10°C water per hour based upon an inlet water temperature of 27°C and an ambient room temperature of 32°C. Cooler shall have self closing, front and side mounted pushbar actuators, shielded bubbler, automatic stream regulator, loose key stop, adjustable thermostat and cast brass P-trap.

Compressor shall be hermetically sealed, positive start with fan cooled condenser and shall be mounted above the cooler top. Cooler shall be provided with 3-wire grounded plug and cord.

Electric water cooler shall be Haws, HWCA8D; Sunroc, HCWC-8S; Elkay, EHFS-8; or equal.

PART 3.- EXECUTION

INSTALLATION.--

General.--All finish for exposed metal on any fixture, including wall flanges, bolts, nuts and washer, shall be polished chrome plated.

FIELD QUALITY CONTROL.--

Testing.--The Contractor shall test piping in accordance with the requirements specified elsewhere in these special provisions.

All installed fixtures shall be tested for proper operation after all plumbing work has been completed.

15.04 PIPE HANGERS AND SUPPORTS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing pipe hangers and supports in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for pipe hanger, channel support system component, thermal pipe shields, and duct hangers shall be submitted for approval.

Shop drawings.--Shop drawings and calculations for multiple piping supports, trapeze hangers, and seismic restraints shall be submitted for approval.

Shop drawings shall include design calculations and indicate size and characteristics of components and fabrication details. Shop drawings and design calculations shall be stamped and signed by an Engineer who is registered as a Civil or Structural Engineer in the State of California.

PART 2.- PRODUCTS

MANUFACTURERS.--

Acceptable manufactures.--Subject to compliance with the specifications, manufacturers offering products which may be incorporated into the work include, but are not limited to, the following:

Pipe Hangers manufacturers shall be B-Line Systems, Inc.; Grinnell Corp; Michigan Hanger Co., Inc.; or equal.

Channel Support Systems manufacturers shall be B-Line Systems, Inc.; Grinnell Corp; Power-Strut Unit; Michigan Hanger Co., Inc.; O-Strut Div; Unistrut Corp; or equal.

MANUFACTURED UNITS.--

Pipe Hangers, Supports, and Components.--

Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.

Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

Channel Support Systems.--

Factory-fabricated components for field assembly.

Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

Thermal-Hanger Shield Inserts.--

690 kPa minimum compressive-strength insulation, encased in sheet metal shield.

Material for Cold Piping.--

ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.

Material for Hot Piping.--

ASTM C 552, Type I cellular glass or water-repellent-treated,
ASTM C 533, Type I calcium silicate.

For Trapeze or Clamped System.--

Insert and shield cover entire circumference of pipe.

For Clevis or Band Hanger.--

Insert and shield cover lower 180° of pipe.

MISCELLANEOUS MATERIALS.--**Mechanical-Anchor Fasteners.--**

Insert-type attachments with pullout and shear capacities appropriate for supported loads and building materials where used.

Structural Steel.--

ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

Grout.--

ASTM C 1107, Grade B, factory-mixed and packaged, non-shrink and nonmetallic, dry, hydraulic-cement grout.

HANGER AND SUPPORT APPLICATIONS.--**Horizontal-Piping Hangers and Supports.--**Unless otherwise indicated install the following types:

Adjustable Steel Clevis Hangers.--For suspension of non-insulated or insulated stationary pipes, 15 mm to 750 mm.

Carbon or Alloy-Steel, Double-Bolt Pipe Clamps.--For suspension of pipes, 20 mm to 600 mm, requiring clamp flexibility and up to 100 mm of insulation.

Clips.-- For support of insulated pipes not subject to expansion or contraction.

Pipe Stanchion Saddles.--For support of pipes, 100 mm to 900 mm, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.

Adjustable Pipe Saddle Supports.--For stanchion-type support for pipes, 65 mm to 900 mm if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.

Vertical-Piping Clamps.--Unless otherwise indicated install the following types:

Extension Pipe or Riser Clamps.--For support of pipe risers, 20 mm to 500 mm.

Carbon- or Alloy-Steel Riser Clamps.--For support of pipe risers, 20 mm to 500 mm, if longer ends are required for riser clamps.

Hanger-Rod Attachments.--Unless otherwise indicated install the following types:

Steel Turnbuckles.--For adjustment up to 150 mm for heavy loads.

Malleable-iron Sockets.--For attaching hanger rods to various types of building attachments.

Building Attachments.--Unless otherwise indicated install the following types:

Steel or Malleable Concrete Inserts.--For upper attachment to suspend pipe hangers from concrete ceiling.

Top-Beam C-Clamps.--For use under roof installations with bar-joist construction to attach to top flange of structural shape.

Center-Beam Clamps.--For attaching to center of bottom flange of beams.

C-Clamps.--For structural shapes.--Provide support strap, fastened to opposite side of beam.

Steel-Beam Clamps with Eye Nuts.--For attaching to bottom of steel I-beams for heavy loads.

Linked-Steel Clamps with Eye Nuts.--For attaching to bottom of steel I-beams for heavy loads, with link extensions.

Malleable Beam Clamps with Extension Pieces.--For attaching to structural steel.

Welded-Steel Brackets.--For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads: Light 340 kg, Medium 675 kg, Heavy 1350 kg.

Side-Beam Brackets.--For sides of steel or wooden beams.

Saddles and Shields.--Unless otherwise indicated install the following types:

Steel Pipe-Covering Protection Saddles.--To fill interior voids with insulation that matches adjoining insulation.

Protection Shields.--Of length recommended by manufacturer to prevent crushing insulation.

Thermal-Hanger Shield Inserts.--For supporting insulated pipe, 360° insert of high density. 690 kPa minimum compressive-strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360° sheet metal shield.

Spring Hangers and Supports.-- Unless otherwise indicated install the following types:

Restraint-Control Devices.-- Where indicated to control piping movement.

Spring Cushions.--For light loads if vertical movement does not exceed 32 mm.

Spring Sway Braces.--To retard sway, shock, vibration, or thermal expansion in piping systems.

Variable-Spring Hangers.--Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.

Variable-Spring Base Supports.--Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

Constant Supports.--For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types: Mounted horizontally, Mounted vertically. Two vertical-type supports and one trapeze member.

PART 3.- EXECUTION

HANGER AND SUPPORT INSTALLATION.--

Pipe Hanger and Support Installation.--Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

Channel Support System Installation.--Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems. Field assemble and install according to manufacturer's written instructions.

Heavy-Duty Steel Trapeze Installation.--Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.

Pipes of Various Sizes.--Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers. Field fabricate from ASTM A 36/A 36M steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

Load Distribution.--Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

Pipe Slopes.--Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

Insulated Piping.--Comply with the following: Attach clamps and spacers to piping. Piping operating above ambient air temperature: Clamp may project through insulation. Piping operating below ambient air temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert. Do not exceed pipe stress limits according to ASME B31.9.

Install protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

Thermal-hanger shield inserts may be used. Include steel weight distribution plate for pipe 100 mm and larger if pipe is installed on rollers. Install protective shields on cold piping with vapor barrier. Shields shall span arc of 180°. Thermal-hanger shield inserts may be used. Include steel weight distribution plate for pipe 100 mm and larger if pipe is installed on rollers.

Shield Dimensions for Pipe.--Not less than the following:

Pipe Size	Shield Length & Thickness
8 mm to 90 mm	305 mm long and 1.22 mm thick
100 mm	305 mm long and 1.52 mm thick
125 mm and 150 mm	457 mm long and 1.52 mm thick
200 mm to 350 mm	610 mm long and 1.91 mm thick
400 mm to 600 mm	610 mm long and 2.67 mm thick

Pipes 200 mm and Larger.--Include wood inserts.

Insert Material.--Length at least as long as protective shield.

Thermal-Hanger Shields.--Install with insulation same thickness as piping insulation.

Hanger rods shall be sized as follows.--

Pipe Size	Minimum Hanger Rod Diameter
15 mm to 50 mm	10 mm
65 mm to 87 mm	13 mm
100 mm to 125 mm	16 mm
150 mm	19 mm

EQUIPMENT SUPPORTS.--

Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.

Grouting.--Place grout under supports for equipment and make smooth bearing surface.

ADJUSTING.--

Hanger Adjustment.--Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

PAINTING.--

Painting requirements shall be in accordance with the requirements specified under "Painting" in Division 9.

15.05 SYSTEM IDENTIFICATION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of identification materials for mechanical components and their installation as shown on the plans and in these special provisions.

Identification materials for mechanical components shall consist of the following:

- Equipment nameplates.
- Equipment markers.
- Equipment signs.
- Access panel and door markers.
- Pipe markers.
- Duct markers.
- Stencils.
- Valve tags.
- Valve schedules.
- Warning tags.

SUBMITTALS.--

Samples.--Two individual samples of each identification material and device that includes color, letter style, graphic representation, and valve numbering scheme shall be submitted for approval.

Valve Schedules.--Provide each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals.

QUALITY ASSURANCE.--

Codes and standards.--Comply with ASME A 13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

PART 2.- PRODUCTS

IDENTIFICATION DEVICES.--

Equipment nameplates.--

Equipment nameplates shall be metal, with data engraved or stamped, for permanent attachment on equipment. The nameplate shall be accessible and visible, and shall include the necessary fasteners required to mount on equipment. The information included on the nameplate shall include, but not be limited to the following: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, essential data, and labels of tested compliances.

Equipment markers.--

Equipment markers shall be engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.

Equipment Marker Data shall include, but not be limited to the following: Equipment Name, equipment service, design capacity, other design parameters such as pressure drop, entering and leaving conditions, and speed.

Equipment signs.--

Equipment signs shall be ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for installations.

Data.-- Instructions for operation of equipment and for safety procedures.

Engraving.--Manufacturer's standard letter style, of sizes and with terms to match equipment identification.

Fasteners.--Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

Access panel and door markers.--

Access panel and door markers shall be 1.6 mm thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 3.2 mm center hole for attachment.

Fasteners.--Self-tapping, stainless-steel screws or contact-type permanent adhesive. Or type as approved by the Engineer.

Piping identification devices.--

Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

Colors.--Comply with ASME A 13.1, unless otherwise indicated.

Lettering.--Use piping system terms indicated and abbreviate only as necessary for each application length. Pipes with OD, Including Insulation, less than 150 mm: Full-band pipe markers extending 360° around pipe at each location. Pipes with OD, including insulation, 150 mm and larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.

Arrows.--Integral with piping system service lettering to accommodate both directions- or as separate unit on each pipe marker to indicate direction of flow.

Pretensioned pipe markers.--

Pretensioned pipe markers shall be precoiled semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

Plastic tape pipe markers.--

Plastic tape pipe markers shall be continuously printed, vinyl tape at least 0.08 mm thick with pressure sensitive, permanent-type, self-adhesive back. Width for Markers on Pipes with OD, including insulation, less than 150 mm: 19 mm minimum. Width for markers on Pipes with OD, including insulation, 150 mm or larger: 38 mm minimum.

Duct markers.--

Duct markers shall be engraved, color-coded laminated plastic. Include direction and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

Maintain minimum letter height of 32 mm for ducts; and minimum letter height of 19 mm for access panel and door markers, equipment markers, equipment signs, and similar operational instructions.

Valve tags.--

Valve tags shall be stamped or engraved with 6.4 mm letters for piping system abbreviation and 13 mm numbers, with numbering scheme approved by the Engineer. Provide 4 mm hole for fastener.

Material.-- 0.8 mm thick brass.

Material.--1 mm thick stainless steel.

Material.--2.4 mm thick laminated plastic with 2 black surfaces and white inner layer.

Valve-Tag Fasteners.--Brass wire-link or beaded chain; or S-hook.

Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

Valve-Tag Size and Shape.--

Cold Water: 38 mm, round.

Hot Water: 38 mm, round.

Fire Protection: 38 mm, round.

Gas: 38 mm, round.

Valve-Tag Color.--

Cold Water: Natural .

Hot Water: Natural .

Fire Protection: Natural .

Gas: Natural.

Letter Color.--

Cold Water: Black.

Hot Water: Black.

Fire Protection: Black.

Gas: Black.

Valve schedules.--

For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), and normal operating position (open, closed, or modulating). Mark valves for emergency shutoff and similar special uses.

Warning tags.--

Warning tags shall be preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing. Size: 75 mm by 133 mm minimum.

Fasteners.--Brass grommet and wire.

Nomenclature.--Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.

Color.--Yellow background with black lettering.

PART 3.- EXECUTION

Equipment identification.--Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment: Pumps, chillers, and similar motor-driven units, fans, blowers, primary balancing dampers, mixing boxes, packaged HVAC central-station, and zone-type units.

Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.

Distinguish among multiple units, indicate operational requirements, and indicate safety and emergency precautions, warn of hazards and improper operations, and identify units. Fire department hose valves and hose stations. Identify mechanical equipment with equipment markers in the following color codes:

- Green.--For cooling equipment and components.
- Yellow.--For heating equipment and components.
- Green and Yellow.--For combination cooling and heating equipment and components.

Piping identification.--Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

Locate pipe markers and color bands where piping is exposed in finished spaces.

Duct identification.--Install duct markers with permanent adhesive on air ducts using the following color codes:

- Green:** For cold-air supply ducts.
- Yellow:** For hot-air supply ducts.
- Blue:** For exhaust, outside, relief, return, and mixed-air ducts. ASME A 13.1 Colors and Designs: For hazardous material exhaust.

Valve tag installation.--Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units.

Warning tag installation.--Write required message on, and attach warning tags to, equipment and other items where required.

Item	Minimum Lettering Height
Nameplate date	6 mm
Drain signs	19 mm
Tamper sign	19 mm

15.06 PIPE INSULATION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds in accordance with details shown on the plans and these special provisions.

Related Section.--Pipe insulation shields and protection saddles shall be in accordance with the requirements specified under "Pipe Hangers and Supports" in Division 15, "Mechanical," of these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for the pipe insulation shall be submitted for approval.

Manufacturer's descriptive data shall include thermal conductivity, thickness, factory-applied jackets, and field-applied jackets-, for each type of product.

Shop drawings.--Shop drawings shall be submitted for approval.
Shop drawings shall include fabrication and installation details for the following:

Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.

Insulation application at elbows fittings, flanges, valves, and specialties for each type of insulation.

Removable insulation at piping specialties and equipment connections.

Application of field-applied jackets.

Installer Certificates.--Signed by the Contractor certifying that installers comply with requirements.

QUALITY ASSURANCE.--

Codes and standards.--Pipe insulation thickness shall comply with requirements of Table 4-3 "Pipe and Duct Distribution Systems" under "Mechanical Systems" of the California Code of Regulations, Title 8, Chapter 4.

PART 2.- PRODUCTS

MANUFACTURERS.--

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include but are not limited to, the following:

Mineral-fiber insulation manufacturers shall be CertainTeed Manson; Knauf FiberGlass GmbH.; Owens-Corning Fiberglas Corp.; Schuller International, Inc.; or equal.

Flexible elastomeric thermal insulation manufacturers shall be Armstrong World Industries, Inc.; Rubatex Corp.; or equal

Polyolefin insulation manufacturers shall be Armstrong World Industries, Inc.; IMCOA; or equal

Calcium silicate insulation manufacturers shall be Owens-Corning Fiberglas Corp.; Pabco; Schuller International, Inc.; or equal

INSULATION MATERIALS.--

Insulation installed indoors.--

Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

Insulation installed outdoors.--

Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

Mineral-Fiber Insulation.--

Glass fibers bonded with a thermosetting resin complying with the following:

Preformed Pipe Insulation.--

Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retardant jacket.

Blanket Insulation.--

Comply with ASTM C 553, Type II, without facing.

Fire-Resistant Adhesive.--

Comply with MIL-A-3316C in the following classes and grades: Class 1, Grade A for bonding glass cloth and tape to unfazed glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfazed glass-fiber insulation. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.

Vapor-Retarder Mastics.--

Fire and water resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-1 9565C, Type II.

Mineral-Fiber Insulating Cements.--

Comply with ASTM C 195. Expanded or Exfoliated

Vermiculite Insulating Cements.--

Comply with ASTM C 196.

Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement.--

Comply with ASTM C 449/C 449M.

Cellular-Glass Insulation.--

Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.

Preformed Pipe Insulation, without Jacket.--

Comply with ASTM C 552, Type II, Class 1.

Preformed Pipe Insulation, with Jacket.--

Comply with ASTM C 552, Type II, Class 2.

Flexible Elastomeric Thermal Insulation.--

Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

Adhesive: As recommended by insulation material manufacturer

Ultraviolet-Protective Coating.--

As recommended by insulation manufacturer.

Polyolefin Insulation.--

Unicellular polyethylene thermal plastic, preformed pipe insulation. Comply with ASTM C 534, Type I, except for density.

Adhesive: As recommended by insulation material manufacturer.

Calcium Silicate Insulation.--

Preformed pipe sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.

Prefabricated Thermal Insulating Fitting Covers.--

Comply with ASTM C 450 for dimensions used in performing insulation to cover valves, elbows, tees, and flanges.

FIELD-APPLIED JACKETS.--

General.--ASTM C 921, Type 1, unless otherwise indicated.

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Foil and Paper Jacket.--

Laminated, glass-fiber-reinforced, flame-retardant craft paper and aluminum foil

PVC Jacket.--

High-impact, ultraviolet-resistant PVC; 0.5 mm thick; roll stock ready for shop or field cutting and forming.

Adhesive: As recommended by insulation material manufacturer.

PVC Jacket Color: White or gray.

Heavy PVC Fitting Covers.--

Factory-fabricated fitting covers manufactured from 0.75 mm thick, high-impact, ultraviolet-resistant PVC.

Shapes: 45° and 90°, short and long radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.

Adhesive: As recommended by insulation material manufacturer.

Aluminum Jacket.--

Factory cut and rolled to indicated sizes. Comply with ASTM B 209 (ASTM B 209M), 3003 alloy, H-14 temper.

Finish and Thickness: Stucco-embossed finish, 0.40 mm thick.

Moisture Barrier: 0.025 mm thick, heat-bonded polyethylene and kraft paper.

Elbows.--

Preformed, 45° and 90°, short and long radius elbows; same material, finish, and thickness as jacket.

Stainless-Steel Jacket.--

ASTM A 666, Type 304 or 316; 2.5 mm thick; and factory cut and rolled to indicated sizes.

Jacket Bands.--

Stainless steel, Type 304, and 19 mm wide.

ACCESSORIES AND ATTACHMENTS.--**Glass Cloth and Tape.--**

Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, pre-sized a minimum of 270 g/m².

Tape Width.--

100 mm.

Bands.--

9 mm wide, in one of the following materials compatible with jacket:

Stainless Steel.--ASTM A 666, Type 304; 0.5 mm thick.

Aluminum.--0.18 mm thick.

Wire.--

2.0 mm, nickel-copper alloy; 1.6 mm, soft-annealed, stainless steel; or 1.6 mm, soft-annealed, galvanized steel.

VAPOR RETARDERS AND CONDENSATION PREVENTION.--

All chilled water piping and equipment shall be insulated so as to prevent moisture condensation on exterior surfaces. If condensation occurs any time during the warranty period, the contractor shall re-work the insulation until satisfactory, at no additional expense to the State. Mastic materials shall be compatible with insulation materials, jackets, and substrates.

PART 3.- EXECUTION

Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application. Proceed with installation only after unsatisfactory conditions have been corrected.

Surface Preparation.--Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

INSTALATION REQUIREMENTS.--

Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

Refer to schedules at the end of this Section for materials, forms, jackets, and thickness required for each piping system. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

Apply insulation with longitudinal seams at top or bottom of horizontal pipe runs.

Apply multiple layers of insulation with longitudinal and end seams staggered.

Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

Keep insulation materials dry during application and finishing. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

Apply insulation with the least number of joints practical. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

Hangers and Anchors.--Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

For insulation application where vapor retarder are indicated, extend insulation on anchor legs at least 300 mm from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, or shield.

Insulation Terminations.--For insulation application where vapor retarder are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder. Apply adhesives and mastics at the manufacturer's recommended coverage rate. Apply insulation with integral jackets as follows:
Pull jacket tight and smooth.

Circumferential Joints.--Cover with 75 mm wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 100 mm o/c.

Longitudinal Seams.--Overlap jacket seams at least 40 mm. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 100 mm o/c. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.

Vapor-Retarder Mastics.--Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic

Roof Penetrations.-- Apply insulation for interior applications to a point even with top of roof flashing. Seal penetrations with vapor-retarder mastic. Apply insulation for exterior applications tightly joined to interior insulation ends. Extend metal jacket of exterior insulation outside roof flashing at least 50 mm below top of roof flashing. Seal metal jacket to roof flashing with vapor-retarder mastic.

Exterior Wall Penetrations.--For penetrations at below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.

Interior Wall and Partition Penetrations.--Apply insulation continuously through walls and floors.

Fire-Rated Wall and Partition Penetrations.--Apply insulation continuously through penetrations of fire-rated walls and partitions.

Floor Penetrations.--Apply insulation continuously through floor assembly. For insulation with vapor retarders, seal insulation with vapor-retarder mastic where floor supports penetrate vapor retarder.

MINERAL-FIBER INSULATION APPLICATION.--

Insulation to straight pipes and tubes.--Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor retarder mastic. Apply vapor retarder to ends of insulation at intervals of 4.5 m to 6 m to form a vapor retarder between pipe insulation segments.

For insulation with factory-applied jackets, secure laps with outward clinched staples at 150 mm o/c. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

Insulation to fittings and elbows.--Apply pre-molded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

Insulation to valves and specialties.--Apply pre-molded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

FIELD-APPLIED JACKET APPLICATION.--

Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory applied jackets. Apply jacket smooth and tight to surface with 50 mm overlap at seams and joints. Embed glass cloth between two 1.6 mm thick coats of jacket manufacturer's recommended adhesive. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

Foil and Paper Jackets.--Apply foil and paper jackets where indicated. Draw jacket material smooth and tight. Apply lap or joint strips with the same material as jacket. Secure jacket to insulation with manufacturer's recommended adhesive.

Apply jackets with 40 mm laps at longitudinal seams and 75 mm wide joint strips at end joints. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

Apply PVC jacket where indicated, with 25 mm overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

Apply metal jacket where indicated, with 50 mm overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 300 mm o/c. and at end joints.

FINISHES.--

Glass-Cloth Jacketed Insulation.--Paint insulation finished with glass-cloth jacket.

Flexible Elastomeric Thermal Insulation.--After adhesive has fully cured, apply two coats of the insulation manufacturer's recommended protective coating.

Color.--Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed work.

15.07 HOT AND CHILLED WATER PUMPS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing, installing, and testing the hot and chilled water pumps in accordance with details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, shipping , handling, installation instructions, and maintenance manuals for the hot and chilled water pumps shall be submitted for approval.

Manufacturer's descriptive data shall include certified performance curves and rated capacities; physical data; furnished specialties; final impeller dimensions; and accessories for each type of product indicated. Pump's operating point shall be shown on curves. Wiring diagrams shall detail wiring for power, signal, and control systems.

All variable Frequency Drive (VFD's) units (equipment mounted type or stand alone type) regardless whether they are specified under Mechanical and or Electrical of these special provisions shall be of the same manufacturer. No exceptions shall be allowed.

QUALITY ASSURANCE.--

Codes and standards.--Pumps shall meet UL compliance. Fabricate and label pumps to comply with UL 778, "Motor-Operated Water Pumps,".

Electrical components, devices, and accessories, shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

DELIVERY, STORAGE AND HANDLING.--

General.—Hot and chilled water pumps shall be delivered to the jobsite and stored in a safe dry location with labels intact and legible.

Manufacturer's preparation for shipping shall include clean flanges and exposed machined metal surfaces treated with anticorrosion compound after assembly and testing.

Hot and chilled water pumps shall be protected from physical damage and from becoming wet or soiled. Protect flanges, and pipe openings with wooden flange covers or with screwed-in plugs. Retain protective covers for flanges and protective coatings during storage. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

Comply with pump manufacturer's written rigging instructions.

PART 2.- PRODUCTS

MANUFACTURERS.--

Acceptable manufactures.--Subject to compliance with the specifications, manufacturers offering products which may be incorporated into the work include, but are not limited to, the following:

Compact in-line circulators manufacturers shall be Amtrol, Inc., Grundfos Pumps Corp.; PACO Pumps; or equal.

End-suction pumps manufacturers shall be Amtrol, Inc., Ingersoll-Dresser Pump Co.; PACO Pumps; or equal.

MANUFACTURED UNITS.--

General.--Pump Units shall be factory assembled and tested.

Motors shall include built-in, thermal-overload protection and grease-lubricated ball bearings. Each motor shall be selected to be non-overloading over the full range of the pump performance curve.

Pump motors shall have minimum efficiency as indicated according to IEEE 112, Test Method B. Include motors with higher efficiency than "average standard industry motors" according to IEEE 112, Test Method B, if efficiency is not indicated.

IN-LINE CIRCULATOR PUMPS.--

General.--In-line circulator pumps shall be centrifugal, single-stage, bronze-fitted, rated for 860 kPa minimum working pressure and a continuous water temperature of 107°C. Casing: Cast iron, with threaded companion flanges for piping connections, and threaded gage tapings at inlet and outlet connections.

Impeller.--

ASTM B 584, cast bronze, statically and dynamically balanced, closed, overhung, single suction, and keyed to shaft.

Shaft and Sleeve.--

Steel shaft with oil-lubricated copper sleeve.

Seals.--

Mechanical type. Include carbon-steel rotating ring, stainless-steel spring, ceramic seat, and flexible bellows and gasket.

Pump Bearings.--

Oil-lubricated, bronze journal and thrust type.

Motor Bearings.--

Oil-lubricated, sleeve type.

Coupling.--

Flexible, capable of absorbing torsional vibration and shaft misalignment.

Motor.--

Motor shall be heavy duty, induction type with permanently lubricated sealed ball bearings and furnished at the specified rating. Variable Frequency Drive (VFD) for the VFD motors is specified under Division 16 of these special provisions. Resiliently mounted to pump casing.

END SUCTION PUMPS.--

General.--Base-mounted, centrifugal, flexible-coupled, end-suction, single-stage, bronze fitted, rated for 1200 kPa minimum working pressure and a continuous water temperature of 107°C.

Casing.--

Cast iron, with flanged piping connections, drain plug at low point of volute, threaded gage tapings at inlet and outlet connections, and integral feet or other means on volute to support weight of casing and attached piping. Casing shall allow removal and replacement of impeller without disconnecting piping.

Impeller.--

ASTM B 584, cast bronze, statically and dynamically balanced, closed, overhung, single suction, keyed to shaft, and secured by locking cap screw.

Wear Rings.--

Replaceable, bronze casing ring.

Shaft and Sleeve.--

Steel shaft with bronze sleeve.

Seals.--

Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and flexible bellows and gasket.

Coupling.--

Flexible-spacer type, capable of absorbing torsional vibration and shaft misalignment for motor sizes of 75 kW and smaller; with flange and sleeve section that can be disassembled and removed without removing pump or motor, for sizes larger than 75 kW.

Coupling Guard.--

Steel, removable, and attached to mounting frame.

Mounting Frame.--

Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate for mounting pump casing, coupling guard, and motor. Field-drill motor mounting holes for field-installed motors.

Motor.--

Secured to mounting frame, with adjustable alignment. Motors with variable frequency drives(VFD) shall comply with Division 16 of these special provisions.

PUMP SPECIALTY FITTINGS.--

Suction Diffuser.--

Angle or straight pattern, 1200 kPa pressure rating, cast-iron body and end cap, pump-inlet fitting; with bronze startup and bronze or stainless-steel permanent strainers; bronze or stainless-steel straightening vanes; drain plug; and factory- or field fabricated support.

Alternate shut-off, balance and check valve assembly.--

Triple-duty valve may be substituted for the shut-off, and check valve shown on the plans. Triple-duty valve shall be angle or straight pattern, 1200 kPa pressure rating, cast-iron body, pump-discharge fitting; with drain plug and bronze-fitted shutoff, balancing, and check valve features.

PART 3.- EXECUTION

Examination.--Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation. Examine Foundations and inertia bases for suitable conditions where pumps are to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.

Pump Installation.--Install pumps according to manufacturer's written instructions. Install pumps to provide access for periodic maintenance, including removing motors, impellers, couplings, and accessories. Support pumps and piping separately so piping is not supported by pumps. Suspend in-line pumps using continuous-thread hanger rod and vibration-isolation hangers. Install seismic bracing as required by authorities having jurisdiction.

Set base-mounted pumps on concrete foundation. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.

Support pump base plate on rectangular metal blocks and shims, or on metal wedges with small taper, at points near foundation bolts to provide a gap of 19 to 38 mm between pump base and foundation for grouting. Adjust metal supports or wedges until pump and driver shafts are level.

Check coupling faces and suction and discharge flanges of pump to verify that they are level and plumb. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.

Alignment.--Align pump and motor shafts and piping connections after setting them on foundations, after grout has been set and foundation bolts have been tightened, and after piping connections have been made. Comply with pump and coupling manufacturers' written instructions. Adjust pump and motor shafts for angular and offset alignment. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill base plate with non-shrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

Connection.--Piping installation shall conform to the requirements of "Pipe, Fittings, and Valves" of these special provisions. Drawings indicate general arrangement of piping, fittings, and specialties. Install piping adjacent to machine to allow service and maintenance.

Connect piping to pumps. Install valves that are the same size as piping connected to pumps. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles. Install check valve and throttling valve on discharge side of in-line circulators. Install non-slam check valve and globe valve on discharge side of vertical in-line pumps. Install suction diffuser and shutoff valve on suction side of end suction pumps. Install suction diffuser and shutoff valve on suction side of base-mounted pumps. Install triple-duty valve on discharge side of base-mounted pumps (optional substitution). Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves. Install pressure gages on pump suction and discharge.

Install at integral pressure-gage tapings where provided. Install temperature and pressure-gage connector plugs in suction and discharge piping around each pump. Install electrical connections for power, controls, and devices. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 466A and UL 486B.

Commissioning.--Verify that pumps are installed and connected according to the Contract Documents. Verify that electrical wiring installation complies with manufacturer's written instructions and the Contract Documents.

TESTING.--

Additional testing requirements shall be in accordance with the requirements specified under "Testing, Adjusting, and Balancing" in Division 15, "Mechanical," of these special provisions.

Pre-start-up checks.--

Lubricate bearings.

Remove grease-lubricated bearing covers, flush bearings with kerosene, and clean thoroughly. Fill with new lubricant according to manufacturer's written instructions.

Disconnect coupling and check motor for proper rotation that matches direction marked on pump casing.

Verify that pumps are free to rotate by hand and that pumps for handling hot liquids are free to rotate with pumps hot and cold. Do not operate pumps if they are bound or drag, until cause of trouble is determined and corrected.

Check suction piping connections for tightness to avoid drawing air into pumps.

Clean strainers.

Verify that pump controls are correct for required application.

15.08 AUTOMATIC FIRE SPRINKLER SYSTEM

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of designing, furnishing and installing an automatic wet pipe type fire sprinkler system, complete and ready for use, in accordance with the details shown on the plans and these special provisions. This work shall also consist of furnishing and installing a fire pump/engine driver, pump controller, jockey pump and controller, and all appurtenances required for complete operation, as shown on the plans.

The automatic fire sprinkling system shall include water flow indicator, check valve, electric alarm bell, valves, sprinkler heads and related appurtenances, valves, piping and fittings.

Design.--The design of the sprinkler system shall be in accordance with the code requirements for ordinary hazard occupancies, group 1, and shall provide coverage of the building area shown on the plans. System design shall be based on 414 kPa pressure available from fire pump.

Fire sprinkler Contractor shall coordinate hanger and bracing anchorage locations with the structural drawings and roof framing systems.

Fire hydrants adjacent to the project site were flow tested on 01-22-07. The water pressure and flow rate shall be verified with the City of Sacramento, Department of Utilities.

SUBMITTALS.--

Shop drawings.--Complete shop drawings, including written verification of the water pressure and flow rate, shall be submitted for approval. Fire pump/engine driver, pump controller, and jockey pump and controller shall also be submitted for approval.

Complete plans, including details and calculation of fire sprinkler anchorage, stamped and signed by a licensed Civil or Structural Engineer, shall be submitted for review and approval prior to fabrication and installation.

Contractor shall submit detailed drawings and plumbing isometric indicating fittings, valves, gauges and all other components required for fire and jockey pumps, per NFPA 20, 2002, for approval.

State Fire Marshal approval.--Prior to the submittal of the shop drawings, the Contractor shall have said drawings stamped "APPROVED" by the State Fire Marshal. Allow 12 weeks for State Fire Marshal review and approval.

QUALITY ASSURANCE.--

Codes and standards.--All work shall be in accordance with the requirements of the State Fire Marshal, the National Fire Protection Association (NFPA) Standard No. 13-1999, "Installation of Sprinkler Systems," NFPA Standard 20-1999, "Installation of Centrifugal Fire Pumps," NFPA Standard No. 37-1999, "Stationary Combustion Engines and Gas Turbines," of the 2001 California Building code (CBC) and the requirements of other regulatory authorities having jurisdiction.

PART 2.- PRODUCTS

Fire pump/Engine driver --

Fire pump shall be a single stage, end suction, horizontal centrifugal pump listed for fire service, and shall have the capacity as shown on the plans. The pump casing shall be foot mounted cast iron with bronze fitted construction and packing bearing on a bronze shaft sleeve. Suction and discharge flanges shall be standard 860 kPa bolt pattern type. Fire pump shall be equipped with coupling guard, stainless steel packing gland, and bronze wear rings.

Fire pump driver shall be a diesel engine. The engine shall include, but not necessarily limited to, electric starter, generator, heat exchanger cooling system, block heater with thermostat, and instrument panel. The engine shall be mounted on a steel base common with the pump, and shall be connected with a flexible type coupling according to the manufacturer's recommendation. After installation, the pump and engine shafts shall be aligned according to the coupling manufacturer's recommendation. Fire pump driver shall develop sufficient power to drive the pump at the capacity shown on the plans with reserve power. Fuel tank shall be sized according to the plans, and shall be filled by the Contractor with 284 liters of diesel fuel.

The Fire Pump/Engine driver shall be equipped with the following accessories:

Starting batteries.--Storage batteries for engine starting and other requirements shall be sufficient in number, and shall be 6-cell, heavy duty, lead-acid type. Total battery capacity shall be a minimum of 90 ampere-hours at the 20-hour rate. Batteries shall be mounted in corrosion resistant battery racks located within the skid base and shall be provided with battery cables of sufficient length to connect to the DC apparatus.

Battery charger.--The battery charger shall be of the dual rate type and shall be wall mounted at a location to suit the fire pump. The battery charger shall be provided with the following features:

1. DC ammeter.
2. Dual fusing for AC input and DC output.
3. Automatic DC voltage regulation.
4. Automatic load regulation.
5. Compensation taps for setting the charger for average AC line and battery conditions.
6. DC cranking circuit disconnect relay.

Block Heater.—

The engine shall be equipped with a 120-volt, 1000-watt electric water jacket heater. The heater shall be thermostatically controlled to maintain engine coolant at the proper temperature to meet the start up requirement of NFPA-99 standard. The required circuitry for proper operation shall be provided. The thermostat shall be adjustable between 35 and 50 degrees Celsius.

Jockey Pump and Controller.--

Jockey pump shall have a cast iron body and discharge, and be driven by an open drip proof, 120-volt AC rated, electric motor.

Controller shall be in a NEMA 4X enclosure and include a full voltage starter, dual setting pressure switch, Hand/Off/Auto switch, overload relays, and circuit breaker disconnect.

Fire pump controller.--

The main fire pump controller shall be a factory assembled, wired and tested unit and shall conform to all of the requirements of the 1999 edition of NFPA 20, Centrifugal Fire Pumps and the 2004 California Electric Code, Article 695.

The controller shall be listed or approved by an independent testing laboratory. The controller shall bear the label of that testing agency.

The controller shall be mounted on a steel base common with the fire pump and driver. Fire pump, driver, controller and accessories shall be furnished by the pump manufacturer.

Water flow indicator.--

Water flow indicator shall be UL or FM listed for fire protection, vane type switch designed for wet pipe systems. Water flow indicator shall be designed for minimum flow rate of 40 liters per minute, and shall have an adjustable delay setting of from 0 to 90 seconds. Water flow indicator shall be Viking, Model VSR-D; Grinnell, Model F620; Reliable, Model A; or equal.

Check valve.--

Check valve shall be UL or FM listed, swing type, self draining, iron body with brass trim and rubber clapper with removable cover plate. Check valve shall be Viking, Grinnell, Groeniger, or equal.

Fire alarm bell.--

Fire alarm bell shall be UL or FM listed electric bell type, 120 volt AC with a minimum sound rating of 95 decibels at 3 m. Fire alarm bell shall have a die cast aluminum housing with built-in rubber gasket for dust proof seal for bell striking mechanism. Fire alarm bell shall be Viking, Grinnell, Reliable, or equal.

Pipe and fittings.--

Pipe and fittings shall be in accordance with the requirements specified under "Pipe, Fittings and Valves," elsewhere in this Division 15.

Pipe and fittings for drain lines shall be as recommended by the valve manufacturer.

Pipe hangers.--

Pipe hangers shall be of types listed as acceptable for specific applications in NFPA No. 13.

Valves.--

Valves shall be UL or FM listed, outside screw and yoke (OS&Y) rising stem type.

Valves (OS&Y) 65 mm and larger in size shall be Crane, 467; Walworth, 8713F; Nibco Scott, F-607-0; or equal.

Valves (OS&Y) 50 mm and smaller in size shall be Crane, 459; Walworth, 873; Nibco Scott, T-104-D; or equal.

Optional; Valves 100 mm and larger may be butterfly type, UL or FM listed, working pressure 1210 kPa, gear operated, indicator flag, ductile iron body, bronze trim, with provisions for locking. Valve shall be provided with mounting block for supervisory switch.

Supervisory switch.--

Supervisory switch shall be UL or FM listed, for the type of valve supplied, single contact set with tamper resistant cover. Supervisory switch shall be suitable for exterior installations.

Sprinkler head.--

Sprinkler head shall be upright type above ceiling and pendant type below ceiling. Sprinkler head shall be brass body, chemical or solder fusing type, with proper temperature rating element. Sprinkler head shall be Viking, Grinnell, Reliable, or equal.

Spare sprinkler cabinet.--

Spare sprinkler cabinet shall be metal cabinet as recommended by the sprinkler head manufacturer and conforming to NFPA requirements. The cabinet shall be painted red.

Fire department connection.--

Fire department connection shall be UL or FM listed, horizontal single or double Siamese as required, with 65 mm inlets, drain cock, caps, chain, and brass nameplate. Inlets shall have national standard fire hose coupling screw threads. The fire department connection shall be Potter-Roemer, Grinnell, or equal.

Accessories.--

Drains, test connection, flush connections, pressure gauges, and other accessories shall be supplied as required.

Sign.--

Sign shall be sheet steel, not less than 0.76 mm thick, with red letters on a white background and a baked enamel coating.

PART 3.- EXECUTION**INSTALLATION.--**

General.--Sprinkler piping and equipment shall be installed in accordance with the approved shop drawings and shall be located to avoid interference with the lighting system, access openings, or other piping.

Reductions in pipe size shall be made with one piece reduction fittings. Bushings shall not be used.

Upon pressure loss on riser due to release of water at sprinkler head(s), the fire pump/ diesel engine shall automatically start and provide a pressure and flow to the sprinkler system if the city water pressure has insufficient capacity.

The jockey pump is to maintain the pressure in the sprinkler system at all times. The jockey pump shall keep the fire pump from starting in the event of small pressure drops or leaks in the sprinkler system. The jockey pump and controller shall not be supplied power from the fire pump controller.

The Start/Stop pressure settings for the fire and jockey pumps shall be as follows:

Both pumps "Stop" pressure = 483 kPa

Jockey pump "Start" pressure = 414 kPa

Fire pump "Start" pressure = 380 kPa

Piping.--Fire sprinkler piping shall be installed level.

Drain piping and test connections shall discharge to the outside of the building. Discharge piping shall not drain across walkways.

Pipe penetrations in fire rated assemblies.--Where pipes pass through fire rated wall, floor or ceiling assemblies, the penetration shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping" in Division 7, "Thermal and Moisture Protection," of these special provisions.

Spare sprinkler cabinet.--The spare sprinkler cabinet shall be installed where temperatures will not exceed 38°C at any time. Such location shall be approved by the Engineer. Twelve spare sprinklers and 2 sprinkler head wrenches shall be furnished and placed in the cabinet.

Securing main shutoff valve.--A galvanized chain, with a nominal material diameter of at least 5 mm, shall be provided to lock the main shutoff in the open position. The lock will be State-furnished as provided under "State-Furnished Materials" in Division 1, "General Requirements," of these special provisions.

Signs.--Signs and messages shall be as required by NFPA No. 13 and the regulatory authorities having jurisdiction. Lettering shall be standard-type of the following heights:

Item	Minimum Lettering Height
Nameplate date	6 mm
Drain signs	19 mm
Tamper sign	19 mm

FIELD QUALITY CONTROL.--

Acceptance tests.--The Contractor shall arrange for testing of the automatic fire sprinkler system in the presence of the Engineer and the State Fire Marshal. Three days written notice of said testing shall be provided by the Contractor.

The system shall be pressure tested for 2 hours at 1380 kPa. A successful test shall have no visible leaks or loss of pressure.

The Contractor shall perform such other tests as may be required by the State Fire Marshal.

15.09 CLEAN AGENT FIRE EXTINGUISHING SYSTEM

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of designing, furnishing and installing a total of five fully automatic clean agent fire extinguishing systems, complete and ready for use, in accordance with the details shown on the plans and these special provisions.

Each automatic clean agent fire extinguishing system shall include suppression agent, storage container/containers, pressure gauges, low pressure supervisory alarm, actuating valves, Clean Agent Interface Panel/Control and Monitoring Panel, conduit and conductors/cable system, dedicated 120-volt, AC, power supply system, battery standby power, smoke detectors/heat detectors, abort stations, audible and visual pre-discharge alarms (stage 1 alarm), engineered discharge nozzles, caution and advisory signs, and related appurtenances, valves, piping and fittings required for the complete and fully automatic operation of the clean agent system. In addition, the contractor shall provide and install any additional equipment and controls that are not mentioned herein but are required for the successful operation of the system at no additional cost to the State.

SUBMITTALS.--

Shop drawings.--Complete shop drawings shall be submitted for approval. Shop drawings for fire alarm detection system, building automation system, and clean agent fire extinguishing system shall be submitted as "One Package." Shop drawings shall include installation instructions, brand name, and catalog reference of equipment supplied, system riser diagram including connection of all peripheral devices, proposed layout of discharge piping system, conduit and conductors system, battery calculations, voltage drop calculations, and interconnection between the fire alarm detection system and building automation system. During shop submittals process, the fire alarm detection system, building automation system, and clean agent fire extinguishing system Subcontractors shall coordinate with each other to integrate all the systems.

State Fire Marshal approval.—After the shop drawings are approved by the Engineer, the Contractor shall have said drawings stamped "APPROVED" by the State Fire Marshal. Allow 12 weeks for State Fire Marshal review and approval.

QUALITY ASSURANCE.--

Codes and standards.--All work shall be in accordance with the requirements of the State Fire Marshal, the National Fire Protection Association (NFPA, 2004 Edition) Standard No. 2001, "Clean Agent Fire Extinguishing Systems," 2004 California Electric Code (CEC), NFPA (2005 Edition) No. 72, and the requirements of other regulatory authorities having jurisdiction.

PART 2.- PRODUCTS

All products, equipment and controls furnished and installed shall comprise a complete system and shall be provided by the same manufacturer. Clean Agent Fire Extinguishing System shall be Fike Corporation, Kidde Fire Systems, or equal.

PART 3.- EXECUTION

INSTALLATION.--

General.—Fire suppression piping and equipment shall be installed in accordance with the approved shop drawings and shall be located to avoid interference with the lighting system, access openings, or other piping.

Only use copper conductors/cables for the wiring of the clean agent fire suppression system. All conductors/cables shall be installed in a conduit system. All conduit system to be concealed conduit system unless otherwise directed by the Engineer. Minimum size of the conduit to be 16 mm trade size diameter conduit system. All conduit and conductors shall comply with the requirements of Section 16 "Basic Materials and Methods" of these special provisions. All cables shall be as recommended by the manufacturer of the Clean Agent Fire Extinguishing System.

120-volt, AC, power for controls shall be obtained from a nearby electrical Panelboards per the directions of the Engineer.

System Operation.-- Upon detection of a fire in any of the rooms requiring clean agent as a means of fire suppression, Clean Agent Interface Panel/Control and Monitoring Panel shall receive fire detection signal from the Fire Alarm Control Panel located in the Administration Building and then activate stage 1 alarm. In addition, Fire Alarm Control Panel will communicate this fire detection signal with the Building Automation System. Upon receiving the signal from the Fire Alarm Control panel that a fire is detected in the basement, Building Automation System will command Air Handler No. 2 and Exhaust Fan No. 3 to be shut down and provide a conformation signal to the Clean Agent Interface Panel/Control and Monitoring Panel in the basement to allow release of the clean agent gas.

Upon receiving the signal from the Fire Alarm Control panel that a fire is detected in Room 116 (IT Room) of the Administration wing, Building Automation System will command IT Room HVAC Rooftop Unit and Ductless AC to be shut down and provide a conformation signal to the Clean Agent Interface Panel/Control and Monitoring Panel for the IT Room to allow release of the clean agent gas. If after fire detection and prior to the release of the clean agent gas, gas release abort switch is activated, then release of clean agent gas shall be halted.

Piping.--Fire suppression piping shall be installed level.

Signs.--Signs and messages shall be as required by NFPA No. 2001 and the regulatory authorities having jurisdiction. Lettering shall be standard-type of the following heights:

Item	Minimum Lettering Height
Nameplate date	6 mm
Drain signs	19 mm
Tamper sign	19 mm

FIELD QUALITY CONTROL.--

Acceptance tests.--The Contractor shall arrange for testing of the automatic fire extinguishing system in the presence of the Engineer and the State Fire Marshal. Seven days written notice of said testing shall be provided by the Contractor.

Each zone requiring Clean Agent as fire suppression shall be pressure tested to ensure complete sealing of all openings in doors, and where all pipes and conduits penetrate walls and floors, as per the State Fire Marshal's requirements.

The Contractor shall perform such other tests as may be required by the State Fire Marshal.

15.10 FANS AND VENTILATORS

PART 1.- GENERAL

Scope.--This work shall consist of furnishing, installing and testing fans and ventilators in accordance with the details shown on the plans and these special provisions.

Certifications.--Fans shall be manufactured at an ISO 9001 certified facility. Underwriter's Laboratories (UL 705) shall list fans. Fans intended for Underwriters Laboratories as "Power Ventilator shall list smoke control for Smoke Control Systems." Fan shall bear the AMCA certified ratings seal for air performance.

All variable Frequency Drive units (equipment mounted type or stand alone type) regardless whether they are specified under Mechanical and or Electrical of these special provisions shall be of the same manufacturer. No exceptions shall be allowed.

PART 2.- PRODUCTS

MANUFACTURERS.--

Acceptable manufacture's.--Subject to compliance with the specifications, manufacturers offering products which may be incorporated into the work include, but are not limited to the following: Cook; Greenheck; or equal.

FAN AND VENTILATOR COMPONENTS.--

Coating.--

All ungalvanized steel fan components shall be treated with an electrostatically applied, baked polyester powder coating. Each component shall be subject to a five stage environmentally friendly wash system, followed by a minimum 2 mil thick baked powder finish. Paint must exceed requirements for 1,000-hour salt spray under ASTM B117 test method. Fans used for high temperature oven exhausts shall instead have all steel fan components coated with a heat resistant silicon-alkyd resin.

Propeller.--

Propeller shall be fixed pitch, one piece cast aluminum, six blade airfoil design. The propeller shall be keyed and secured to the shaft with a split taper bushing, and retaining plate. Propeller shall be balanced in accordance with AMCA Standard 204-96.

Wheel.--

Blower wheel shall be steel, non-overloading, centrifugal backward inclined, or airfoil type. Blades on all sizes shall be continuously welded to the backplate and deep spun inlet shroud. Hubs shall be keyed and securely attached to the fan shaft. Wheel shall overlap aerodynamic aluminum inlet cones to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96. Explosion proof fan shall have aluminum wheels and shall be constructed per AMCA Standard 99.

Motor.--

Motors shall be heavy duty type with permanently lubricated sealed ball bearings and furnished at the specified voltage, phase and enclosure. Variable Frequency Drive(VFD) for the VFD motors are specified under Division 16 of these special provisions. Fan motors shall be explosion proof where indicated on the plans.

Bearings.--

Bearings shall be designed and tested specifically for use in air handling applications. Bearings shall be heavy duty regreasable ball or roller type in a cast iron pillow block housing selected for a minimum L50 life in excess of 400,000 hours for horizontal units, and L50 life in excess of 250,000 hours for vertical units at maximum cataloged operating speed.

Belts and Drives.--

Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

Shaft.--

Fan shaft material shall be AISI C-1045 hot rolled, and accurately turned, ground and polished. Shafting shall be sized for a critical speed of at least 125% of maximum RPM.

For utility fans, shaft shall be Type 316 Stainless Steel accurately turned, ground and polished. Shafting shall be sized for a critical speed of at least 125% of maximum RPM.

Name Plate.--

Units shall bear an engraved aluminum nameplate. Nameplate shall indicate design L/s (CFM), static pressure, and maximum fan RPM.

AXIAL FLOW FANS.--**Tube axial flow fans.--**

Tube axial flow fans shall be belt drive, fixed pitch, tube axial fans, and where designated fans shall be high temperature type. Fans shall be of bolted and welded construction utilizing corrosion resistant fasteners, and for high temperature applications shall be suitable for up to 260°C continuous operating temperature. Housing shall be minimum 12 gauge steel with continuously welded seam and integral inlet and outlet flanges pre-punched for mounting. Copper lube lines, shall be extended from the bearings to the outside of the housing. Adjustable motor plate shall be attached to a welded motor sub-base and shall utilize threaded studs for positive belt tensioning.

UPBLAST FANS.--

Upblast centrifugal exhaust ventilator fans.--

Upblast centrifugal exhaust ventilator fans shall be spun aluminum, roof mounted, belt driven, upblast high pressure centrifugal exhaust ventilator. Where designated fans shall be suitable for high temperature, and smoke control. The fans shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16-gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The base shall have a one piece inlet spinning and continuously welded curb cap corners for maximum leak protection. A two piece top cap shall have stainless steel quick release latches to provide access into the motor compartment without the use of tools. The motor, bearings and drives shall be mounted on a minimum 14 gauge steel power assembly. These components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. High temperature units shall be tested to operate at 260°C for 4 hours per IRI requirements and operate at 538°C in excess of 15 minutes per SBCCI requirements.

Tubular upblast centrifugal ventilator fans.--

Tubular upblast centrifugal ventilator fans shall be a spun aluminum, belt driven, in-line, upblast tubular centrifugal fan. The fan shall be bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum housing shall be constructed of minimum 8-gauge marine alloy aluminum. Curb cap shall have continuously welded corners for maximum leak protection. Straightening vanes shall be utilized for uniform airflow. Extended lube lines shall be furnished for lubrication of fan bearings. Aluminum adjustable motor mounting plate shall utilize threaded studs for positive belt tensioning. Fan shall have hinged butterfly discharge dampers of aluminum or steel construction with a rain gutter to prevent rain infiltration. The damper assembly shall be protected by a continuously welded aluminum windband of minimum 14-gauge aluminum.

Direct driven upblast centrifugal ventilator fans.--

Direct driven upblast centrifugal ventilator fans shall be a spun aluminum, roof mounted, direct driven, upblast extended pressure centrifugal exhaust ventilator. The fans shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16-gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have a one piece inlet spinning and continuously welded curb cap corners for maximum leak protection. A two piece top cap shall have stainless steel quick release latches to provide access into the motor compartment without the use of tools. The motor shall be enclosed in a weather-tight compartment, separated from the exhaust airstream.

Utility centrifugal fans.--

Utility centrifugal fans shall be a single width, single inlet backward inclined airfoil, belt driven centrifugal blower. The fans shall be of bolted and welded construction utilizing corrosion resistant fasteners. The entire fan housing shall have continuously welded seams for leakproof operation and shall have a minimum 40 mm outlet discharge flange. A performance cut-off shall be furnished to prevent the recirculation of air in the fan housing. Bearing support shall be minimum 10 gauge welded steel.

HOODED FANS.--

Tiered filtered air supply fans.--

Tiered filtered air supply fans shall be a roof mounted, belt driven, filtered, double width, double inlet centrifugal supply blower with tiered aluminum hood. The fans shall be of bolted and welded construction utilizing corrosion resistant fasteners. The louvered hood shall be constructed of extruded aluminum with continuously welded and mitered corners. The removable topcap shall be constructed of minimum 1.62 mm aluminum. Filters shall be washable expanded aluminum media with two inch formed aluminum frame. The aluminum curb cap shall have continuously welded corners. The internal blower scroll wrapper and scroll side panels shall be a minimum 12 gauge steel and shall have continuously welded seams for leakproof operation. A performance cut-off shall be furnished to prevent the recirculation of air in the fan housing. Bearing support shall be minimum 7.5 mm welded steel.

Low profile supply ventilator fans.--

Low profile supply ventilator fans shall be a hooded, low profile, roof mounted, belt driven, downblast centrifugal exhaust ventilator. The fans shall be of bolted and welded construction utilizing corrosion resistant fasteners. The motor, bearings and drives shall be mounted on a welded tubular steel power assembly. The power assembly shall be rigidly secured to the fan housing. The fans shall be enclosed with a minimum 18 gauge galvanized steel hood bolted to the fan housing. The hood shall have a removable top cap to allow unobstructed access to the motor and power assembly without removing entire hood. The fan outlet shall be protected from entry of foreign material by 15 mm x 15 mm galvanized steel screen.

Hi-pressure low contour ventilator fans.--

Hi-pressure low contour ventilator fans shall be a low profile, roof mounted, belt driven, centrifugal exhaust ventilator. The fans shall be of bolted and welded construction utilizing corrosion resistant fasteners. The aluminum base shall have a one piece inlet spinning and continuously welded curb cap corners for maximum leak protection. The top cap shall have quick release latches to provide access into the motor compartment. The motor, bearings and drives shall be mounted on a minimum 14-gauge steel assembly. These components shall be enclosed in a weather-tight compartment, separated from the exhaust air stream. Diverters shall be provided to discharge air vertically. Fan wheels shall be mounted to an access door for inspection and cleaning. Access doors shall be removable.

Exhaust fan (ceiling mounted).--

Exhaust fan (ceiling mounted) shall be ceiling mounted, AMCA certified and shall be equipped with grille, backdraft damper and metal housing. Exhaust fan motor shall have integral thermal overload protection. Ceiling exhaust fan shall be Breidert, ILG, Penn, or equal.

PART 3.- EXECUTION

INSTALLATION.--

The Contractor shall examine the following requirements and other conditions affecting performance of the fan and ventilator:

Verify that unit is secure on mountings and supporting devices and those connections to manufacturer provided roof curbs, ducts, and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.

Verify that cleaning and adjusting are complete.

Verify lubrication for bearings and other moving parts.

Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.

Starting Procedures.--Energize motor and adjust fan to indicated rpm. Measure and record motor voltage and amperage.

Operational Test.--After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

Shut units down and reconnect automatic temperature-control operators.

Refer to Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

Replace fan and motor pulleys as required to achieve design airflow.

ADJUSTING.--

Adjust damper linkages for proper damper operation.
Adjust belt tension.

Additional adjusting requirements shall be in accordance with the requirements specified under "Testing, Adjusting, and Balancing" in Division 15, "Mechanical," of these special provisions.

15.11 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT AND SYSTEMS

PART 1.- GENERAL

Scope.--This work shall consist of furnishing, installing and testing heating, ventilating and air conditioning (HVAC) equipment and fume exhaust systems in accordance with the details shown on the plans and these special provisions.

The performance rating and electric service of the HVAC equipment shall be as shown on the plans.

Temperature controls.--Thermostats, relays, time switches, and other sensor type control devices required for this work shall be furnished and installed by the supplier of the heating, ventilating and air conditioning equipment. All temperature control wiring shall be furnished and installed in accordance with the requirements specified in Division 16, "Electrical," of these special provisions.

Codes and standards.--Equipment and systems shall conform to California State Energy Commission Regulations and, where applicable, shall be American Refrigeration Institute (ARI), American Gas Association (AGA), Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), and Air Movement and Control Association (AMCA) approved for performance ratings and application shown on the plans.

Any appliance for which there is a California standard established in the Appliance Efficiency Standards may be installed only if the manufacturer has certified to the Commission, as specified in those regulations, that the appliance complies with the applicable standards for that appliance. Space conditioning equipment may be installed only if the manufacturer has certified that the equipment meets or exceeds all applicable efficiency requirements listed in the Energy Efficiency Standards.

Duct insulation R-Values shall comply with requirements of Table 4-4 "Pipe and Duct Distribution Systems" under "Mechanical Systems" of the California Code of Regulations, Title 8, Chapter 4.

PART 2.- PRODUCTS

PACKAGE AIR HANDLING UNITS WITH COILS.--

General.—

Air handling unit shall be blow-thru type suitable for low-pressure operations. Units shall be complete with fan, hot water coil, chilled water coil, filter sections, and cooling, coil section accessories, and dampers. Air handling unit shall be manufactured by Trane; Carrier; McQuay; or equal.

The Contractor shall verify dimensions of air handler unit support framing on the structural drawings to match the unit supports prior to ordering and installing air handler units.

Casing.--

Air handling unit casing shall be constructed of 1.2 mm galvanized steel on channel base. Fabricate channel base and drain pans of welded steel coated externally with zinc chromate, iron oxide, or phenolic resin paint. Provide drain pans under heating coil and cooling coil sections with asphalt base coating. Casing sections shall be insulated with 38 mm thick, 24 kg per cu meter density, neoprene coated, glass fiber insulation, "K" value at 23.89 degrees C maximum 0.26, applied to internal surface with adhesive and weld pins. Coat exposed edges of insulation with adhesive. Insulation and adhesive: Conform to NFPA 90A.

Casings shall be painted with zinc chromate, iron oxide, or phenolic resins paint. Seal fixed joints with flexible weather tight sealer. Seal removable joints with closed-cell foam gasket. Provide cap strips over roof flanges. Provide rain caps and gaskets on access doors.

Air handling unit shall be provided with access doors of galvanized steel insulated sandwich construction, for flush mounting, with gasket, latch, and handle assemblies, hinges. Provide welded channel frame to set door out from casing to permit external insulation.

Air handling stationary louvers shall be fabricated of galvanized steel, 152 mm deep with plenum, 12.7 mm mesh, 1.02 mm galvanized wire birdscreen in aluminum frame, and bearing AMCA Certified Ratings Seal in accordance with AMCA 500.

Accessible sections shall be provided with light, with wire guards, factory wired to weatherproof switch and duplex outlet mounted on casing exterior.

Fan.--

Fan shall be forward curved type fan and shall be provided self-aligning, grease lubricated, roller bearings with lubrication fittings extended to exterior of fan casing with copper tube and zerk fittings rigidly attached to casing.

Fan and motor shall internally be mounted on welded steel base coated with zinc chromate, iron oxide, or phenolic resin paint. Factory mount motor on slide rails. Provide access to motor, drive, and bearings through removable casing panels on hinged access doors. Mount base on vibration isolators. Fan and coil sections shall be separated with flexible connection.

Fan Motor.--

Fan motors rating shall be as indicated on the plans. Motor bearings shall be rated at 400,000 hours for L-50 life and shall be supported on pillow block type, self-aligning, grease-lubricated roller bearings. Drive shafts shall be solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.

Fan Drive.--

Fan motor shall be V-Belt drive type with cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Fan motor shall be variable frequency drive type (VFD) and shall be rated for 480 volts input and output and suitable for the motor kilowatt output, as shown on the plans. The drive shall incorporate state-of-the-art solid-state circuitry, motor circuit protector type circuit breaker as main disconnect, drive bypass configuration, three contactors (input, output, bypass) design, motor overload relay, keypad for performing different functions, hand-off-auto selector switch, and a drive bypass bottom. The keypad shall be menu structured, alphanumeric keypad with four-line backlit display. The keypad must be capable of coping drive parameters as backup or for transferring between drives. A software package that is built into the drive shall ensure quick and easy start-up. The drive unit shall be capable of communicating all desired function such as status of drive, start-stop, and speed signal with and functioning directly under the command of Building Automation System (BAS). The drive unit shall withstand rating of 65,000 amperes symmetrical at 480 volts and shall be designed and tested per UL standard UL508C. AHU-10 and AHU-11 shall have clean powered VFD drive. The harmonics introduced by the clean powered variable frequency drive at the Point of Analysis (POA) shall have a maximum current distortion of 5.5% to ensure harmonic compliance. For purposes of this specification, the POA shall be the line side of the chiller disconnect to the VFD. VFD shall be of the same manufacturer as the other VFD's.

Coils.--

Hot water and chilled water coils shall have copper tubing, copper fins that mechanically are bonded to the tubing. Hot water coil shall have cast iron header with tubes expanded into header, seamless copper tube with silver brazed joints, or prime coated steel pipe with brazed joints. DX coil shall have seamless copper header or brass tubes with silver brazed joints.

Air handling coils section shall have access to both sides of coils. Enclose coils with headers and return bends fully contained within casing. Slide coils into casing through removable end panel with blank off sheets and sealing collars at connection penetrations.

Provide drain pans 610 mm downstream of coil and down spouts for cooling coil banks. Provide eliminators of PVC, mounted over drain pan. Provide coils with indicated ratings for hot water heating and chilled water cooling.

Filters.--

Filter box shall be galvanized steel with filter guides, access doors from both sides, for side loading. Provide filter gauges one piece molded plastic inclined manometer, with static pressure taps.

Economizer.--

Provide mixing boxes with factory mounted outside and return air dampers of galvanized steel and edge seals in galvanized frame, with galvanized steel axles in self-lubricating nylon bearings, in opposed blade arrangement with damper blades positioned across short air opening dimension.

Wiring for the economizer shall be compatible with the air conditioner installed and shall provide for automatic compressor lockout and minimum position damper control to provide the minimum outside air as shown on the plans.

TERMINAL UNIT.--

Terminal unit.--

Terminal unit shall be factory-assembled, externally powered, variable air volume control terminal. Unit shall be complete with a damper assembly, flow sensor, externally mounted volume controller, collars for duct connection, heating coil and all required features. Control box shall be clearly marked with an identification label that lists such information as nominal liters per second, maximum and minimum factory-set airflow limits, coil type and coil hand, where applicable.

Unit cabinet.--

Unit cabinet shall be constructed of 22-gage galvanized steel with round or rectangular inlet collar and rectangular discharge with slip and drive connection. Standard cabinet insulation shall be 15 mm thick, 0.68 kg equivalent density, mat-faced insulation that meets the requirements of UL-181 and NFPA-90A.

Control air damper assembly.--

Control air damper assembly shall be constructed of heavy gage steel with solid shaft rotating in Delrin® bearings. Damper shaft shall be marked on the end to indicate damper position. Damper blade shall incorporate a flexible gasket for tight airflow shutoff and operate over a full 90°. Units shall have communicating controls, as specified, capable of maintaining required airflow set points $\pm 5\%$ of the unit's capacity at any inlet pressure up to 1.5 kPa.

Controllers.--

Controllers shall be direct digital electronic control (DDC) arrangements field supplied for factory mounting, unless otherwise noted. All DDC control arrangements include a standard linear inlet flow sensor, transformer to 24 VAC and control enclosure. Controls shall be capable of resetting between factory or field-set maximum and a minimum (>1.778 mps inlet duct velocity) set points to satisfy the room space sensor or DCV demand. The unit shall be equipped with an amplified linear averaging flow probe located across the inlet. The sensor will provide a differential pressure signal amplified to equal 3 times the velocity pressure with an accuracy of at least $\pm 10\%$ throughout the range of 1.778 mps to 13.21 mps inlet duct velocity, depending on the controller employed.

Hot water heating coil.--

Coils shall be 15 mm O.D. copper tubing mounted in a minimum 20-gage galvanized steel casing. Coils shall have aluminum fins (4 fins/cm.) bonded to the copper tubes by mechanical expansion. Coils shall be two rows multi circuit type. Right or left-hand fittings with sweat connection sizes as indicated on equipment drawings.

Hot water coils shall be tested for leakage at 1723 kPa with the coil submerged in water. Sound power levels shall be ARI certified in accordance with the requirements of ARI-880-98. Coils shall be sized according to the plans.

REFRIGERANT MONITOR.--**Refrigerant monitor.--**

Refrigerant monitor shall be a six port multiple gas, multiple area infrared refrigerant gas monitoring system capable of continuous low-level sampling of the HFC gas R134a. The monitor shall comply with refrigerant monitoring requirements of ANSI/BSR ASHRAE 15-1994. The monitor shall come standard with barb fitting sampling ports, five line end filters, charcoal filter, T-bolt brackets, and operations manual. The detector shall be an infrared non-dispersive computer enhanced type with accuracy of +/- 10 PPM from 0 to 100 PPM. The unit shall have a monitoring distance of up to 152 meters and shall be 120 VAC single phase. For line sizes see the plans. The unit shall be installed according to the manufacturer's recommendations.

Time switch.--

Time switch shall be one-hour, spring-wound, "OFF" type time switch without a "HOLD" feature. Time switch shall be Intermatic, Type F60M; Tork, A500 Series; or equal.

AUXILIARY HVAC COMPONENTS.--

Unless specified herein, all components shall be sized and have the characteristics as shown on the plans.

DUCTWORK.--**General****Steel duct.--**

Steel duct shall be made from ASTM A525 galvanized steel sheet, lock-forming quality, having zinc coating of 382 g per square meter for each side in conformance with ASTM A90.

Flexible duct.--

Flexible duct shall be interlocking spiral of galvanized steel rated to 0.5 kPa positive and 0.37 kPa negative for low pressure ductwork.

Circular duct, lined.--

Spiral lock seam galvanized steel, with acoustic duct liner at 24 kg per cubic meter. Liner shall be 25 mm fiberglass. Fittings shall be similar construction as straight duct, solid welded steel construction.

Stainless steel duct.--

Stainless steel duct shall be ASTM A167, type 304 18-8.

Sealant.--

Sealant shall be non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

Gasket.--

Gasket shall be continuous, reinforced, inert self-conforming type, 3 mm thick, with a width to match angle connection.

Low pressure ductwork.--

Low pressure ductwork shall be fabricated and supported in accordance with SMACNA HVAC Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

Round ducts.--

Round ducts shall be installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

T's bends and elbows.--

T's bends and elbows shall be constructed with radii not less than 1.5 times the width of the duct on centerline. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation. Increase duct sizes gradually, not exceeding 15° divergence wherever possible. Divergence upstream of equipment shall not exceed 30°; convergence downstream shall not exceed 45°.

Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10% duct area, split into two ducts maintaining original duct area.

Connect flexible ducts to metal ducts with draw bands.

Use crimp joints with or without bead for joining round duct sizes 200 mm and smaller with crimp in direction of airflow.

Use double nuts and lock washers on threaded rod supports.

Ceiling diffuser (for gypsum board ceilings).--

Ceiling diffuser for gypsum board ceilings shall be round, rectangular or square type. Diffuser shall be steel with oven baked-on enamel bone white dull finish or extruded aluminum, equipped with a removable core and a standard flanged frame with sponge rubber or felt gasket. Rectangular or round diffuser shall have individually adjustable curved blades, counter-sunk screw holes, shall be surface mounted. Round diffuser shall be recessed type or outer cone surface mounted type as shown on plans. Diffuser shall have face velocity less than 3.05 m/s and shall be Titus; Air Mate; Hart and Cooley; or equal.

Return grille (for gypsum board ceilings).--

Return grille for gypsum board ceilings shall be rectangular or square, and shall be steel with oven baked-on enamel bone white dull finish or extruded aluminum, fixed bar type, die formed louvers set at 45°, 13 mm spacing maximum, surface mounted; Titus; ; Air Mate; Hart and Cooley; or equal.

Return register (for gypsum board ceilings).--

Return register for gypsum board ceilings shall be rectangular or square, and shall be steel with oven baked-on enamel bone white dull finish or extruded aluminum, adjustable louvers with handles, surface mounted; Titus; Air Mate; Hart and Cooley; or equal.

Wall supply register.--

Wall supply register shall be double-deflecting adjustable type, with vertical face bars and horizontal rear louvers, steel with oven baked-on enamel bone white finish or extruded aluminum, flanged frame with sponge or felt gasket; Hart and Cooley ; Air Mate or equal.

Wall return grille.--

Wall return grille shall be single deflecting type, with horizontal fixed louvers, steel with oven baked-on enamel bone white finish or extruded aluminum, flanged frame with sponge or felt gasket; Hart and Cooley; Air Mate; Titus; or equal.

Volume Control Dampers.--

Volume control dampers shall be constructed in accordance with SMACNA HVAC duct construction standards, and as indicated.

Splitter dampers of material same gage as duct to 610 mm size in either direction, and two gages heavier for sizes over 610 mm.

Fabricate splitter dampers of double thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 8 mm diameter rod in self-aligning, universal joint action flanged bushing with setscrew. Fabricate single blade dampers for duct sizes to 300 mm x 1220 mm.

Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 300 mm x 1825 mm. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

Except in round ductwork 300 mm and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

Provide locking, indicating quadrant regulators on single and multi-blade dampers. (Where rod lengths exceed 760 mm provide regulator at both ends.)

Single blade dampers.--

In galvanized steel ductwork dampers shall be 16 gauge galvanized steel, except as noted.

In low velocity systems dampers shall meet SMACNA HVAC duct construction standards, except as noted. Insulated ducts quadrants mounted on bracket to clear insulation, based on insulation thickness.

Multiblade dampers for low pressure systems.--

Multiblade dampers for low pressure systems shall be opposed blade dampers a maximum of 200 mm wide for ducts over 360 mm. Dampers shall be rated at 4.72 L/s per 0.093 m² at 1 kPa.

Fire dampers.--

Fire dampers shall be approved by the California State Fire Marshal. The Contractor shall demonstrate the ability to reset fire dampers. Fire dampers shall be fabricated in accordance with CBC Section 1505 and UBC standard 43-7, and as required by the California State Fire Marshal. In stainless steel ductwork type 304 shall be installed. Fire dampers shall be installed as noted on the plans and in ducts and opening in shafts, floors, firewalls, fire rated ceilings, and exit corridor walls. An access door shall be provided in the duct, adjacent to each fire damper.

Multi-blade fire dampers.--

Multi-blade fire dampers shall have blade housing out of the air stream, and shall be equipped with fusible link. In horizontal ducts link shall be gravity drop type, and in vertical ducts link shall be spring-loaded type.

Fusible link.--

Fusible links shall be UL listed with a temperature rating not greater than 10°C above the highest air temperature in the duct.

Combination fire and smoke dampers.--

Combination fire and smoke dampers shall be approved by the California State Fire Marshal. They shall be fabricated in accordance with NFPA 90A and UBC standards. Provide factory sleeve for each damper, install damper operator on exterior of sleeve and link to damper operation shaft. Operating shaft shall have a 90-degree operating range between open and closed.

Multi-blade fire and smoke dampers.--

Multi-blade fire and smoke dampers shall be classified as a 1-1/2 hour UL fire damper, leakage rated smoke damper under UL 555S and UL 555.

Damper actuator.--

Damper actuator shall be electric type spring return, 120 volts AC, 60 Hz. UL listed and labeled as a fire damper actuator. Fail-safe type, with close dampers on failure of power.

Air filter (for HVAC units).--

Air filter shall be permanent metal viscous impingement type, constructed of aluminum or galvanized steel, 50 mm minimum thickness and be approved for Class 2 use. Filter shall have a minimum efficiency rating of 50 percent as determined when tested in accordance with ASHRAE Test Standard 52. Filter shall be mounted in 1.52 mm (16-gage) galvanized steel holding frames. Two cans of recharging adhesive shall be provided with the filter and shall be nearly odorless, have a high flash point, rapid wetting characteristics, dye tracer and be water soluble. Filter shall be Airspan, Type AF, Eco-Air Products, Inc., Type HIA; Snyder General, Type AAF; or approved equal.

Boxed louver.--

Boxed louver shall be sized as shown on contract plans. Boxed louver frame shall be 6063-TS extruded aluminum with 2.3 mm thickness. Boxed louver blades thickness shall be 2 mm, screen shall be 12.7 mm x 1.3 mm flattened expanded aluminum. Boxed louver shall be provided with roof curb, provided by the same manufacturer.

Flues (for drying ovens).--

Flues for drying ovens shall be approved Type B.

Condensate drain piping.--

Condensate drain piping shall be rigid, Type L copper tubing with brazed solder fittings. The suction line shall be insulated, with vapor barrier and shall be weatherproofed for exterior installation. Factory sealed tubing shall not be used.

PART 3.- EXECUTION**INSTALLATION.--**

Ventilators.--Exhaust ducts connected to exhaust fans shall be routed as shown on the plans and shall terminate in a weatherproof cap. Duct sizes shall be as shown on the plans or as recommended by the manufacturer, whichever is larger. Roof fans shall be curb mounted.

Mounting heights.--Space sensors, humidistats, and time switches shall be installed as shown on the plans.

Each space sensor shall be insulated from the outside walls. Global temperature sensor, enthalpy sensor, etc shall be install in a protective enclosure and shall be provided with an aluminum radiation shield above the enclosure.

Temperature control for each unit heater shall be provided by a thermostat and time switch. Thermostat shall be set for 21°C. The thermostat shall be wired in series with the time switch and shall de-energize the heater above the setpoint.

Air outlets.--Volume dampers shall be furnished and installed for all diffusers. Blocking shall be provided on all sides of air outlets between ceiling or wall joists. Collars shall be supplied for all outlets and shall be taped and sealed in place.

Vents and flues.--Vents and flues shall be securely fastened to the building construction, shall be provided with a collar at all ceiling penetrations and shall terminate with a weather cap fabricated of the same material.

Access door.--Access doors shall be provided in rigid ducts and plenums for access to volume dampers, fire dampers and control devices located within such ductwork; and shall be provided at such other locations as shown on the plans.

Duct, general.--Construct with gauges, joints, bracing, reinforcing, and other details per latest UMC, ASHRAE, SMACNA, or NFPA standard unless specified otherwise. Provide ducts with NFPA 90A gauges when traversing smoke zones. Install ductwork of sizes, runs and connections as shown on the plans. Verify all dimensions at the site, making all field measurements and shop drawings necessary for fabrication and erection of sheet metal work. Dimensions shown are net free areas. Make allowances for beams, pipes, and other obstructions in building construction and for work of other trades. Check plans showing work of other trades. Ductwork shall be fabricated in a workmanlike manner with airtight joints, presenting smooth surfaces on the inside, neatly finished on the outside, and shall be constructed with curves, bends, and turning vanes to aid in easy flow of air. Construct, brace and support ducts and air plenums to prevent sagging and to minimize vibration when fans are operating. Maintain rectangular cross section of ductwork unless otherwise shown. Duct dimensions indicated are net, inside, clear dimensions.

Flexible duct connections.--Flexible duct connections shall be neoprene coated glass fabric with metal collar frames at each end of connections. Fabric shall be attached tightly to ducts. Allow at least 25 mm of slack in connections. Length of fabric connections shall be a minimum of 100 mm and a maximum of 250 mm. Install at connections to fans and air handling units.

Tapers.--Pitch sides of duct in a diverging airflow a maximum of 20°, and in a converging airflow a maximum of 30°.

Branch duct connections.--Make branch duct connections to other ducts or plenums in such a manner that it provides a smooth airflow with. Minimum turbulence and minimum air pressure drops at the connections.

Duct test holes.--Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps. Permanent test holes shall be factory fabricated, air tight, flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

Elbows and Transitions.--Turning vanes shall be provided in miter elbows in round and rectangular ducts.

Joint sealing.--Seal transverse and longitudinal joints of sheet metal ducts, including angle iron connections, by one of the following methods; use 170 gram canvas strip, 150 mm wide, adhered with lagging adhesive, or other applications as recommended by the manufacturer. Seal punched holes and corner cracks. After installation and balancing reseal joints found to be leaking.

Stainless steel ductwork.--Stainless steel ductwork material thickness and construction shall be the same as specified for low pressure ductwork.

Round ductwork.--Fittings—Round ductwork fittings shall be factory fabricated with a radius of elbows and angles a minimum of 1-1/2 times diameter of duct. Where tee fittings of conical type change in shape from round to rectangular, utilize a transformation joint with a taper ratio of 1 to 7.

Joints between ducts.--Joints between ducts shall be made with beaded sleeve joints as scheduled. With duct sealer applied to male end. Mechanically fastened with sheet metal screws or pop rivets. Over joint and screw or rivet heads, apply coating of duct sealer. Cover entire joint with duct tape.

Horizontal supports.--Horizontal supports shall consist of one or two-piece clamp band strap, with a minimum of one per section. Support fittings to prevent sagging.

Duct hangers and supports.--Duct hangers and supports shall be attached to structure, as required. Seismic restraints shall be provided. Support horizontal ducts with hangers of size and spacing as indicated in pertinent SMACNA HVAC duct construction standards. Hangers shall be installed at each change in direction of duct. Support horizontal ducts on the roof with supports of size and spacing as indicated on the drawings.

Strap hangers.--Strap hangers shall extend strap down both sides of ducts, and turn under bottom 25 mm minimum. Metal screw bottoms of duct, upper and lower sides of ducts, and not more than 300 mm on center.

Angle hangers.--Provide angle hangers formed by extended vertical bracing angles, or by rods connecting to bottom angles if size or bracing angles conform to hanger schedule.

Vertical Duct Supports.--Vertical ducts shall be supported at every floor. Use angles or channels riveted to ducts. Set angles or channels on floor slab or structural steel members placed in opening, unless otherwise noted.

Leakage.--Leakage shall not exceed 3% of design L/s. Leakage shall be determined by summation of all supply outlet L/s on any one system subtracted from the total L/s developed by the unit serving that system. The Contractor shall inspect the systems that exceed the 3% leakage allowance and reseal leaking ductwork at no additional cost to the State until the leakage rate is within the 3% allowance.

Ducts and vents.--Ductwork within the building shall be installed to clear lighting fixtures, doors, windows and other obstructions. Ductwork shall preserve head room and shall keep openings and passageways clear whether shown on plans or not.

Ductwork shall be installed and braced according to the latest edition of the SMACNA "HVAC Duct Construction Standards."

Slopes in sides at transitions shall be approximately one to five. The ductwork system shall not contain abrupt changes or offsets of any kind unless otherwise shown on the plans.

Where ducts pass through walls, floors or ceilings, galvanized sheet metal or steel angle collars shall be installed around the ducts.

Duct sections shall be connected by beaded sleeve-type couplings using joint sealer as recommended by the duct manufacturer. Duct sections shall be mechanically fastened with pop rivets or sheet metal screws and sealed with mastic or insulated, reinforced silver tape.

Flexible connections shall be provided at both inlet and outlet of fan coil and ventilating units.

Sheet metal plenums shall be adequately braced and supported from the floor or structure with structural steel angles to prevent sagging, flexing and vibration.

All standing seams and transverse joints of supply, return and exhaust ducts and seams around plenums, fan and coil housings shall be sealed with sealant and taped.

Duct penetrations in fire rated assemblies.--Where ductwork passes through fire rated wall, floor or ceiling assemblies, the penetration shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping" in Division 7, "Thermal and Moisture Protection," of these special provisions.

Ductwork identification.--Ductwork shall be in accordance with the requirements specified under "System Identification" elsewhere in this Division 15.

Damper installation.--Dampers shall be installed in accordance with manufacturer's instructions. Provide balancing dampers at points on low pressure supply, return, and exhaust systems at the following locations: In all duct splits and branches of supply, return and exhaust systems. In ducts serving single outlets. At open return ducts above ceilings. In ducts connected to a common plenum. Where shown on the plans. Provide fire dampers, and combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by the California Fire Marshall. Install with required perimeter mounting angles, sleeves, breakaway ducts connections, corrosion resistant springs, bearings, bushings, and hinges. Demonstrate re-setting of fire dampers to authorities having jurisdiction and State representatives.

FIELD QUALITY CONTROL.--

Pre-test requirements.--Before starting or operating systems, equipment shall be cleaned and checked for proper installation, lubrication and servicing.

In each system, at least one air path, from fan to final outlet, shall have all balance dampers open. The final air quantities shall be achieved by adjusting the volume dampers or the fan RPM.

Final adjustments and balancing of the systems shall be performed in such a manner that the systems will operate as specified and as shown on the plans.

The Contractor shall replace or revise any equipment, systems or work found deficient during tests.

All automatic operating devices which are pertinent to the adjustment of the aforementioned air systems shall be set and adjusted to deliver the required quantities of air and at temperatures specified by the Engineer. All control work shall be done in collaboration with the control manufacturer's representative.

Project completion tests.--The Engineer shall be notified at least 3 working days in advance of starting project completion tests.

Additional testing requirements shall be in accordance with the requirements specified under "Testing, Adjusting, and Balancing" in Division 15, "Mechanical," of these special provisions.

Operational Data.--The tests shall include operation of the heating, cooling, and ventilating and fume exhaust systems for not less than two 8-hour days, each system shall operate at not less than 90 percent of their full specified capacities.

The required data shall be accurately measured. The data shall be measured during one operational cycle in the presence of the Engineer and shall be submitted for approval.

15.12 HYDRONIC PIPING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of piping systems for hot water heating, chilled water cooling, condenser water, make-up water for these systems, and condensate drain piping in accordance with details shown on the plans and these special provisions.

Piping materials and equipment shall include pipes, fittings, and specialties, special duty valves, and hydronic specialties.

SYSTEM DESCRIPTION.--

General.--The hydronic piping systems are the "water-side" of an air-and-water heating and air conditioning system. These systems are classified by ASHRAE as Low Water Temperature, Forced, and Recirculating systems.

SUBMITTALS.--

Contractor shall submit the piping manifolds for the primary/secondary loops in boiler and chiller rooms, for approval, prior to erection.

Product data.--Manufacturer's descriptive data and installation instructions for each hydronic specialty and special duty valve shall be submitted for approval.

Manufacturer's descriptive data shall include rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties and accessories, and flow and pressure drop curves for diverting fittings and calibrated plug valves, based on manufacturer's testing.

Shop drawings.--Shop drawings shall be submitted for approval.

Shop drawings shall include manufacturer's drawings detailing dimensions, weight loadings, required clearances, methods of assembly of components, and location and size of each field connection.

Coordination drawings.--Coordination drawings for all chiller room, boiler room, etc, shall be submitted for approval. Drawings shall include all major equipment, valves and accessories. Maintain updated drawings for record purposes at project completion.

Maintenance data.--Maintenance data for hydronic specialties and special duty valves shall be furnished for inclusion in operating and maintenance manuals.

MAINTENANCE.--

Maintenance Stock.--A sufficient quantity of chemical shall be furnished for initial system start-up and for preventative maintenance for one year from acceptance of the work.

PART 2.- PRODUCTS

PIPE AND TUBING MATERIALS.--

Copper tubing.--

ASTM B 88, Type L, drawn temper copper tubing with wrought copper fittings and solder joints 50 mm and smaller, above ground, within building. Use type K, annealed temper copper tubing for 50 mm and smaller without joints, below ground within slabs. Mechanical fittings (crimp or flair) are not permitted.

Steel pipe.--

ASTM A 53, Schedule 40, with threaded joints and fittings for 50 mm and smaller, and with welded joints for 65 mm and larger. Use mechanical grooved end steel pipe and mechanical couplings and fittings for condenser water piping systems.

End seals shall be factory applied, sealed to the jacket and the carrier pipe.

FITTINGS.--

Steel fittings.--

ASTM A 234, seamless or welded, for welded joints.

Grooved mechanical fittings.--

ASTM A 106, steel fittings with grooves or shoulders designed to accept grooved end couplings, as manufactured by Victaulic Company of America, Grinnell or equal.

Grooved mechanical couplings.--

Consist of ductile or malleable iron housing, a synthetic rubber gasket of a central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings, as manufactured by Victaulic Company of America, Grinnell or equal.

Flexible connectors.--

Pipe size 40 mm and smaller shall have flexible hose connectors consisting of a corrugated inner metal hose wrapped with a wire protective braid; hose and braid to be stainless steel. Pipe size 50 mm and larger shall have rubber expansion joints of the single or double arch type, constructed of an EPDM molded rubber cover. Joints shall have flanges integral with the body. Each joint shall be furnished with ANSI 125# drilling and flanges and solid 10 mm thick galvanized steel retaining rings. All units shall be suitable for working pressures up to 1035 kPa.

Pipe expansion fittings and loops.--

Install pipe bends and loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

Attach pipe bends and loops to anchors.

Steel anchors.--

Attach by welding. Comply with ASME B31-9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications." Expansion fittings for pipes DN65 to DN100: Stainless-steel hoses and double-braid, stainless-steel sheaths with 2890 kPa at 21°C and 2170 kPa at 232°C minimum pressure ratings.

SPECIAL DUTY VALVES.--**Calibrated plug valves.--**

Calibrated plug valves shall be 860 kPa water working pressure, 121°C maximum operating temperature, bronze body, plug valve with calibrated orifice. Provide with connections for portable differential pressure meter with integral check valves and seals. Valve shall have integral pointer and calibrated scale to register degree of valve opening. Valves 50 mm and smaller shall have threaded connections and 65 mm valves shall have flanged connections. Acceptable manufacturers include Bell & Gossett ITT (Fluid Handling Div.), Taco, Inc., and Thrush Products, Inc or equal.

Butterfly valve.--

Butterfly valve shall be flanged, ferrous-alloy butterfly valves. Valve rating shall be for tight shutoff, 1375 kPa, with disc and lining suitable for hot and chilled water applications. Valve shall be Bray International, Grinnell Corporation, or equal.

Shut-off/check valve combo valves.--

Shut-off/check valve combo valves shall be 1300 kPa working pressure, 150°C maximum operating temperature, cast-iron body, bronze disc and seat, stainless steel stem and spring, and "Teflon" packing. Valves shall have flanged connections and straight or angle pattern as indicated. Features shall include non-slam check valve with spring-loaded weighted disc, and calibrated adjustment feature to permit regulation of pump discharge flow and shutoff. Valve shall be Amtrol, Inc., Armstrong Pumps, Inc., Bell & Gossett ITT (Fluid Handling Div.), and Taco, Inc., or equal.

Triple duty valves.--

Triple duty valves shall be 1300 kPa working pressure, 150°C maximum operating temperature, cast-iron body, bronze disc and seat, stainless steel stem and spring, and "Teflon" packing. Valves shall have flanged connections and straight or angle pattern as indicated. Features shall include non-slam check valve with spring loaded weighted disc, and calibrated adjustment feature to permit regulation of pump discharge flow and shutoff. Valve shall be Amtrol, Inc., Bell & Gossett ITT (Fluid Handling Div.), and Taco, Inc or equal.

Circuit balancing valves.--

Circuit balancing valves shall be bronze body for valve sizes 15 mm to 50 mm, ductile iron body for valve sizes 65 mm to 300 mm. Each valve shall be equipped with two 8 mm metering ports with EPT check valves. Valves are modified, equal percentage globe valves with memory locks, which provide three functions: flow measurement, flow balance and positive drip tight shutoff.

Temperature control valve.--

Temperature control valve (TCV) shall be operable with an electronic positioner type actuator. Valve body shall be ductile iron ASTM A536, and all internal cast components shall be ductile iron or CF8M (316) stainless steel. All ductile iron components, including the body and cover, shall be lined and coated with an NSF and FDA approved epoxy coating applied by the electrostatic heat fusion process. All main valve trim and throttling components (cover bearing, valve seat and disc guide) shall be stainless steel.

Electronic positioner shall be direct acting, 100% solid state, 120V, 60 Hz.. Operation of the valve positioner shall be based on the comparison of 2 voltages-one derived from the input signal and other from the feedback potentiometer driven by the actuator shaft. Torque rating of the actuator shall be selected to operate the valve selected.

HYDRONIC SPECIALTIES.--**Manual air vent.--**

Manual air vents shall be bronze body and nonferrous internal parts; 1030 kPa working pressure, 107°C operating temperature; manually operated with screwdriver or thumbscrew; and having 3 mm discharge connection and 15 mm inlet connection. Vent shall be Armstrong Machine Works, Bell & Gossett ITT (Fluid Handling Div.), Hoffman Specialty ITT (Fluid Handling Div.), Crane Co., Metraflex Co., Spirax Sarco, or equal.

Automatic air vent.--

Automatic air vents shall be designed to vent automatically with float principle; bronze body and nonferrous internal parts; 1035 kPa working pressure, 115°C operating temperature; and having 8 mm discharge connection and 15 mm inlet connection. Vent shall be Armstrong Machine Works, Bell & Gossett ITT (Fluid Handling Div.), Hoffman Specialty ITT (Fluid Handling Div.), Spirax Sarco, or equal.

Diaphragm-type compression tanks.--

Diaphragm type compression tanks shall be of the size and number as indicated; construct of welded carbon steel for 860 kPa working pressure, 190°C maximum operating temperature. Separate air charge from system water to maintain design expansion capacity, by means of a flexible diaphragm securely sealed into tank. Provide taps for pressure gauge, air charging fitting, and drain fitting. Support horizontal tanks with steel saddles. Tank, with taps and supports, shall be constructed, tested, and labeled in accordance with ASME Pressure Vessel Code, Section VIII, and Division 1. Tank shall be Amtrol, Inc., Armstrong Pumps, Inc., Taco Inc, or equal.

Gauge glass.--

Gauge glass shall be 12 mm in size and of adequate length to indicate the entire contents of the tank. The gauge shall be an automatic type with drain cock and shall be valved top and bottom to allow changing the glass without draining the tank.

Pump suction diffusers.--

Pump suction diffusers shall have cast-iron body, flanged connections; 1200 kPa working pressure, 150°C maximum operating temperature. Diffusers shall be complete with inlet vanes with minimum length of 65 mm times pump suction diameter; cylinder strainer with 5 mm diameter openings with total free area equal to or greater than five times cross-sectional area of pump suction, designed to withstand pressure differential equal to pump shutoff head; disposable fine mesh strainer to fit over cylinder strainer; permanent magnet, located in flow stream, removable for cleaning; adjustable foot support, designed to carry weight of suction piping; and blowdown tapping in bottom, gauge tapping in side. Pump suction diffusers shall be Amtrol, Inc., Armstrong Pumps, Inc., and Bell & Gossett ITT (Fluid Handling Div.) or equal.

Chemical feeder.--

Bypass type chemical feeders of five gallon capacity, welded steel construction; 860 kPa working pressure; complete with fill funnel and inlet, outlet, and drain valves. Chemicals shall be specially formulated to prevent accumulation of scale and corrosion in piping system and connected equipment, developed based on a water analysis of make-up water. Chemical feeder shall be Culligan USA, Vulcan Laboratories (Subsidiary of Clow Corp.), and York-Shipley, Inc or equal.

Y-pattern strainers.--

Cast-iron body (ASTM A 126, Class B), flanged ends for 65 mm and larger, threaded connections for 50 mm and smaller, bolted cover, perforated Type 304 stainless steel basket, bottom drain connection; 800 kPa working pressure. Y-pattern strainers shall be Amtrol Inc., Armstrong Pumps, Inc., Bell & Gossett (Fluid Handling Div.), and Taco, Inc or equal.

Air separators.--

Air separators shall be a steel tank, with inlet and outlet connections and strainer removal connection. The removable strainer shall be of stainless steel with 5 mm diameter perforations and a free area of not less than five times the cross sectional area of the connecting pipe. Unit shall have separate top fittings for connection to system expansion tank and for air vent. There shall be a bottom connection for blowdown cleaning. Unit must be constructed in accordance with the ASME boiler and pressure vessel code and stamped 860 kPa design pressure. Air separators shall be Amtrol, Inc., Armstrong Pumps, Inc., Bell & Gossett ITT (Fluid Handling Div.), and Taco, Inc or equal.

PART 3.- EXECUTION**PIPING INSTALLATIONS.--**

Make reductions in pipe sizes using eccentric reducer fitting installed with the level side up. Install branch connections to mains using tee fittings in main with take-off out the bottom of the main, except for up-feed risers, which shall have take-off out the top of the main line.

Install unions in pipes 50 mm and smaller, adjacent to each control valve, at final connections each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices. Install flanges on valves, apparatus, and equipment having 65 mm and larger connections.

Install flexible connectors at inlet and discharge connections to pumps (except inline pumps) and other vibration producing equipment.

Anchor piping to ensure proper direction of expansion and contraction.

Install expansion loops in hot and chilled water piping, in attic, to absorb thermal expansion as required.

JOINTS.--

Comply with recommended industry practice for preparation and assembly of soldered, threaded, and flanged joints.

Comply with the procedures contained in the AWS "Brazing Manual" for brazed joints.

WELDING.--

Pipe welding shall comply with the provisions of the latest Revision of the Applicable Code, whether ASME Boiler Construction Code, ASA Code for Pressure Piping, or such state or local requirements as may supersede codes mentioned above.

VALVE APPLICATIONS.--

General duty valve applications.--The plans indicate valve types to be used. Where specific valve types are not indicated the following requirements apply:

1. Shut-off duty: Use gate, ball, and butterfly valves
2. Throttling duty: Use globe valves
3. Install shut-off duty valves at each branch connection to supply mains, at supply connection to each piece of equipment, and elsewhere as indicated.
4. Install throttling duty valves at each branch connection to return mains, at return connections to each piece of equipment, and elsewhere as indicated.
5. Control: Use globe valves.

Install circuit balancing valves on each heating or cooling element and elsewhere as required to facilitate system balancing.

Install drain valves at low points in mains, risers, branch lines, and elsewhere as required for system drainage.

Install check valves on each pump discharge and elsewhere as required to control flow direction.

Install safety relief valves on all hydronic systems, and elsewhere as required by ASME Boiler and Pressure Vessel Code. Pipe discharge to floor without valves. Comply with ASME Boiler and Pressure Vessel Code Section VIII, Division 1 for installation requirements.

Install pressure reducing valves on inlet water line, and elsewhere as required to regulate system pressure.

HYDRONIC SPECIALTIES INSTALLATION.--

Install manual air vents at all high points in the system, at heat transfer coils, and elsewhere as required for system air venting.

Install pump suction diffusers on end suction pump suction inlet; adjust foot support to carry weight of suction piping. Install diffusers to maintain minimum service clearance to service strainers. Install nipple and ball valve in blowdown connection.

Install triple duty valves (optional valve) in horizontal or vertical position with stem in upward position. Allow clearance above stem for check mechanism removal.

Install shot-type chemical feeders in hydronic system; in upright position with top of funnel not more than 1200 mm above floor. Install feeder in bypass line, off main using globe valves on each side of feeder and in the main between bypass connections. Pipe drain, with ball valve, to nearest equipment drain.

Install diaphragm-type compression tank as shown on plans. Vent and purge air from hydronic system; charge tank.

Expansion fitting installation:

Install expansion fittings according to manufacturer's written instructions.

Install expansion fittings in sizes matching pipe size in which they are installed.

Align expansion fittings to avoid end loading and torsional stress.

FIELD QUALITY CONTROL.--

TESTS.--

Preparation for testing.--Prepare hydronic piping in accordance with ASME B 31.9 and as follows:

Leave joints including welds uninsulated and exposed for examination during the test.

Provide temporary restraints for expansion joints, which cannot sustain the reactions due to test pressure. If temporary restraints are not practical, isolate expansion joints from testing.

Flush system with clean water. Clean strainers.

Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.

Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test.

Acceptance tests.--Test hydronic piping as follows:

Use ambient temperature water as the testing medium, except where there is a risk of damage due to freezing. Another liquid may be used if it is safe for workers and compatible with the piping system components.

Use vents to release trapped air while filling the system.

Examine system to see that equipment and parts that cannot withstand test pressures are properly isolated. Examine test equipment to ensure that it is tight and that low pressure filling lines are disconnected.

Subject piping system to a hydrostatic test pressure, which at every point in the system, is not less than 1.5 times the design pressure. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under test. Make a check to verify that the stress due to pressure at the bottom of vertical runs does not exceed either 90 percent of specified minimum yield strength, or 1.7 times the "SE" value in Appendix A of ASME B 31.9, Code For Pressure Piping, Building Services Piping.

After the hydrostatic test pressure has been applied for at least ten minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are no leaks.

ADJUSTING AND CLEANING.--

Clean and flush hydronic piping systems. Remove, clean, and replace strainer screens. After cleaning and flushing hydronic-piping system, but before balancing, remove disposable fine mesh strainers in pump suction diffusers.

Mark calibrated nameplates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.

Provide a water analysis prepared by the chemical treatment supplier to determine the type and level of chemicals required for prevention of scale and corrosion. Perform initial treatment after completion of system testing.

All uninsulated piping (such as condenser water piping) shall be completely cleaned and painted. The Engineer will determine paint color.

15.13 PACKAGED HERMETIC CENTRIFUGAL LIQUID CHILLER

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing, installing, and testing the hermetic centrifugal liquid chiller in accordance with details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions for the chiller shall be submitted for approval.

Shop drawings.--Shop drawings shall be submitted for approval.

Shop drawings shall include manufacturer's drawings detailing dimensions, methods of assembly of components.

QUALITY ASSURANCE.--

Codes and standards.--Chiller shall be designed and constructed to meet UL requirements and have labels appropriately affixed. Equipment and installation shall be in compliance with ANSI/ASHRAE 15 (latest edition). Chiller performance shall be rated in accordance with ARI Standard 550/590-2003.

Cooler and condenser refrigerant side shall include ASME "U" stamp and nameplate certifying compliance with ASME Section VIII, Division 1 code for unfired pressure vessels.

Inspection and tests.--Centrifugal compressor impellers shall be dynamically balanced and over-speed tested by the manufacturer at a minimum of 120% design operating speed. Each compressor assembly shall undergo a mechanical run-in test to verify vibration levels, oil pressures, and temperatures are within acceptable limits. Each compressor assembly shall be proof tested at a minimum 1406 kPa and leak tested at 1276 kPa with a tracer gas mixture.

Entire chiller assembly shall be proof tested at 1406 kPa and leak tested at 1276 kPa with a tracer gas mixture on the refrigerant side. The waterside of each heat exchanger shall be hydrostatically tested at 1.3 times rated working pressure.

On chillers with unit-mounted VFD (variable frequency drive), the chiller VFD shall be factory wired and tested together to verify proper operation prior to shipment.

DELIVERY, STORAGE AND HANDLING.--

General.--Units shall be delivered to the jobsite, stored, and handled in accordance with manufacturer's instructions.

Unit shall be delivered with all refrigerant piping and control-wiring factory installed.

Unit shall be delivered charged with oil and full charge of refrigerant HFC-134a.

Unit shall be delivered with firmly attached labels that indicate name of manufacturer, chiller model number, chiller serial number, and refrigerant used.

WARRANTY.--

Warranty shall include parts and labor for one year after start-up or 18 months from shipment, whichever occurs first. A refrigerant warranty shall be provided for a period of five years.

PART 2.- PRODUCTS

EQUIPMENT.--

General.--The chiller shall be factory assembled, single piece, liquid chiller shall consist of compressor, motor, starter or variable frequency drive, lubrication system, cooler, condenser, initial oil and refrigerant operating charges, microprocessor control system, and documentation required prior to start-up. A Variable Frequency Drive (VFD) can be mounted on the chiller, wired, and tested by the chiller manufacturer.

Compressor.--

One centrifugal compressor of the high performance, single-stage type.

Compressor, motor, and transmission shall be hermetically sealed into a common assembly and arranged for easy field servicing.

Internal compressor parts must be accessible for servicing without removing the compressor base from the chiller. Connections to the compressor casing shall use O-rings instead of gaskets to reduce the occurrence of refrigerant leakage. Connections to the compressor shall be flanged or bolted for easy disassembly.

Transmission shall be single ratio, single helical, parallel shaft speed increaser. Gears shall conform to AGMA Standards, Quality II.

Journal bearings shall be of the steel backed babbitt lined type. Aluminum journal bearings are not acceptable. The thrust bearing shall be tilting pad or rolling element type.

Centrifugal compressors shall use variable inlet guide vanes to provide capacity modulation while also providing pre-whirl of the refrigerant vapor entering the impeller for more efficient compression at all loads.

Centrifugal compressors shall be provided with a factory-installed lubrication system to deliver oil under pressure to bearings and transmission. Included in the system shall be:

1. Hermetic driven rotary vane oil pump with factory-installed motor contactor with overload protection.
2. Refrigerant-cooled oil cooler. Water-cooled oil coolers are not acceptable.
3. Oil pressure regulator.
4. Oil filter with isolation valves to allow filter change without removal of refrigerant charge.
5. Oil sump heater controlled from unit microprocessor.
6. Oil reservoir temperature sensor with main control center digital readout.

Motor.--

Compressor motor shall be of the semi-hermetic, liquid refrigerant cooled, squirrel cage, induction type suitable for voltage shown on the equipment schedule.

Motors shall be suitable for operation in a refrigerant atmosphere and shall be cooled by atomized refrigerant in contact with the motor windings.

Full load operation of the motor shall not exceed nameplate rating.

Cooler and Condenser.--

Cooler shall be of shell and tube type construction, each in separate shells. Units shall be fabricated with high-performance tubing, minimum 6mm steel shell and tube sheets with fabricated steel waterboxes.

1. Waterbox shall be nozzle-in-head Waterbox.
2. Waterbox stub out nozzles shall have standard mechanical couplings.

Condenser shall be of shell and tube type construction, each in separate shells. Units shall be fabricated with high-performance tubing, minimum 6mm steel shell and tube sheets with fabricated steel waterboxes.

1. Water box shall be Nozzle in Head.
2. Waterbox shall have standard mechanical couplings.

Waterboxes shall have vents, drains, and covers to permit tube cleaning within the space shown on the drawings. A thermistor type temperature sensor with quick connects shall be factory installed in each water nozzle.

Tubes shall be individually replaceable from either end of the heat exchanger without affecting the strength and durability of the tube sheet and without causing leakage in adjacent tubes.

Tubing shall be copper, high-efficiency type, with integral internal and external enhancement unless otherwise noted. Tubes shall be rolled into tube sheets and shall be individually replaceable. Tube sheet holes shall be double grooved for joint structural integrity.

The condenser shell shall include a Flash Subcooler which cools the condensed liquid refrigerant to a reduced temperature, thereby increasing the refrigeration cycle efficiency.

A reseating type pressure relief valve shall be installed on each heat exchanger.

Refrigerant Flow Control.--

To improve part load efficiency, liquid refrigerant shall be metered from the condenser to the cooler using a float-type metering valve to maintain the proper liquid level of refrigerant in the heat exchangers under both full and part load operating conditions.

CONTROLS AND SAFETIES.—

Control.--

The chiller shall be provided with a factory installed and wired microprocessor control center. The control center shall include a 16 line by 40 character liquid crystal display, 4 function keys, stop button, and alarm light. The microprocessor can be configured for either English or SI units.

All chiller and starter monitoring shall be displayed at the chiller control panel.

The controls shall make use of non-volatile memory.

The chiller control system shall have the ability to interface and communicate directly to the building automation system.

The default standard display screen shall simultaneously indicate the following minimum information:

1. Date and time of day
2. 24 character primary system status message
3. 24 character secondary status message
4. Chiller operating hours
5. Oil supply pressure
6. Oil sump temperature
7. Percent motor Rated Load Amps (RLA)
8. Entering condenser water temperature
9. Leaving condenser water temperature
10. Condenser refrigerant temperature
11. Entering chilled water temperature
12. Leaving chilled water temperature
13. Evaporator refrigerant temperature

In addition to the default screen, status screens shall be accessible to view the status of every point monitored by the control center including:

1. Evaporator pressure
2. Condenser pressure
3. Bearing oil supply temperature
4. Compressor discharge temperature
5. Motor winding temperature
6. Line current and voltage for each phase
7. Frequency, kW, kWhr, demand kW
8. Discrete output status of various devices
9. Compressor motor starter status
10. Optional spare input channels
11. Number of compressor starts
12. Control point settings

Schedule Function.--The chiller controls shall be configurable for manual or automatic start-up and shutdown. In automatic operation mode, the controls shall be capable of automatically starting and stopping the chiller according to a stored user programmable occupancy schedule. The controls shall include built-in provisions for accepting:

1. A minimum of two 365-day occupancy schedules.
2. Means of configuring occupancy timed override
3. Chiller start-up and shutdown via remote contact closure
4. 18 user-defined holidays
5. Minimum of 8 separate occupied/unoccupied periods per day
6. Daylight savings start/end

Pump Control.--Upon request to start the compressor, the control system shall start the chilled water pump, condenser water pumps and verify that flows have been established.

Chilled Water Reset.--The control center shall allow reset of the chilled water temperature set point based on any one of the following criteria:

1. Chilled water reset based on an external 4 to 20 mA signal.
2. Chilled water reset based on a remote temperature sensor (such as outdoor air).
3. Chilled water reset based on water temperature rise across the evaporator.

Demand Limit.--The control center shall limit amp draw of the compressor to the rated load amps or to a lower value based on one of the following criteria:

1. Demand limit based on a user input ranging from 40% to 100% of compressor rated load amps
2. Demand limit based on external 4 to 20 mA signal.

Controlled Compressor Shutdown.--The controls shall be capable of being configured to soft stop the compressor. When the stop button is pressed or remote contacts open with this feature active, the guide vanes shall close to a configured amperage level and the machine shall then shut down. The display shall indicate "shutdown in progress."

Safeties.--

Unit shall automatically shut down when any of the following conditions occur:

1. Motor overcorrect
2. Over voltage. Shall not require manual reset or cause an alarm if auto-restart after power failure is enabled.
3. Under voltage. Shall not require manual reset or cause an alarm if auto-restart after power failure is enabled.
4. Single cycle dropout. Shall not require manual reset or cause an alarm if auto-restart after power failure is enabled.
5. Bearing oil high temperature
6. Low evaporator refrigerant temperature
7. High condenser pressure
8. High motor temperature
9. High compressor discharge temperature
10. Low oil pressure
11. Prolonged surge
12. Loss of cooler water flow
13. Loss of condenser water flow
14. Starter fault

Each of these protective limits shall require manual reset and cause an alarm message to be displayed on the control panel screen.

During the capacity override period, a pre-alarm (alert) message shall be displayed informing the operator which condition is causing the capacity override. Once the condition is again within acceptable limits, the override condition shall be terminated and the chiller shall revert to normal chilled water control. If during either condition the protective limit is reached, the chiller shall shut down and a message shall be displayed informing the operator which condition caused the shutdown and alarm.

PIPING REQUIREMENTS.--

Contractor shall supply and install pressure gages in readily accessible locations in piping adjacent to the chiller such that they can be easily read from a standing position on the floor. Scale range shall be such that design values shall be indicated at approximately mid-scale.

Gages shall be installed in the entering and leaving water lines of the cooler and condenser.

VIBRATION ISOLATION.—

Chiller manufacturer shall furnish neoprene isolator pads for mounting equipment on a level concrete surface.

UNIT MOUNTED VARIABLE FREQUENCY DRIVE (VFD) (WITH BUILT IN HARMONIC FILTER).--

Variable Frequency Drive (VFD) Design.--

VFD shall be refrigerant cooled, microprocessor based, pulse width modulated design. Water-cooled designs are not acceptable. Unit mounted chillers VFD shall be "Clean Power VFD." The harmonics introduced by the variable frequency drives at the "Point of Analysis" (POA) shall have a maximum current distortion of 5.5% to ensure harmonic compliance. For purposes of this specification, the POA shall be the line side of the chiller disconnect to the VFD inside the unit mounted VFD enclosure.

Active rectifier shall convert incoming fixed voltage/frequency to fixed DC voltage. Input current and voltage shall be regulated.

Transistorized inverter and control regulator shall convert fixed DC voltage to a sinusoidal PWM waveform.

Low voltage control sections and main power sections shall be physically isolated.

Integrated controls shall coordinate motor speed and guide vane position to optimize chiller performance over a wide variety of operating conditions. Surge prevention and surge protection algorithms shall take action to prevent surge and move chiller operation away from surge. VFD shall have a short circuit interrupt and withstand rating of at least 65,000 amps.

VFD Rating.--

Drive shall be suitable for nameplate voltage $\pm 10\%$.

Drive shall be suitable for continuous operation at 100% of nameplate amps and 150% of nameplate amps for 5 seconds.

Drive shall comply with applicable ANSI, NEMA, UL and NEC standards.

Drive shall be suitable for operation in ambient temperatures between 40 and 50 C, 95% humidity (non-condensing) for altitudes up to 1829 m above sea level.

Chillers VFD shall be "Clean Power VFD." The harmonics introduced by the variable frequency drives at the Point of Analysis (POA) shall have a maximum current distortion of 5.5% to ensure harmonic compliance. For purposes of this specification, the POA shall be the line side of the chiller disconnect to the VFD.

VFD full load efficiency shall meet or exceed 97% at 100% VFD rated ampacity.

Active rectifier shall regulate unity displacement power factor to 0.99 or higher.

Voltage boost capability to provide full motor voltage at reduced line voltage conditions.

Soft start, linear acceleration, coast to stop.

Base motor frequency shall be 60 hertz.

VFD Electrical Service.-- (single point power):

VFD shall have input circuit breaker with minimum 65,000-amp interrupt capacity.

VFD shall have standard 15 amp branch oil pump circuit breaker to provide power for chiller oil pump.

VFD shall have standard 3 KVA control power transformer with circuit breaker to provide power for oil heater, VFD controls and chiller controls.

The branch oil pump circuit breaker and control power transformer shall be factory wired.

Input power shall be 480 vac, ±10 percent, 3 Phase, 60 Hz, ±2% Hz.

Enclosure.--

Pre-painted, unit mounted, NEMA 1 cabinet, that shall include hinged, lockable doors and removable lifting lugs.

Provisions to padlock main disconnect handle in the "Off" position shall be provided. Mechanical interlock to prevent opening cabinet door with disconnect in the "On" position or moving disconnect to the "ON" position while the door is open shall be provided.

Provisions shall be made for top entry of incoming line power cables.

PART 3.- EXECUTION

START-UP.--

General.--The chiller manufacturer shall provide a factory-trained representative, employed by the chiller manufacturer, to perform the start-up procedures as outlined in the Start-up, Operation and Maintenance manual provided by the chiller manufacturer.

Manufacturer shall supply the following literature:

1. Start-up, operation and maintenance instructions.
2. Installation instructions.
3. Field wiring diagrams.
4. One complete set of certified drawings.

Building Automation System Interface: The chiller control system shall have the ability to interface and communicate directly to the building automation system. Unit manufacturer shall furnish standard flanged piping connections on the cooler and/or condenser.

Chiller Protection.--The following shall be supplied:

1. Programmable auto re-starts after loss of power
2. Motor Overload Protection (NEMA Class 10)
3. Motor Over Temperature Protection
4. Phase Reversal
5. Ground Fault
6. Phase Unbalance Protection
7. Single Cycle Voltage Loss Protection
8. Under-Voltage
9. Over Voltage
10. Phase Loss

User Interface.--Displays shall provide interface for programming and display of VFD and chiller parameters. Viewable parameters shall include:

1. Operating, configuration and fault messages
2. Frequency in Hertz
3. Load and line side voltage and current (at the VFD) kW

TESTING.--

VFD shall be factory mounted, wired and tested on the chiller prior to shipment.

Chiller shall perform as specified herewith and per sequence of operation on the contract plans.

Additional testing requirements shall be in accordance with the requirements specified under "Testing, Adjusting, and Balancing" in Division 15, "Mechanical," of these special provisions.

15.14 BUILDING AUTOMATION SYSTEM

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing Building Automation System (BAS), utilizing Direct Digital Controls (DDC), in accordance with details shown on the plans and these special provisions.

The BAS shall perform control algorithms, calculations and all monitoring functions. The BAS shall provide operator interaction and dynamic process manipulation, including overall system supervision, coordination and control. This shall include HVAC controls, fume exhaust controls, metering, energy management, alarm monitoring, and all reporting and maintenance management functions related to normal building operations all as shown on the plans or specified elsewhere in this specification.

The BAS shall be complete to provide Sequence of Operations for HVAC and fume exhaust systems as outlined on the contract plans.

REFERENCES.--

General.--The design, fabrication, and installation of building automation system shall conform to the applicable requirements of ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) Standards 90.1 and 62.99, (UBC) Uniform Building Code, including local amendments, and Listed Underwriters Laboratory for Open Energy Management Equipment (PAZX) under the UL Standard for Safety 916. Listing includes both U.S. and Canadian certification, NEC National Electrical Code, FCC Part 15, Subpart J, Class A, EMC Directive 89/336/EEC (European CE Mark), and these special provisions.

The latest edition of the standards and codes in effect and amended as of date of supplier's purchase order, and any subsections thereof as applicable, shall govern design and selection of equipment and material supplied.

SUBMITTALS.--

Shop drawings.--Shop drawings shall be submitted for approval.

Shop drawings shall include control sequences, list of materials, bus riser diagrams, hardware/software product data sheets, applicable valve and damper schedules, and various control systems interlocks as described elsewhere in these special provisions.

Prior to installation of the low voltage control wiring system, a complete layout shall be submitted to the Engineer for approval.

Submit engineering calculations used for sizing modulating control valves. Calculations for sizing modulating valves shall be based on actual characteristics of equipment and system being installed. Valve calculations shall include information such as pump head or available pressure; branch piping circuit losses including all pipe, fittings, valves, and coils; flow rates; and pressure losses of other in-line devices.

Shop drawings for fire alarm detection system, building automation system, and clean agent fire extinguishing system shall be submitted as "One Package." Shop drawings shall include installation instructions, brand name, and catalog reference of equipment supplied, complete schematic/wiring diagrams including system interlocks and various equipment powering up and shut down schedule, battery calculations, voltage drop calculations, all systems riser diagrams and floor plans showing all devices and conduit and conductor sizes. Separate packages of shop submittals shall be returned for resubmission.

Operation and maintenance manuals.--Operation and maintenance manuals shall be submitted prior to final acceptance. The manuals shall include the following:

A. **Drawings:** The system supplier shall submit drawings that will serve as As-Built drawings for maintaining and servicing systems, control sequences, bill of materials, bus riser diagrams, hardware/software product data sheets, and applicable valve and damper schedules for approval.

Drawings shall be submitted in the following standard sizes:

11" x 17" or 8 1/2" x 11"

Six complete sets of submittal drawings shall be provided.

4 Drawings shall be available on CD-ROM.

B. **Operation and Maintenance** Manuals will be provided prior to final acceptance. The manuals shall include:

Installation instructions.

Principles of operation and a detailed system description

Startup and operating instructions

System layout and interconnection schematic diagrams

Routine preventive maintenance procedures and corrective diagnostic troubleshooting procedures.

Name, address and telephone number of the DDC Systems field representative.

Complete recommended spare parts list.

QUALITY ASSURANCE.--

Responsibility.--The supplier of the Building Automation System shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship furnished by him.

Component Testing.--Maximum reliability shall be achieved through extensive use of high-quality, pre-tested components. The manufacturer prior to shipment shall individually test each and every controller, sensor, and all other DDC components.

Tools, Testing and Calibration Equipment.--The Building Automation System supplier shall provide all tools, testing and calibration equipment necessary to ensure reliability and accuracy of the control system. The installer shall have an established working relationship with the Building Controls Systems Manufacturer for not less than three years. The installer shall have a minimum of five years documented experience in Building Automation System installations and be approved by the Manufacturer or their authorized distributors.

WARRANTY.--

Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of one year from completion and acceptance by the owner, except for damages from other causes.

Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours during normal business hours.

This warranty shall apply equally to both hardware and software and be at no cost to the State.

PART 2.- PRODUCTS

MATERIALS.--

General.--All products used in this project installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of six months. This installation shall not be used as a test site for any new products unless explicitly approved by the Owner's Representative in writing. Spare parts shall be available for at least five years after completion of this contract.

Operator Interface.--

Web server shall reside on high-speed network with building controllers. Each standard browser connected to server shall be able to access all system information. In addition to the primary operator interface, the system shall include a secondary interface compatible with a locally available commercial wireless network and viewable on a commercially available wireless device such as a Wireless Access Protocol (WAP) enabled cellular telephone or personal digital assistant (PDA). This secondary interface may be text-based and shall provide a summary of the most important data. As a minimum, the following capabilities shall be provided through this interface:

1. An operator authentication system that requires an operator to log in before viewing or editing any data, and which can be configured to limit the privileges of an individual operator.
2. The ability to view and acknowledge any alarm in the system. Alarms or links to alarms shall be provided on a contiguous list so the operator can quickly view all alarms.
3. A summary page or pages for each piece of equipment in the system. This page shall include the current values of all critical I/O points and shall allow the operator to lock binary points on or off and to lock analog points to any value within their range.
4. Navigation links that allow the operator to quickly navigate from the home screen to any piece of equipment in the system, and then return to the home screen. These links may be arranged in a hierarchical fashion, such as navigating from the home screen to a particular building, then to a specific floor in the building, and then to a specific room or piece of equipment.

Communication.--

Web server or workstation and area controllers shall communicate using BACnet protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ASHRAE/ANSI 135-2001, BACnet Annex J.

Performance Standards.--

System shall conform to the following minimum standards over network connections:

Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.

Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec. and shall automatically refresh every 15-sec.

Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.

Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 15 sec.

Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 sec of other workstations.

Systems shall be tested using manufacturer's recommended hardware and software for operator workstation (server and browser for web-based systems).

Hardware.--

Workstation or web server shall meet or exceed DDC system manufacturer's recommended specifications and shall meet response times specified in Performance Standards Section. Hard disk shall have sufficient memory to store system software, one year of data for trended points specified in Point List, and a system database at least twice the size of the existing database at system acceptance. Configure computers and network connections if multiple computers are required to meet specified memory and performance.

Web server or workstations shall be IBM-compatible PCs with a minimum of:

Intel Pentium 2.66 GHz processor

1 GB RAM

40 GB hard disk providing data at 100 MB/sec

48x CD-ROM drive

482 mm (19 inch) LCD monitor, 1280 x 1024, 8 ms

Serial, parallel, and network communication ports and cables required for proper system operation.

Modem. Auto-dial modem and associated cables shall transmit over voice-grade telephone lines at a nominal 56,000-baud and shall provide communication between workstation or web server and remote buildings and workstations.

Operator functions.--

Operator interface shall allow each authorized operator to execute the following functions as a minimum:

Log In and Log Out. System shall require user name and password to log in to operator-interface.

Point-and-click navigation. Operator interface shall be graphically based and shall allow operators to access graphics for equipment and geographic areas using point-and-click navigation.

View and adjust equipment properties. Operators shall be able to view controlled equipment status and to adjust operating parameters such as setpoints, PID gains, on and off controls, and sensor calibration.

View and adjust operating schedules. Operators shall be able to view scheduled operating hours of each schedulable piece of equipment on a weekly or monthly calendar-based graphical schedule display, to select and adjust each schedule and time period, and to simultaneously schedule related equipment. System shall clearly show exception schedules and holidays on the schedule display.

View and respond to alarms. Operators shall be able to view a list of currently active system alarms, to acknowledge each alarm, and to clear (delete) unneeded alarms.

View and configure trends. Operators shall be able to view a trend graph of each trended point and to edit graph configuration to display a specific time period or data range. Operator shall be able to create custom trend graphs to display on the same page data from multiple trended points.

View and configure reports. Operators shall be able to run preconfigured reports, to view report results, and to customize report configuration to show data of interest.

Manage control system hardware. Operators shall be able to view controller status and download new control modifications to each controller.

Manage operator access. Typically, only a few operators are authorized to manage operator access. Authorized operators shall be able to view a list of operators with system access and of functions they can perform while logged in. Operators shall be able to add operators, to delete operators, and to edit operator function authorization. Operator shall be able to authorize each operator function separately.

System software.--

Operating System. Web server shall have an industry-standard professional-grade operating system. Acceptable systems include Microsoft Windows XP Pro and Windows 2000.

System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone set point.

Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.

Animation. Graphics shall be able to animate by displaying different image files for changed object status.

Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.

Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Macromedia Flash).

System Tools.--

System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.

Automatic System Database Configuration.--

Each workstation or web server shall store on its hard disk a copy of the current system database, including necessary controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.

Controller Download.--

Operators shall be able to download configuration from the system database to each controller.

System Configuration.--

Operators shall be able to configure the system.

Online Help.--

Context-sensitive online help for each tool shall assist operators in operating and editing the system.

Security.--

System shall require a user name and password to view, edit, add, or delete data.

Operator Access. Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object. Authorized operators shall be able to vary and deny each operator's accessible functions based on equipment or geographic location.

Automatic Log Out.--

Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.

Encrypted Security Data.--

Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.

System Diagnostics.--

System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).

Alarm Processing.--

System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified in Points List. Alarms shall be BACnet alarm objects and shall use BACnet alarm services.

Alarm Messages.--

Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.

Alarm Reactions.--

Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be able to log, print, display messages, send e-mail, send page, and audibly annunciate.

Alarm Maintenance.--

Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server hard disk from each workstation or web browser interface.

Trend Configuration.--

Operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk. Configure trends as specified in Points List. Trends shall be BACnet trend objects.

Object and Property Status and Control.--

Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu, on graphics, or through custom programs.

Reports and Logs.--

Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.

Standard Reports.--

Furnish the following standard system reports:

Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.

Alarm summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.

Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:

1. Alarm History.
2. Trend Data. Operator shall be able to select trends to be logged.
3. Operator activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp-logged activity.

Custom Reports.--

Operator shall be able to create custom reports that retrieve data, including archived trend data, from the system, that analyze data using common algebraic calculations, and that present results in tabular or graphical format. Reports shall be launched from the operator interface.

Graphics Generation.--

Graphically based tools and documentation shall allow operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and binary values, dynamic text, static text, and animation files to a background graphic using a mouse.

Graphics Library.--

Complete library of standard HVAC equipment graphics shall include equipment such as chillers, boilers, air handlers, terminals, and unit ventilators. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.

Custom Application Programming.--

Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:

Language. Language shall be graphically based and shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks.

Programming Environment. Tool shall provide a full-screen, cursor-and-mouse-driven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.

Independent Program Modules. Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.

Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.

Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.

Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.

Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.

1. Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.
2. System Variables. Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be able to enable, disable, and change setpoints of Controller Software.

Portable Operator's Terminal.--

Provide two IBM-compatible laptop computer and all necessary software to configure the computer for use as a Portable Operator's Terminal. Operator shall be able to connect configured Terminal to the system network or directly to each controller for programming, setting up, and troubleshooting.

Laptop shall have 17-inch screen, processor shall be 2.33 GHz, 4M cache, and 667 MHz. Operating system shall be Window XP Professional and shall have 100 GB hard drive and 4 GB of ram memory. BACnet.

Web server or workstation shall have demonstrated interoperability during at least one BMA Interoperability Workshop and shall substantially conform to BACnet Operator Workstation (B-OWS) device profile as specified in ASHRAE/ANSI 135-2001, BACnet Annex L.

Sequencing.--

Provide application software to properly sequence the start and stop of chillers, boilers, and pumps to minimize energy usage in the facility.

PID Control.--

A PID (proportional-integral-derivative) algorithm with direct or reverse action and anti-windup shall be supplied. The algorithm shall calculate a time-varying analog value that is used to position an output or stage a series of outputs. The controlled variable, set point, and PID gains shall be user-selectable.

Staggered Start.--

This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts, shall be user-selectable.

TEMPERATURE CONTROL PANEL (TCP)--

General.--The TCP shall be electronic, expandable controller and shall be located where shown on the plans and shall include inherent input/output capability. Each TCP shall include a minimum of eight inputs and eight outputs. If the TCP's input/output capability is exceeded, the TCP shall be capable of supporting additional TCP-I/O modules. Each TCP-I/O module shall be capable of supporting a minimum of eight additional inputs and outputs. The TCP's and associated TCP-I/O modules shall include the ability to support a combination of universal HVAC sensor input and output types. The TCP and TCP-I/O modules shall include the inherent ability to support any combination of discrete, 0–10 VDC and 4–20ma outputs and the following sensor inputs types as a minimum:

Dry contact and pulsing dry contacts
0 – 10 VDC and 4 – 20ma
10K thermistor
1000 ohm Nickel RTD

All output channels shall include diagnostic LEDs. Whenever a discrete output has been enabled by the TCP, a LED associated with that channel shall light. When used with analog output points the LED shall indicate the commanded position by dimming and brightening of the LED when the HAND-OFF-AUTO (HOA) is in the Auto position. When the output is commanded to its minimum position the LED will become dim. As the analog output commanded position increases, the brightness of the LED shall increase, until it is fully illuminated at the maximum commanded output.

Each input and output channel shall include a configuration switch such that the user shall be able to select the input or output type from any of the types listed above. The TCP and TCP-I/O shall not require wiring to a terminal strip. Both types of controllers shall utilize “plug type” terminals such that the user may be able to disconnect and replace a module simply by removing the plug type connectors and plugging them into a new module.

The TCP shall be capable of supporting HAND-OFF-AUTO (HOA) override switches for all output channels. The HOA switches shall be accessible to the user and shall allow the user the ability to force the controllers discrete outputs on, off, or in an automatic mode allowing the TCP to command the discrete output channel on and off. When used with analog output channels, the hand position will command the analog output to its maximum value. When the switch is indexed to the automatic mode the TCP's algorithm will command the output.

CONTROLLER ATTRIBUTES.--

General.--The controller shall be powered from standard, off-the-shelf, Class II, 24-volt transformers. The controller shall be listed under UL916-PAZX (Energy Management), UL 864-UDTZ (General Utility Signaling), UL864-UUKL (Smoke Control), VDE, and CSA. Products shall be manufactured in a facility having a Quality System that is registered to either ISO 9002 or ISO 9001 Quality Assurance Standard. The controller shall be designed to be easily mounted in a standard NEMA 1 type enclosure without special rails or mounting hardware and as local and national code dictates.

The controller shall include a 365-day real-time clock and watchdog timer diagnostic indicator provided by a LED. The watchdog timer shall reset upon power on and be resettable by software thereafter. Should the watchdog timer not be resettable during the timing period, it shall time out and set all outputs to their non-powered state. The LED shall illuminate solidly to indicate this failure.

The controller shall not require a battery. All configuration data, custom programs, etc., will be stored in non-volatile memory. The controller shall provide a minimum of two days data retention for the time clock and consumable data (runtimes, GPM, KWH, etc.). Systems that require a battery to store data is not acceptable.

The controller shall include the capability to provide a local interface for all operating values, alarms, etc., via a hand held panel mounted, or remotely mounted Local Interface Device. The controller shall also be capable of interfacing to a portable PC for configuring or altering the configuration, setting the address, performing uploads/downloads, entering of custom programs, etc., through a separate, additional RJ14 plug.

The controller shall be capable of operating in either a stand-alone mode or as part of a network with an EMS operator's station and other system elements including Product Integrated Controllers (PICs).

ENVIRONMENT.--

General.--The hardware shall be suitable for the anticipated ambient conditions. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at -40°C to 65°C. Controllers used in conditioned space shall be mounted in dust-proof enclosures, and shall be rated for operation at 0°C to 50°C.

SERVICEABILITY.--

General.--Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal connectors or to a removable molex tye cable.

CONTROLLER INPUTS AND OUTPUTS.--

Hardwired inputs and outputs may tie into the system through Building, Custom Application, or Application Specific Controllers.

All input points and output points shall be protected such that shorting of the point to itself to another point or to ground — will cause no damage to the controller. All input and output points shall be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no damage to the controller. Inputs and outputs shall be arranged on interchangeable modules or circuit boards to allow the replacement of a damaged module or board without replacing the entire controller.

Binary inputs shall allow the monitoring of On/Off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices, and shall be protected against the effects of contact bounce and noise. Binary inputs shall sense “dry contact” closure without external power (other than that provided by the controller) being applied.

Pulse accumulation input objects. This type of object shall conform to all the requirements of binary input objects, and also accept up to 10 pulses per second for pulse accumulation.

Analog inputs shall allow the monitoring of low-voltage (0 to 10 VDC), current (4 to 20 mA), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with — and field-configurable to — commonly available sensing devices.

Binary outputs shall provide for On/Off operation, or a pulsed low- voltage signal for pulse width modulation control. Binary outputs on Building and Custom Application Controllers shall have three-position (On/Off/Auto) override switches and status lights. Outputs shall be selectable for either normally open or normally closed operation.

Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10 VDC or a 4 to 20 mA signal as required to provide proper control of the output device. Analog outputs on Building or Custom Application Controllers shall have status lights and a two-position (AUTO/MANUAL) switch and manually adjustable potentiometer for manual override. Analog outputs shall not exhibit a drift of greater than 0.4% of range per year.

Tri-State Outputs. Provide tri-state outputs (two co-ordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of three-point floating devices shall be limited to zone control and terminal unit control applications (VAV terminal units, duct mounted heating coils, zone dampers, radiation, etc.). Control algorithms shall run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

Input/Output points shall be universal type, i.e., controller input or output may be designated (in software) as either a binary or analog type point with appropriate properties. Application Specific Controllers are exempted from this requirement.

AUXILIARY CONTROL DEVICES.--

Damper selection and sizing.--

Calculate actual duct pressure drops for each duct section containing dampers using latest version of ASHRAE Handbook of Fundamentals.

Contractor to provide dampers as shown on drawings or as scheduled.

Two-position dampers shall be sized as close as possible to duct size, but in no case is damper size to be less than duct area.

Valve selection and sizing.--

Select control valves to meet their intended service without cavitation. Provide cavitation calculations for all modulating butterfly valves over 16°C.

Control valves serving terminal devices may be sized based on flow ranges for each pump system.

Contractor is responsible for obtaining adequate system information necessary for sizing.

Hot and Chill Water Valves.--

Design criteria for sizing modulating valves shall be based on two port, fail open or fail closed, as shown on plans, equal percentage valves unless otherwise specified.

Heating control valves shall be full port ball valve or globe valve and shall be selected for a minimum of 25% of equipment sub-circuit pressure drop, but not more than maximum available pump head allowing minimum 13.7 kPa drop for balance valve.

Terminal reheat control valves shall be ball type and shall be selected for a minimum of 25% of equipment sub-circuit pressure drop, but not more than maximum available pump head allowing minimum 13.8 kPa drop for balance valve.

Cooling control valves may be full port ball, globe or butterfly type and shall be selected for minimum of 10% of equipment sub-circuit pressure drop, but not more than maximum available pump head allowing minimum 13.7 kPa drop for balance valve.

Select control valves based on pressure drop calculations using Cv values at 100% stroke.

Motorized control dampers.--

Motorized control dampers shall be as follows:

Multiple blade dampers shall be parallel or opposed blade types as listed below. Single blade round dampers shall have an elliptical blade.

Modulating outdoor air and exhaust dampers shall be opposed blade type with blade and side seals.

Modulating return air dampers shall be parallel blade type with blade and side seals.

Two-position shut off dampers may be parallel or opposed blade type with blade and side seals.

Damper frames shall be 16 gauge galvanized steel channel or 3 mm extruded aluminum with reinforced corner bracing.

Damper blades shall not exceed 200 mm in width or 1220 mm in length. Blades are to be suitable for medium velocity performance (<610 m/min). Blade thickness shall not be less than 16 gauge.

Damper shaft bearings shall be as recommended by manufacturer for the application, Oilite or better.

All blade edges and top and bottom of the frames shall be provided with replaceable butyl rubber or neoprene seals. Side seals shall be spring-loaded stainless steel. Provide a minimum of one damper actuator per section. Dampers shall have exposed linkages.

Electronic Valve and Damper Actuators.--

Electronic valve and damper actuators shall be as follows Electronic actuators, less than 67,800 mN m. of rated torque, shall have ISO Electronic 9001 quality certification and be UL listed under standard 873, CSA C22.2 No. 24 and have CE certification.

Electronic actuators used on valves or dampers shall be designed to directly couple and mount to a stem, shaft or ISO style-mounting pad. Actuator mounting clamps shall be a V-bolt with a toothed V-clamp creating a cold weld, positive grip effect. Single point, bolt, or single screw actuator type fastening techniques or direct-coupled actuators requiring field assembly of the universal clamp shall not be used.

Actuators shall be fully modulating/proportional, pulse width, floating/tri-state, or two position as required and be factory or field selectable. Actuators shall have visual position indicators and shall operate in sequence with other devices, if required. Optional auxiliary switches shall be available.

Actuators shall have an operating range of -30° to 50°C . Proportional actuators shall accept a 0-10 VDC or 0-20 mA input signal and provide a 2-10 VDC or 4-20 mA (with a load resistor) operating range.

Actuators shall be capable of operating on 24, or 120 VAC, or 24VDC and Class 2 wiring as dictated by the application. Power consumption shall not exceed 5 VA for AC, including 120VAC actuators.

Actuators shall have electronic overload protection or digital rotation sensing circuitry to prevent actuator damage throughout the entire rotation. For power-failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Spring return actuators shall be capable of CW or CCW mounting orientation. Spring return models shall be capable of mounting on shafts up to 27 mm in diameter. Spring return actuators with more than 67,800 mN m. of torque shall have a metal, manual override crank.

Upon loss of control signal, a proportional actuator shall fail open or closed based on the minimum control signal. Upon loss of power, a non-spring return actuator shall maintain the last position.

Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required. Valves and dampers requiring greater torque or higher close off may be assembled with multiple low torque actuators.

Dual mounted actuators using additional anti-rotation strap mechanical linkages, or special factory wiring to function is not acceptable. Actuators in a tandem pair must be standard off the shelf actuators ready for field wiring.

Damper and valve actuators shall not produce more than 62 dB when furnished with a mechanical fail-safe spring. Non-spring return actuators shall conform to a maximum noise rating of 45 dB (A) with power on, or in the running or driving mode.

Direct Coupled Glove Valve Actuator And Adapter Bracket.--

Actuator shall be designed with an integrated adaptor bracket that will direct mount to the valve.

Actuator shall provide a linear force capable of fulfilling the required close-off of the valve. Actuator shall include an automatic valve-coupling device that shall lock securely to the valve stem.

Proportional and spring return actuators shall adapt upon powering the actuator. This adaptation will determine stroke length and enable the actuator to set the minimum and maximum limits of the supplied control signal, thereby utilizing the entire control signal range. Feedback, running time and other parameters shall be automatically adjusted to the effective stroke.

Actuator shall have a manual override equipped with an inter-locking device to protect the actuator from over-torque of the manual override.

Industrial Type Actuators For Butterfly Valves.--

The valve actuator shall consist of a capacitor-type reversible electric motor, gear train, limit switches and terminal block, all contained in a die cast aluminum enclosure.

Enclosure shall be designed to meet NEMA 4 (weatherproof) requirements, or CSA approved for non-hazardous or hazardous locations. Output shaft shall be electroless nickel plated to prevent corrosion. The enclosure shall have an industrial quality coating. Actuator shall have a motor rated for continuous duty.

Actuator shall be suitable for operation in ambient temperature ranging from -30°C to $+65^{\circ}\text{C}$.

The motor shall be fractional horsepower; permanent split capacitor type designed to operate on a 120 VAC, 1 ϕ , 60 Hz supply. A self-resetting thermal switch shall be imbedded in the motor for overload protection.

A 1825mm wiring harness shall be provided for ease in field wiring. Actuator will have a suitable sized NPT entry for external connections.

Reduction gearing shall be designed to withstand the actual motor stall torque.

Gears shall be hardened alloy steel, permanently lubricated. A self-locking gear assembly or a brake shall be supplied. Two adjustable cam actuated end travel limit switches shall be provided to control direction of travel.

Two SPDT auxiliary switches rated at 250 VAC shall be included. Actuator shall be equipped with a hand wheel or shaft for manual override to permit operation of the valve in the event of electrical power failure or system malfunction. Hand wheel, where applicable, must be permanently attached to the actuator.

When in manual operation electrical power to the actuator will be permanently interrupted. The hand wheel will not rotate while the actuator is electrically driven.

Actuator shall have heater and thermostat to minimize condensation within the actuator housing. Modulating units shall include programmable card capable of 0-10 VDC, 2-10 VDC, 4-20 mA, and 1-5 VDC default settings.

Valve actuator(s) shall provide the minimum torque, based on the manufacturers' calculations, required for the rated valve close-off.

Zone valves.--

Zone valves shall be as specified; Zone valves with brass bodies shall be used in terminal unit water applications where sizing or physical limitations prohibit the use of characterized control valves, or in terminal equipment, where water sizing dictates a 2 or 3-way electronic control valve 19 mm or smaller.

Valve shall have threaded union male NPT, compression ends or copper sweat ends.

Zone valve actuators shall have a minimum of 200 kPa close-off rating.

Control valves.--

The valve trim shall utilize a stainless steel ball and stem for water. For water applications, optional chrome plated brass ball and brass stem can be used.

Valve bodies shall be nickel-plated, forged brass with female NPT threads. Bodies shall be rated at 1025 kPa. The maximum allowable pressure differential shall be 1025 kPa for on/off and 345 kPa for modulating service.

The valves shall have provisions for actuator mounting. A non-metallic coupling, constructed of high temperature, continual use material shall provide a direct, mechanical connection between the valve body and actuator. The coupling shall be designed to provide thermal isolation and eliminate lateral and rotational stem forces. Vent hole shall be provided to reduce condensation build-up.

Globe valves.--

Globe valves may be used for chilled or hot water.

Screwed and flanged water valves shall have equal percentage or linear flow characteristics for 2 or 3-way valves, respectively. All stems shall be stainless steel.

Screwed globe valves 13 mm through 50 mm shall have bronze bodies rated at ANSI Class 250. For water up to 240 kPa, trim shall include a brass plug, a spring-loaded TFE packing, and a bronze seat. The maximum differential shall be 240 kPa.

2-way and 3-way flanged globe valves 65 mm to 150 mm shall have cast iron bodies rated for ANSI Class 125. The maximum differential shall be 175 kPa. Trim shall include stainless steel stems, bronze plugs, bronze seats, and a TFE V-ring packing.

Butterfly valves.--

Butterfly valves sizes shall be as specified; Butterfly valves 50 to 300 mm shall be flanged, ferrous-alloy. Flanges shall meet ANSI 125/150 standards. The one-piece body shall feature an extended neck allowing sufficient clearance for flanges and 50 mm of piping insulation. The disc shall be aluminum bronze and provide bi-directional bubble-tight close off in either direction for water. The disc shall be polished and contoured to minimize torque and wear. The valve shall be rated for 1375 kPa.

The disc shall have full 360° concentric seating. A 316 stainless steel taper pin shall provide a positive connection of the disc to a one piece, 416 stainless steel shaft. A phenolic backed, non-collapsing, EPDM seat shall be field replaceable and shall create a positive seal between flange face and valve body. No gaskets shall be required between the valve and flange faces. The shaft shall be supported at three locations by PTFE bushings.

Butterfly valves may be used in all two-position applications, in modulating applications larger than 65 mm, or where the close off rating of other valve styles does not meet the design requirements.

A CV factor of 60° shall be used for sizing all modulating butterfly valves.

High torque industrial valve actuators, >67,800 mN m. of rated torque, may be used where low torque actuators are not suitable.

High torque electronic industrial actuator enclosures shall be designed to meet NEMA 4 (weatherproof) requirements, or have CSA approval for non-hazardous or hazardous locations. An NPT entry for external connections shall be provided.

BINARY TEMPERATURE DEVICES.--

Low-voltage space thermostat shall be 24 V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C to 30°C setpoint range, 1°C maximum differential, and vented ABS plastic cover.

Line-voltage space thermostat shall be bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch type, or equivalent solid-state type, with heat anticipator, UL listed for electrical rating, concealed setpoint adjustment, 13°C to 30°C setpoint range, 1°C maximum differential, and vented ABS plastic cover.

Low-limit thermostats shall be vapor pressure type with an element 6 m minimum length. Element shall respond to the lowest temperature sensed by any 30 cm section. The low-limit thermostat shall be manual reset only.

TEMPERATURE SENSORS.--

Temperature sensors shall be Resistance Temperature Device (RTD) or Thermistor.

Duct sensors shall be rigid or averaging as shown on the plans. Averaging sensors shall be a minimum of 1.5 m in length.

Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.

Space sensors shall be equipped with set point adjustment, override switch, display, and/or communication port as shown.

Provide matched temperature sensors for differential temperature measurement.

HUMIDITY SENSORS.--

Duct and room humidity sensors shall have a sensing range of 20% to 80%.

Duct sensors shall be provided with a sampling chamber.

Outdoor air humidity sensors shall have a sensing range of 20% to 95% RH. They shall be suitable for ambient conditions of -40°C to 75°C .

Humidity sensor's drift shall not exceed 1% of full scale per year.

FLOW SWITCHES.--

Flow-proving switches shall be either paddle or differential pressure type, as shown on the plans.

Paddle type switches (water service only) shall be UL Listed, SPDT snap-acting with pilot duty rating (125 VA minimum), adjustable sensitivity, and NEMA 1 enclosure unless otherwise specified.

Differential pressure type switches (air or water service) shall be UL Listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application, or as specified.

RELAYS.--

Control relays shall be UL Listed plug-in type or hub mount with dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.

Time delay relays shall be UL Listed solid-state, plug-in type, with adjustable time delay. Delay shall be adjustable $\pm 200\%$ (minimum) from set point shown on plans. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.

OVERRIDE TIMERS.--

Override timers shall be digital, 24 or 120 VAC, with adjustable time-out delay, time scrolling, flash option, and beeper option. Timer shall be UL Listed, with contact rating and configuration as required by application. Timer shall be suitable for flush mounting on control panel face, and shall be located on local control panels or where shown on the plans.

CURRENT TRANSMITTERS.--

AC current transmitters shall be self-powered combination split-core current transformer types with built-in rectifier and high-gain servo amplifier with 4 to 20 mA two-wire outputs. Unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A full scale, internal zero and span adjustment, and $\pm 1\%$ full-scale accuracy at 500 ohm maximum burden.

Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA Recognized.

Unit shall be split-core type for clamp-on installation on existing wiring.

CURRENT TRANSFORMERS.--

AC current transformers shall be UL/CSA Recognized and completely encased (except for terminals) in approved plastic material.

Transformers shall be available in various current ratios and shall be selected for $\pm 1\%$ accuracy at 5 A full scale output. Transformers shall be fixed-core or split-core type for installation on new or existing wiring, respectively.

VOLTAGE TRANSMITTERS.--

AC voltage transmitters shall be self-powered single loop (two-wire) type, 4 to 20 mA outputs with zero and span adjustment.

Ranges shall include 100 to 130 VAC, 200 to 250 VAC, 250 to 330 VAC, and 400 to 600 VAC full-scale, adjustable, with $\pm 1\%$ full-scale accuracy with 500 ohm maximum burden.

Transmitters shall be UL/CSA Recognized at 600 VAC rating and meet or exceed ANSI/ISA S50.1 requirements.

VOLTAGE TRANSFORMERS.--

AC voltage transformers shall be UL/CSA Recognized, 600 VAC rated, complete with built-in fuse protection.

Transformers shall be suitable for ambient temperatures of 4 to 55°C and shall provide $\pm 0.5\%$ accuracy at 24 VAC and a 5 VA load.

Windings (except for terminals) shall be completely enclosed with metal or plastic material.

POWER MONITORS.--

Power monitors shall be three-phase type furnished with three-phase disconnect/shorting switch assembly, UL Listed voltage transformers and UL Listed split-core current transformers.

Shall provide a selectable rate pulse output for kWh reading and a 4 to 20 mA output for kW reading. Shall operate with 5 current inputs with a maximum error of $\pm 2\%$ at 1.0 power factor or $\pm 2.5\%$ at 0.5 power factor.

CURRENT SWITCHES.--

Current-operated switches shall be self-powered, solid-state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.

PRESSURE TRANSDUCERS.--

Transducer shall have linear output signal. Zero and span shall be field-adjustable.

Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.

Water pressure transducer shall have stainless steel diaphragm construction, and proof pressure of 1035KPa minimum. Transducer shall be complete with 4 to 20 mA output, required mounting brackets, and block and bleed valves.

Water differential pressure transducer shall have stainless steel diaphragm construction, and proof pressure of 1035 kPa minimum. Over-range limit (differential pressure) and maximum static pressure shall be 2070 kPa. Transducer shall be complete with 4 to 20 mA output, required mounting brackets, and five-valve manifold.

DIFFERENTIAL PRESSURE TYPE SWITCHES.--

DP shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application, or as shown.

LOCAL CONTROL PANELS.--

All indoor control cabinets shall be fully enclosed NEMA 1 construction with hinged door, key-lock latch, and removable sub-panels. A single key shall be common to all field panels and sub-panels.

Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL Listed for 600 volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.

Provide ON/OFF power switch with over-current protection for control power sources to each local panel.

DEMAND CONTROLLED VENTILATION.--

Wall-mounted combination sensors shall contain a space temperature sensor and Carbon Dioxide (CO₂) sensors in a single, decorative housing. The CO₂ sensor shall use single-beam absorption infrared diffusion technology (non-dispersive infrared), and shall have integral programming to perform automatic baseline calibration without user interface. Wall-mounted combination sensors shall include:

Operating conditions: 15 to 32°C, and 0 to 95% RH, non-condensing.

Power supply: 18-30 VAC, 50/60 Hz [18-42 VDC polarity protected].

CO₂ sampling method: diffusion.

CO₂ sensor output: 4 to 20 ma or 0 to 10 Volt signal.

CO₂ measurement range: 0-2,000 PPM.

Sensitivity: ±20 PPM.

Accuracy: ±100 PPM at 15 to 32°C; and 760 mmHg.

CO₂ sensor calibration: single point calibration via push button and LED.

Space temperature sensor: 10K-ohm ±2% at 25°C thermistor with pushbutton override. Combination sensors shall be provided with the manufacturer's recommended Carbon Dioxide calibration kit. The quantity shall be suitable to initially calibrate each sensor provided for the project.

ZONE CONTROLLER.--

Each single-duct zone controller shall be specifically designed to provide demand controlled ventilation (DCV) operation using a proportional-integral (PI) control loop. All DCV application software shall be resident in the zone controller's memory and shall be factory-tested and factory-configured. The zone controller shall be capable of stand-alone operation and shall execute the DCV control functions without being dependent on a network system, additional hardware, or intermediate controllers.

Zone controllers shall be capable of being added to a system network without additional hardware. They shall be designed for connection to other zone controllers and to a common system controller to perform DCV control functions as part of an integral ventilation system.

Zone controllers shall be designed to interface directly with the specified CO₂ sensors.

Zone controllers shall be capable of maintaining a ventilation setpoint through a DCV algorithm in conjunction with system controller to fulfill the requirements of ASHRAE standard, 62-1989 "Ventilation For Acceptable Indoor Air Quality" (including Addendum 62a-1990). The algorithm shall also be capable of modulating the terminal unit heating to maintain the space temperature between the heating and cooling setpoints. For terminal units without supplementary heating, the zone controller DCV algorithm shall have a primary airflow limit to protect the zone from overcooling.

DCV control sequences shall be as specified herein [or as indicated on the drawings].

UNIT CONTROLLERS.--

The unit controller shall be a solid-state microprocessor controller using direct digital control and software specifically designed to provide demand controlled ventilation (DCV) functions. The controller shall be factory-installed and wired within the unit, and shall be furnished complete with all application software to perform DCV functions. The unit controller shall be pre-configured and pre-tested for DCV operation.

The controller shall maintain an adjustable CO2 setpoint by control of the mixed-air damper position. The unit controller shall also have the ability to limit the maximum amount of outdoor air during DCV operation, and modulate heating to maintain a minimum supply air temperature.

The unit controller shall be designed to interface directly with the specified CO2 sensors.

DCV control sequences shall be as specified as indicated on the drawings.

FIRE ALARM INTERFACE PANEL.--

Unit shall be manufactured in a facility having a Quality System that is registered to either ISO 9002 or ISO 9001 Quality Assurance Standard. The unit shall be designed to be easily mounted in a standard NEMA 1 type enclosure without special rails or mounting hardware and as local and national code dictates. The unit controller shall be powered from standard, off-the-shelf, Class II, 24 volt transformers.

The controller shall be listed under UL916-PAZX (Energy Management), UL 864-UDTZ (General Utility Signaling), UL864-UUKL (Smoke Control), VDE, and CSA.

Interface panel shall provide appropriate interface between fire alarm panel and building automation system to form a commercial fire alarm system. The interface panel shall provide all monitoring, control, and indicating functions of the system.

The unit controller shall include a 365-day real-time clock and watchdog timer diagnostic indicator provided by a LED. The watchdog timer shall reset upon power on and be reset table by software thereafter. Should the watchdog timer not be reset table during the timing period, it shall time out and set all outputs to their non-powered state. The LED shall illuminate solidly to indicate this failure.

The controller shall not require a battery. All configuration data, custom programs, etc., will be stored in non-volatile memory. The controller shall provide a minimum of two days data retention for the time clock and consumable data. Systems that require a battery to store data are not acceptable.

WIRING AND RACEWAYS.--

Provide and install low voltage control wiring as required between building automation system equipment/devices and various exhaust fan VFD's, terminal units, thermostats, temperature control panels, interface panels, motorized dampers, fire and smoke dampers, and any other control devices not mentioned herein but are shown on the plans or specified in these special provisions. All low voltage control wiring shall consists of conduit and conductors system and plenum rated cable system. Low voltage conduit and conductors system shall be in accordance with the requirements specified under "Basic Materials and Methods" in Division 16, "Electrical," of these special provisions.

All insulated wire to be copper conductors, UL labeled for 90C minimum service.

COMMUNICATION BUS.--

The Communication bus shall be a three-conductor cable with shield. EIA Standard RS-485 Communication's protocol shall be employed. The communication bus shall comply with FCC Part 15, Subpart J, Class A for bus radiated and conductive noise.

Communication bus shall be capable of having multiple system elements connected. Each Communication bus shall allow for the use of modules as an interface to secondary buses.

Whenever the Communication bus enters or leaves a building, the bus shall be provided with adequate lightning suppression devices.

The Communication bus shall be capable of communicating through a telephone modem to a remote building. This interface shall allow any EMS operator's station, as applicable, to communicate with any other remotely located, compatible, communications bus.

OPERATOR INTERFACE VIA WEB BROWSER.--

General.--The control system shall be as shown and consist of a high-speed, peer-to-peer network of DDC controllers and a stand alone Web Server. The stand alone Web server shall be a compact device capable of routing peer to peer communications of devices on the RS-485 network to either an Ethernet LAN or a telephone line. The Web Server shall be capable of storing all system device definitions within the Web server and shall not require an external system manager, computer, or controller to define or access system control devices. The Web Server will allow users to interface with the network via dynamic color graphics served over the Intranet or Internet via a standard Web Browser. The Web server shall be capable of tabular and graphic displays of mechanical systems, building floor plans, or control devices depicted by point-and-click graphics.

Operator interface.--Web Server shall connect via Ethernet to a LAN or to a Phone Line and be able to serve up controller information to up to four simultaneous operators connected via the Ethernet or telephone with standard Web Browsers.

Hardware.--Furnish one compact Web server router with internal 56k modem and ethernet port for operator computer access. The web server shall have an integrated RS-485 port for connection to the peer to peer controller network. The web server shall not require a permanent keyboard or monitor, however shall have an integrated terminal port for connecting a terminal and keyboard during installation and configuration. The Web server shall allow file transfer of files from another system for use as graphics backgrounds or custom displays.

DATA COLLECTION.--

The Data Collection option shall enable the operator to acquire three categories of historical data and store that data for access by the Energy Management PC.

The three categories of historical data shall be as follows:

1. Consumable Data: Information such as kilowatt-hours, BTUs, gallons per minute, and so on, that are acquired in either analog or digital pulse form.
2. Runtime Data: Information on time and operation of equipment based on equipment status.
3. History Data: Trend log data on status of equipment or values such as an analog sensor.

History data collection shall be initiated from either a specified time function or an event.

Provide enough software capacity to accomplish the required data collection function for the total system as specified. The data collection process shall not require the Energy Management PC to be online. Additional option modules may be added at any time to meet increased system requirements. The operator shall be capable of configuring each additional module.

PART 3.- EXECUTION

EXAMINATION.--

Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

Notify the State Representative in writing of conditions detrimental to the proper and timely completion of the work.

INSTALLATION (GENERAL).--

Install hardware and software in accordance with manufacturer's instructions.

Provide all miscellaneous devices, hardware, software, interconnection installation and configuration required to insure a complete operating system in accordance with the sequences of operation and point schedules.

All low voltage control wiring shall be installed in conduit system. Conduit and conductors system shall be concealed system every where except conduit system may be exposed at places where specifically directed by the Engineer. Minimum conduit size shall be 16 mm trade size conduit. Any required splices shall be made only within an approved junction box or other approved protective device.

Install equipment, piping, and wiring/raceways parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.

All building automation system wiring to be installed in metal raceways conforming to the requirement of Division 16, "Electrical," of these special provisions.

All raceways shall be installed concealed inside office areas and exposed inside attic and other places as directed by the Engineer. Minimum size of the raceways shall 16 mm trade size conduit.

LOCATION AND INSTALLATION OF COMPONENTS.--

Locate and install components for easy accessibility; in general, mount 1525 mm above floor with minimum 915 mm clear access space in front of units. Obtain approval on locations from State's representative prior to installation.

All instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration, moisture and high or low temperatures.

Identify all equipment and panels. Provide permanently mounted tags for all panels.

Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections; sized to suit pipe diameter without restricting flow.

INTERLOCKING AND CONTROL WIRING.--

Provide all interlock and control wiring. All wiring installation shall conform to the requirements in Division 16, "Electrical," elsewhere in these special provisions.

Provide wire and wiring techniques recommended by equipment manufacturers.

Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the State's representative prior to rough in.

Provide auxiliary pilot duty relays on motor starters as required for control function.

Provide power for all control components from nearest electrical control panel or as indicated on the electrical drawings; coordinate with electrical contractor.

All control wiring in the mechanical, electrical, telephone and boiler rooms to be installed in raceways. All other wiring to be installed in a neat and inconspicuous manner per local code requirements.

When a cable enters or exits a building, a surge suppressor must be installed. The surge suppressor shall be installed according to the manufacturer's instructions.

All sensor wiring shall be labeled to indicate the origination and destination of data.

FIELD SERVICES.--

Prepare and start the control system under provisions of this section.

Start-up and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

Provide the capability for off-site monitoring. As a minimum, off-site facility shall be capable of system diagnostics and software download. Owner shall provide phone line for this service for 1 year or as specified.

Provide State's Representative with spare parts list. Identify equipment critical to maintaining the integrity of the operating system.

Provide the Owners Representative an in warranty maintenance proposal.

TRAINING.--

Provide training to the owner in the operation of systems and equipment.
Provide basic operator training for a minimum of 6 people on all functions of the Operator Interface unit.
Provide training, as required, for up to 40 hours as part of this contract.

DEMONSTRATION.--

Provide systems demonstration of each sub-system.
Demonstrate a complete operating system to State's Representative.
Provide certificate stating that control system has been tested and adjusted for proper operation.

15.15 TESTING, ADJUSTING AND BALANCING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of balancing airflow and water flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances, adjusting total HVAC systems to provide indicated quantities, and measuring electrical performance of HVAC equipment in accordance with details shown on the plans and these special provisions.

SUBMITTALS.--

Sample report forms.--Two copies of sample testing, adjusting, and balancing report forms shall be submitted for approval.

Certified testing, adjusting, and balancing reports.--Two copies of final reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent shall be submitted for approval.

Report Forms: Submit 2 sets of sample testing, adjusting, and balancing report forms.

Warranties.--Two copies of the special warranty specified in the "Warranty" Article below shall be submitted for approval.

QUALITY ASSURANCE.--

Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by AABC.

Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification shall include reviewing field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.

Testing, Adjusting, and Balancing Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards."

PART 2.- PRODUCTS

PRE-TEST.--

Examine strainers for clean screens and proper perforations.

Examine 3-way valves for proper installation for their intended function of diverting or mixing fluid flows.

Examine heat-transfer coils for correct piping connections and for clean and straight fins.

Examine open-piping-system pumps to ensure absence of entrained air in the suction piping.

Examine equipment for installation and for properly operating safety interlocks and controls.

Examine automatic temperature system components to verify the following:

Dampers, valves, and other controlled devices operate by the intended controller.

Dampers and valves are in the position indicated by the controller.

Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers variable-air-volume terminals.

Automatic modulating and shutoff valves, including 2-way valves and 3-way mixing valves, are properly connected.

Thermostats are located to avoid adverse effects of sunlight, drafts, and cold walls.

Sensors are located to sense only the intended conditions.

Sequence of operation for control modes is according to the Contract Documents.

Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.

Interlocked systems are operating.

CONSTANT-VOLUME AIR SYSTEMS.--

Measure fan static pressures to determine actual static pressure as follows:

Measure static pressure across each air-handling unit component.

Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.

Adjust fan speed higher or lower than design with the approval of the Architect. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.

Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

Adjust volume dampers for main duct, sub-main ducts, and major branch ducts to design airflows within specified tolerances.

Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.

Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.

VARIABLE-AIR-VOLUME SYSTEMS.—

Similar to constant volume air system with following additions:

Compensating for Diversity: When the total airflow of all terminal units is more than the fan design airflow volume, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the design airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.

Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outside air dampers at minimum, and return and exhaust air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure for the critical terminal unit is not less than the sum of the terminal unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge duct losses.
3. Measure total system airflow. Adjust to within 10 percent of design airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use the terminal unit manufacturers written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.
6. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.
7. Record the final fan performance data.

Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Balance systems similar to constant-volume air systems.
2. Set terminal units and supply fan at full-airflow condition.
3. Adjust inlet dampers of each terminal unit to design airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
4. Readjust fan airflow for final maximum readings.
5. Measure operating static pressure at the sensor that controls the supply fan, if one is installed, and verify operation of the static-pressure controller.

6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that the controller is maintaining it.
7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.
8. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.
9. Measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.

Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set system at maximum design airflow by setting the required number of terminal units at minimum airflow. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.
2. Adjust supply fan to maximum design airflow with the variable-airflow controller set at maximum airflow.
3. Set terminal units being tested at full-airflow condition.
4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to design airflow. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
5. Adjust terminal units for minimum airflow.
6. Measure static pressure at the sensor.
7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.

HYDRONIC SYSTEMS.--

Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

Prepare schematic diagrams of systems' "as-built" piping layouts.

Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check expansion tank liquid level.
3. Check makeup-water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation and set at design flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type, unless several terminal valves are kept open.
6. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
7. Check air vents for a forceful liquid flow exiting from vents when manually operated.

BALANCING HYDRONIC SYSTEMS.--

Determine water flow at pumps. Use the following procedures:

1. Verify impeller size by operating the pump with the discharge valve closed. Verify with the pump manufacturer that this will not damage pump.
2. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on the pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
3. Report flow rates that are not within plus or minus 5 percent of design.
4. Measure flow at all stations and adjust, where necessary, to obtain first balance.
5. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than design flow.

Adjust balancing stations to within specified tolerances of design flow rate as follows:

1. Determine the balancing station with the highest percentage over design flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over design flow and proceeding to the station with the lowest percentage over design flow.
3. Record settings and mark balancing devices.

Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures, including outdoor-air temperature.

Measure the differential-pressure control valve settings existing at the conclusions of balancing.

ADDITIONAL PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS.--

Balance systems with automatic 2- and 3-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

MOTORS.--

Motors, 0.37 kW and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating if high-efficiency motor.
5. Nameplate and measured voltage each phase.
6. Nameplate and measured amperage each phase.
7. Starter thermal-protection-element rating.

Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

BOILERS.--

Measure entering and leaving water temperatures and water flow.

CHILLERS.--

Measure and record the following:

1. Water flow rate in L/s.
2. Water pressure differential in feet of head or kPa.
3. Entering-water temperature in °C.
4. Leaving-water temperature in C.
5. Condenser entering-water temperature in °C.

6. Condenser leaving-water temperature in °C.
7. Condenser water temperature differential in °C.
8. Condenser entering-water pressure in feet of head or kPa.
9. Condenser leaving-water pressure in feet of head or kPa.
10. Condenser water pressure differential in feet of head or kPa.
11. Control settings.
12. Unloader set points.
13. Low-pressure-cutout set point in kPa
14. High-pressure-cutout set point in kPa.
15. Suction pressure in kPa.
16. Suction temperature in °C.
17. Condenser refrigerant pressure in kPa.
18. Condenser refrigerant temperature in °C.
19. Oil pressure in kPa.
20. Oil temperature in °C.
21. Voltage at each connection.
22. Amperage for each phase.
23. The kW input.

REHEAT COILS.--

Measure the following data for each coil:

1. Entering- and leaving-water temperatures.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperatures of entering and leaving air.
6. Wet-bulb temperatures of entering and leaving air for cooling coils designed for less than 3540 L/s.
7. Airflow.
8. Air pressure drop.

PART 3.- EXECUTION

FINAL REPORT.--

General.--A final report typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems including a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer shall be submitted for approval.

The final report shall include the following:

1. Certified field report data
2. Pump curves
3. Fan curves
4. Field test reports prepared by system and equipment installers
5. Other information relative to equipment performance
6. Summary of contents, including the following:
 - a) Design versus final performance
 - b) Description of system operation sequence if it varies from the Contract Documents.
 - c) Nomenclature sheets for each item of equipment.
 - d) Data for terminal units, including manufacturer, type size, and fittings.
 - e) Notes to explain why certain final data in the body of reports vary from design values.

7. Test conditions for fans and pump performance forms, including the following:
 - a) Settings for outside, return, and exhaust air dampers.
 - b) Conditions of filters.
 - c) Cooling coil, wet and dry bulb conditions.
 - d) Face and bypass damper settings at coils.
 - e) Other system operating conditions that affects performance.

8. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present. with single-line diagrams and include the following:
 - a) Water flow rates.
 - b) Pipe and valve sizes and locations.
 - c) Terminal units.
 - d) Balancing stations.

9. Air-Conditioning Unit Test Reports: For air-handling units with coils, include the following:

Unit Data: Include the following:

 - a) Unit identification.
 - b) Location.
 - c) Make and type.
 - d) Model number and unit size.
 - e) Manufacturer's serial number.
 - f) Unit arrangement and class.
 - g) Discharge arrangement.
 - h) Sheave make, size in mm, and bore.
 - i) Sheave dimensions, center-to-center and amount of adjustments in mm.
 - j) Number of belts, make, and size.
 - k) Number of filters, type, and size.

10. Motor Data: Include the following:
 - a) Make and frame type and size.
 - b) Horsepower and rpm.
 - c) Volts, phase, and hertz.
 - d) Full-load amperage and service factor.
 - e) Sheave make, size in mm, and bore.
 - f) Sheave dimensions, center-to-center and amount of adjustments in inches (mm).

11. Test Data: Include design and actual values for the following:
 - a) Total airflow rate in L/s.
 - b) Total system static pressure in Pa.
 - c) Fan rpm.
 - d) Discharge static pressure in Pa.
 - e) Filter static-pressure differential in Pa.

12. Air-Terminal-Device Reports: For terminal units, include the following:
 - a) Total airflow rate in L/s.
 - b) Location and zone.
 - c) Test apparatus used.
 - d) Area served.

- e) Air-terminal-device makes.
- f) Air-terminal-device number from system diagram.
- g) Air-terminal-device type and model number.
- h) Air-terminal-device size.
- i) Air-terminal-device effective area in m².

13. Air-Terminal-Device Reports: For terminal units, include the following:

- a) System and air-handling unit identification.
- b) Location and zone.
- c) Test apparatus used.
- d) Area served.
- e) Air-terminal-device makes.
- f) Air-terminal-device number from system diagram.
- g) Air-terminal-device type and model number.
- h) Air-terminal-device size.
- i) Air-terminal-device effective area in m².

14. System-Coil Reports: For reheat coils of terminal units, include the following:

- a) Serving air-handling unit identification.
- b) Location and zone.
- c) Room served.
- d) Coil make and size.
- e) Flowmeter type.

15. Test Data: Include design and actual values for the following:

- a) Airflow rate in L/s.
- b) Entering-water temperature in °C.
- c) Leaving-water temperature in °C.
- d) Water pressure drop in feet of head or kPa.
- e) Entering-air temperature in °C.
- f) Leaving-air temperature in °C.

DIVISION 16. ELECTRICAL

16.01 ELECTRICAL WORK

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of performing electrical work in accordance with the details shown on the plans and these special provisions.

Electrical work shall include furnishing all labor, materials, equipment and services required to construct and install the complete electrical system shown on the plans, to include but not limited to the motor control centers, power distribution, lighting, the fire alarm system and the IT data cable system as shown on the plans, and the work of installing electrical connections for the thermostats, motors, and controls specified elsewhere in these special provisions.

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of conduits and other facilities and location of equipment is to be governed by structural conditions and other obstructions, and shall be coordinated with the work of other trades. Equipment requiring maintenance and inspection shall be located where it is readily accessible for the performance of such maintenance and inspection.

Related work.--Earthwork, foundations, sheet metal, painting, mechanical and such other work incidental to and necessary for the proper installation and operation of the electrical work shall be done in accordance with the requirements specified for similar work elsewhere in these special provisions.

ELECTRIC POWER FOR INTERIM HVAC

The Contractor has the option of utilizing the existing Caltrans owned, 480-volt, 3-phase, 4-wire, on site electric service power distribution system, from the existing spare, 3-pole circuit breaker for powering the interim HVAC system, with a temporary distribution system with the load limited to 800 Amperes. The Contractor will be responsible for providing and installing, maintaining and removing temporary electrical power distribution equipment and cables and conductors system for powering interim HVAC described in Division 15 "Mechanical" of these special provisions.

CLOSEOUT SUBMITTALS.--

Operation and maintenance manuals: Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material will be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

Manuals shall be submitted for the following equipment:

Variable frequency drive, each size

QUALITY ASSURANCE.--

Codes and standards: All work performed and materials installed shall be in accordance with the CEC and the California Code of Regulations, Title 8, Chapter 4, "Electrical Safety Orders." .

Warranties and guarantees: Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

The Contractor's personnel and foreman involved in removing, installing, and verifying the data communications cabling and equipment shall each have one of A. "Certified Cable Technician" to the standards of the Structured Cabling Association, B. "Technician Level" to the standards of Building Industry Consulting Services International (BICSI), or C. Equivalent certification to the standards International Brotherhood of Electrical Workers (IBEW) / National Electrical Contractors Association (NECA) for installation and verification of mixed copper and fiber optic data communications systems.

SEQUENCING.--

At the Contractor's option, the following may be installed prior to the beginning of the work:

Underground conduit system for providing power to the Main Laboratory Building and other underground conduit system as required.

Underground vaults / pull boxes.

Concrete foundation for underground pull section adjacent to the existing Main Switchboard (MSB) outside.

Main Switchboard (MSB) replacement.--Replacement of existing MSB inside the Basement Chiller Room with new MCC1 shall take place over a 4 day weekend. The Engineer shall be notified in writing at least 10 working days but not more than 20 working days in advance of the date of scheduled shut down of the power to the Main Laboratory Building. The Engineer will approve or disapprove the planned shutdown in writing. The Contractor shall have a legible copy of the shutdown approval on site at all times during the shutdown. If necessary, the Contractor has the option to work around the clock to finish the work described below. The following work must be completed prior to beginning of business day Tuesday following the week of shut down:

- A. Removal of existing MSB inside basement chiller room.
- B. Removal of existing electrical feeder supplying existing MSB.
- C. Removal of existing underground feeder supplying existing MCC.
- D. Removal of existing underground/aboveground feeder system supplying existing chillers.
- E. Removal of other miscellaneous items required for facilitating new installation.
- F. Installation of new MCC1.
- G. Installation of underground pull section outside adjacent to the existing MSB as shown on the plans.
- H. Reconnecting existing Main Laboratory loads as shown on the plans.
- I. Provide and install suitable sized temporary power conductors between existing MCC (inside basement chillers room that supplies existing air handlers and exhaust fans) and new MCC1.

The Contractor shall submit to the Engineer for approval, the proposal for the replacement of the MCC2 and MCC3. The proposal must account for keeping existing air handlers and exhaust fan in running condition.

Prior to Asbestos Abatement.--Contractor may turn power OFF to the area under abatement during the time duration as specified elsewhere in these special provisions.

Electrical panelboards, switchboards, transformers, electrical gutters, junction boxes, electrical fittings, switches, duplex receptacles, and other electrical devices shall be effectively covered to prevent dust, water and moisture entry into them. Telephone and data outlets and other related devices shall be effectively covered to prevent dust, water and moisture entry into them. All electrical equipment shall be protected by wood framing and plywood to prevent physical damage during the asbestos abatement. Dust, water, and physical damage protection coverings/structures for electrical equipment shall be verified prior to asbestos abatement work beginning.

Telephone and data cables can be disconnected from their source of origin if required during asbestos abatement.

Telephone and data switching devices etc. inside telephone/data/IT rooms shall be effectively covered to prevent dust, water and moisture entry into them and incidental physical damage from asbestos abatement operations.

Remove exposed conduit and conductors system and electrical devices that are exposed and are scheduled to be removed during the course of construction as shown on the electrical plans.

A one week advance notice to the Engineer and Caltrans Lab IT personnel is required prior to shutting down any of the 4 IDF's (Intermediate Distribution Frames). Caltrans Lab IT personnel will make arrangements for the orderly shut down of these devices. Contact the Associate Information System Analyst, (currently this is Dave Biggs at (916) 227-7122) at the Caltrans Lab for making arrangement for orderly shut down. The Contractor should allow 4 hours to do the orderly shut down. The Contractor will be notified when the shutdown has been completed.

Any shutdowns that will affect the main IT rooms (rooms 114 and 116) shall be submitted with at least a one week notice. This would include shutting down power Panels 4L, 5L, SA, or CP and any of the 3 air conditioners that supply room 116. If this level of shut down is required the contractor shall allow 4 hours for the main IT "powered core switch" to be de-energized in a controlled manner.

If the Contractor will be shutting down any of the IDF's or the main IT Rooms (room 114 or 116) or disconnecting any communication cables (copper or FO), the Contractor shall have at hand a Cisco Certified Network Associate for consultation and performing other duties as directed by the Engineer.

During Asbestos Abatement.--Remove all conduit and conductors system and lighting systems that are scheduled to be removed during the course of construction as shown on the electrical plans.

Support all other conduit and conductors system and telephone/data cables that is either shown on the plans to remain in place or not shown on the plans and is scheduled to remain in place as required.

After Asbestos Abatement.--Prior to turning power ON, remove all framing and protective coverings, spot check panelboards, switchboards, transformers, electrical gutters, junction boxes, electrical fittings, switches, duplex receptacles, and other electrical devices for water and moisture entry into them as directed by the Engineer.

Upon discovery of the presence of moisture in the electrical system as described, a thorough cleanup of the electrical system shall be done as directed by the Engineer at no additional cost to the State.

If telephone and data system were disconnected, then prior to switching the system ON, Contractor shall recertify all telephone/data cables prior to reconnection.

If any of the 4 IDF's (Intermediate Distribution Frames) required to be shutdown, the Lab IT personnel will make arrangements for the orderly re-energization of these devices. The Contractor should allow 4 hours to do the orderly re-start of an IDF.

If the main IT rooms (rooms 114 and 116) were shut down the contractor shall allow 4 hours for the main IT "powered core switch" to be re-energized in a controlled manner. The Lab IT personnel shall be contacted and make arrangements for the orderly re-start of the IT "powered core switch".

Any cables found to be not functioning correctly should be replaced immediately by the Contractor at his expense.

TEMPORARY POWER.--

During power shut down, equipment at various places as described below shall be kept powered up at all time regardless of the length of the power outage. The temporary power for powering up equipment can be supplied from a standby power source meeting the power requirement of the equipment.

The maximum time of power outage shall not be greater than 20 minutes during connection and disconnection process of the standby power.

A. Room No. 258 (Cement Lab.)

Oven, 208-volt, 1-phase, 5 kW, rated oven with L6-20 plug. The oven is located on the north side of Room No. 258

B. Room No. 286F (Paint Room)

Refrigerator, 120-volt, 1 kW, rated refrigerator with 120-volt, explosion proof type plug. The refrigerator is located on the north wall of the Room No. 286F

C. Room No. 264A (Fog Room)

120-volt power for controls only. Controller has 120-volt rated plug and is located in the NE corner of Room No. 264

D. Room Nos. 114 and 116 (IT Rooms)

IT Room UPS system (total of two UPS) is supplied from Panel CP located in the NW corner of IT room. Panel CP is 120/208-volt, 3-phase, 4-wire, rated panelboard with UPS load not to exceed 15 kW.

E. Room No. 258D (50% Room)

50% room is an environmentally controlled room. This room is supplied with blower and a condenser unit. Blower is located above the room inside attic space and condenser unit is located on the roof. Blower is rated at 120-volt and condenser is rated at 208-volt, 1-phase, and 15 running load amperes. The total combined connected load of this room not to exceed 5 kW.

F. Hazardous Materials Storage Building A thru E

Hazardous material storage building A thru E has a common power source. The power source is rated at 120/208-volt, 3-phase, and 4-wires. The total combined connected load of the hazardous material storage buildings not to exceed 10 kW.

The Contractor shall field verify location of all equipment and associated control/controllers and submit to the Engineer for approval a work plan to power equipment listed above with a standby power during power outage. Engineer will assist the Contractor during walk thru for the purpose of identifying equipment and their locations. The work plan must be approved prior to switch over of the power supply system from a normal source to a standby source.

TESTING.--

After the electrical system installation work has been completed, the electrical system shall be tested in the presence of the Engineer to demonstrate that the electrical system functions properly. The Contractor shall make necessary repairs, replacements, adjustments and retests at his expense.

16.02 BASIC MATERIALS AND METHODS

PART 1.- GENERAL

SUMMARY.--

Scope: This work shall consist of furnishing and installing conduits, conductors, fittings, and wiring devices in accordance with the details shown on the plans and these special provisions.

Conduits, conductors, fittings, and wiring devices shall include those accessories and appurtenances, not mentioned, that are required for the proper installation and operation of the electrical system.

Related work: Roof penetrations shall be flashed and sealed watertight conforming to the requirements specified under "Sheet Metal Flashing" in Division 7, "Thermal and Moisture Protection," of these special provisions.

Where conduits pass through fire rated walls, floor or ceiling assemblies, the penetrations shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping" in Division 7, "Thermal and Moisture Protection," of these special provisions.

SUBMITTALS.--

Product data: A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions for recessed junction and pull boxes, and component layout shall be included where applicable. All control and power conductors on the shop drawings shall be identified with wire numbers.

PART 2.- PRODUCTS

CONDUITS, SURFACE METAL RACEWAY, AND FITTINGS.--

Rigid steel conduit and fittings.--

Rigid steel conduit shall be threaded, full weight rigid steel, hot-dip galvanized inside and outside with steel or malleable iron fittings. Fittings shall be threaded unless otherwise specified or shown on the plans.

Split or three-piece couplings shall be electroplated, malleable cast iron couplings.

Insulated grounding bushings shall be threaded malleable cast iron body with plastic insulated throat and steel, lay-in ground lug with compression screw.

Insulated metallic bushings shall be threaded malleable cast iron body with plastic insulated throat.

Electrical metallic tubing (EMT) and fittings.--

Electrical metallic tubing shall be formed of cold rolled strip steel, electrical resistance welded continuously along the longitudinal seam with zinc coating outside and enamel or lacquer coating inside.

Couplings shall be electroplated, rain and concrete tight, gland compression type, steel body couplings with malleable iron nuts.

Connectors shall be electroplated, rain and concrete tight, gland compression type, steel body connectors with male hub, malleable iron nut and insulated plastic throat.

Flexible metallic conduit and fittings.--

Flexible metallic conduit shall be fabricated in continuous lengths from galvanized steel strip, spirally wound and formed to provide an interlocking design.

Fittings shall be electroplated screw-in type with malleable cast iron body and threaded male hub with insulated throat.

Liquid tight flexible metallic conduit and fittings.--

Liquid tight flexible metallic conduit shall be fabricated in continuous length from galvanized sheet steel, spirally wound and formed to provide an interlocking design with an extruded polyvinyl chloride cover.

Fittings shall be electroplated, malleable cast iron body, with cap nut, grounding ferrule, and connector body with insulated throat.

Rigid non-metallic conduit and fittings.--

Rigid non-metallic conduit shall be Schedule 40, high impact, nonconducting, self-extinguishing polyvinyl chloride (PVC) rigid non-metallic conduit for direct underground burial.

Couplings shall be PVC, socket type or thread on one end and socket type on the other end as required for the particular application.

Terminal adapters for adapting PVC conduit to boxes, threaded fittings, or metallic conduit system shall be PVC adapters with threads on one end and socket type on the other end.

Surface metal raceway.--

Surface metal raceway shall be surface-mounted, rugged steel, low-profile, base and cover furnished as preassembled one piece unit, ivory finished, complete with end plates and fittings with removable covers. Surface metal raceway shall be sized to suit the number and size of cable and conductors to be installed in the raceway.

CABLES AND CONDUCTORS.--

Cables.--

Cables shall be as follows:

CAT 6 Cables.--

Cat 6 cables shall be category 6e rated 500MHZ, 4 pairs, 23 AWG, unshielded twisted pair (UTP), low loss, CMP Rated (plenum rated), extended frequency data cable and shall conform to TIA/EIA 568A Commercial Telecommunications Buildings Standards, Horizontal Cable Section and be part of UL Law Certifications and Follow-up program. Pairs coloring shall be according to EIA/TIA 568 standards.

CAT 6 termination Jack.--

Cat 6 termination jack shall be modular termination device for Category 6 cable and shall snap into CAT 6 face plates and/or CAT 6 termination boxes. Cat 6 termination jack shall allow punch down termination of 4 pairs of 22-24 AWG, UTP cables on the back of the Jack and a male RJ-45 connector on the front. Cat 6 termination jack shall be UL approved, fit 568A or 568B applications and meet or exceed TIA/EIA CAT 6 specification to support 1000 Base-T & Gigabit Ethernet system applications.

CAT 6 face plates.--

CAT 6 face plates shall be constructed to secure 1 thru 4 CAT 6 termination jacks as required for the termination location. Faceplates shall mount to junction boxes. Faceplate shall be Ivory or White in color to match surrounding wall paint.

CAT 6 termination boxes.--

CAT 6 termination boxes shall have space for CAT 6 termination jacks to lock into. Termination boxes shall fit 1, 2 or 4 jacks (as required for the location) so they are accessible from the exterior. Termination boxes shall have means to be secure to the wall (or other surface) in a permanent manner.

CAT 6 48 Port Patch Panel.--

Cat 6 48 Port Patch Panel shall be a rack mountable Category 6 High Bandwidth rated panel prewired to terminate 48 Cat 6 cables on 110 IDC punch downs (in the rear of the panel) and have 48 RJ45 female terminations (on the front). It shall be tested to EIA/TIA Category 6 specifications and be UL approved. There shall be a write on white strip on the front of the panel for labeling.

Conductors.--

Conductors shall be stranded copper wire.

Conductor insulation types unless otherwise shown or specified, shall be as follows:

1. Conductors across hinges of control panel enclosures shall be Type MTW.
2. Conductors shall be type XHHW-2 in wet, underground, and outdoor locations.
3. Conductors shall be type THHN in dry locations.

Wire connections and devices.--

Wire connections and devices shall be pressure or compression type, except that connectors for No. 10 AWG and smaller conductors in dry locations may be preinsulated spring-pressure type.

ELECTRICAL BOXES.--

Outlet, device and junction boxes.--

Unless otherwise shown or specified, boxes shall be galvanized steel boxes with knock-outs and shall be the size and configuration best suited to the application indicated on the plans. Minimum size of outlet, receptacle, switch or junction boxes shall be 100 mm square by 40 mm deep, except that switch boxes for the installation of single switches and outlet boxes for flush-mounted light fixtures shall be 50 mm by 75 mm by 40 mm deep.

Multiple switches shall be installed in standard gang boxes, unless otherwise specified or shown on the plans.

Cast metal boxes shall be cast iron boxes with threaded hubs and shall be of the size and configuration best suited to the application shown on the plans.

Flush-mounted boxes shall have stainless steel covers, one mm thick. Cover screws shall be metal with finish to match cover finish.

Unless otherwise shown or specified, surface-mounted boxes shall have galvanized steel covers with metal screws.

Weatherproof junction boxes shall have cast iron covers with gaskets.

Weatherproof switch and receptacle boxes shall have cast iron gasketed covers with gasketed hinged flaps to cover switches and receptacles.

Sectional device plates will not be permitted.

Underground pull boxes.--

Pull boxes shall be high density reinforced concrete box with ultraviolet inhibitor polyethylene etched face anchored in concrete and fiberglass cover with hold down bolts. The polyethylene and fiberglass material shall be fire resistant and show no appreciable change in physical properties with exposure to the weather. No. 5 pull box shall be Brooks Products, No. 5; Christy Concrete Products, N30; or equal. No. 6 pull box shall be Brooks Products No. 6; Christy Concrete Products, N36; or equal.

Traffic rated pull boxes shall be high density reinforced concrete box with steel cover with hold down bolts and bonding strap. Pull box and cover shall be designed for H20 loading. No. 5 pull box shall have inside dimensions of 335 mm by 610 mm and No. 6 pull box shall have inside dimensions of 432 mm by 762 mm.

Electrical vault shall be of high density reinforced concrete box with traffic rated steel cover with hold down bolts. Electrical vault dimensions shall be as shown on the plans.

RECEPTACLES AND SWITCHES.--

Ground fault circuit interrupter receptacles, (GFCI).--

Ground fault circuit interrupter receptacles shall be NEMA Type 5-20R, feed-through type, ivory color, 3-wire, 20-ampere, 125-volt AC, grounding type, specification grade, duplex receptacle with ground fault interruption. Receptacle shall detect and trip at current leakage of 5 milliamperes and shall have front mounted test and reset buttons.

Duplex receptacles.--

Duplex receptacles shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, specification grade receptacle suitable for wiring with stranded conductors.

Snap switches.--

Snap switches shall be 20-ampere, 120/277-volt AC, quiet type, specification grade, ivory color switch with silver cadmium alloy contacts. Switch shall be suitable for wiring with stranded conductors.

Occupancy sensor wall switches (Single level).--

Occupancy sensor wall switches (Single level), shall be wall-mounted, passive infrared (PIR) sensor switch with adjustable photocell override and time delay. Switch shall be rated at 800 W (minimum) incandescent or 1200 VA (minimum) fluorescent at 120 volts and operate on 120/277-volt AC. The switch shall be capable of manual-on/automatic off mode. The sensor switch shall cover a minimum of 80 square meter of floor area, be suitable for installation in a single gang box, and shall have a field of view of not less than 180 degrees. The time delay off setting shall be adjustable from 30 seconds to 30 minutes, initially set at 10 minutes. Light level adjustment shall be adjustable from 30 lux to 2000 lux, initially set at 800 lux.

Occupancy sensor wall switch (Bi-level).--

Occupancy sensor wall switch (bi-level), shall be wall-mounted, passive infrared dual relay sensor switch with adjustable photocell override and time delay. Primary relay shall be rated at 800 W (minimum) incandescent or 1200 VA (minimum) fluorescent at 120 volts. Secondary relay shall be rated at 800 W (minimum) incandescent or 800 VA (minimum) fluorescent at 120 V. Switch shall operate on 120/277-volt AC. The relays in the sensor shall be capable of simultaneously controlling 2 different lighting loads or circuits. The second relay shall be independent allowing for two circuit control. The unit shall have dual manual override switches that can be used to toggle manual-on/automatic off mode for each lighting load. Sensor shall have audible alert to indicate impending light shut off. The sensor switch shall cover a minimum of 90 square meter of floor area, be suitable for installation in a single gang box, and shall have a field of view of not less than 180 degrees. The time delay off setting shall be adjustable from 30 seconds to 30 minutes, initially set at 10 minutes. Light level adjustment shall be adjustable from 30 lux to 2000 lux, initially set at 800 lux.

Occupancy sensor ceiling-mounted switches.--

Occupancy sensor ceiling mounted switches shall be a low voltage, dual technology, passive infrared (PIR) sensor switch. Switch shall have an adjustable photocell override or built-in light level sensor and time delay. Switch shall operate on 24-volt, DC, and shall be provided with a power pack unit. The sensor switch shall cover a minimum of 110 square meter of floor area. Switch shall have a field of view of not less than 360 degrees, conical pattern. The time delay off setting shall be adjustable from 30 seconds to 30 minutes, initially set at 10 minutes. Light level adjustment shall be adjustable from 30 lux to 2000 lux, initially set at 800 lux. The sensor shall have LED indicator that remains active at all times in order to verify detection within the area to be controlled.

Three-way toggle switches.--

Three-way toggle switches shall be 20-ampere, 120/277-volt AC, quiet type, specification grade, ivory color switch with silver cadmium alloy contacts. Switch shall be suitable for wiring with stranded conductors.

Four-way toggle switches.--

Four-way switches shall be 20-ampere, 120/277-volt AC, quiet type, specification grade, ivory color switch with silver cadmium alloy contacts. Switch shall be suitable for wiring with stranded conductors.

MISCELLANEOUS MATERIALS.--**Warning Tape.--**

Warning tape shall be 100 mm wide and contain the printed warning "CAUTION ELECTRICAL CONDUIT" in bold 19 mm black letters at 760 mm intervals on bright orange or yellow background. The printed warning shall be non-erasable when submerged under water and resistant to insects, acids, alkali, and other corrosive elements in the soil. The tape shall have a tensile strength of not less than 690 N per 100 mm wide strip and shall have a minimum elongation of 700 percent before breaking.

Pull ropes.--

Pull ropes shall be nylon or polypropylene with a minimum tensile strength of 2200 N.

Watertight conduit plugs.--

Watertight conduit plugs shall be a hollow or solid stem expansion plugs complete with inner and outer white polypropylene compression plates and red thermoplastic rubber seal. Seal material shall be non-stick type rubber resistant to oils, salt, and alkaline substances normally available at the construction sites.

Anchorage devices.--

Anchorage devices shall be corrosion resistant, toggle bolts, wood screws, bolts, machine screws, studs, expansion shields, and expansion anchors and inserts.

Electrical supporting devices.--

Electrical supporting devices shall be one hole conduit clamps with clamp backs, hot-dipped galvanized, malleable cast iron.

Construction channel shall be 41 mm x 41 mm, 2.66 mm (12-gage) galvanized steel channel with 13 mm diameter bolt holes, 40 mm on center in the base of the channel.

Ground rod(s).--

Ground rod(s) shall be a 19 mm (minimum) galvanized or copper clad steel rod, 3 meters long.

Telephone outlet boxes.--

Telephone outlet boxes shall be 102 mm square boxes and plates with modular type telephone outlet. Boxes on stud walls shall have plaster ring.

Plates for flush mounting outlets in finished room shall be Type 430 stainless steel, one mm thick with satin finish.

PART 3.- EXECUTION**INSTALLATION.--**

Conduit, general: Rigid steel conduit shall be used unless otherwise shown on the plans or specified in these special provisions.

Electrical metallic tubing may be used in furred spaces and for exposed work indoors above the switch height.

Unless otherwise specified or shown on the plans, flexible metal conduit shall be used to connect suspended lighting fixtures, motors, HVAC equipment, and other equipment subject to vibration in dry locations.

Unless otherwise specified or shown on the plans, liquid-tight flexible metal conduit shall be used to connect motors, HVAC equipment, and other equipment subject to vibration in wet locations.

Rigid non-metallic conduit shall be used at the locations shown on the plans for direct underground burial 762 mm below grade. All risers and elbows through building floors shall be rigid steel.

Conduit installation: Conduit trade sizes are shown on the plans. No deviation from the conduit size shown on the plans will be permitted without written permission from the Engineer.

All conduit penetrations thru firewalls shall be made "Fire and Smoke Tight" by utilizing approved "Fire and Smoke Stop" fittings in accordance with the manufacturers recommendations.

Conduit shall be concealed unless otherwise shown on the plans.

Conduits shall be tightly covered and well protected during construction using metallic bushings and bushing "pennies" to seal open ends.

Rigid non-metallic conduit bends of 30 degrees or greater shall be factory-made long radius sweeps. Bends less than 30 degrees shall be made using an approved heat box.

A pull rope shall be installed in all empty conduits. At least one meter of pull rope shall be doubled back into the conduit at each termination.

Locations of conduit runs shall be planned in advance of the installation and coordinated with the ductwork, plumbing, ceiling and wall construction in the same areas and shall not unnecessarily cross other conduits or pipe, nor prevent removal of ceiling tiles or panels, nor block access to mechanical or electrical equipment.

Where practical, conduits shall be installed in groups in parallel, vertical or horizontal runs and at elevations that avoid unnecessary offsets.

Exposed conduit shall be installed parallel and at right angles to the building lines.

Conduits shall not be placed closer than 300 mm from a parallel hot water or steam pipe or 75 mm from such lines crossing perpendicular to the runs.

All raceway systems shall be secured to the building structures using specified fasteners, clamps and hangers.

All metal conduits, metal conduit risers, and metal conduit elbows in contact with soil or concrete shall be wrapped with a double layer of 0.5 mm thick pipe wrapping tape. Each individual layer shall be overlapped a minimum of 50%.

Single conduit runs shall be supported by using one hole pipe clamps. Where run horizontally on walls in damp or wet locations, conduit shall be installed with "clamp backs" to space conduit off the surface.

Multiple conduit runs shall be supported with construction channel secured to the building structure. Conduits shall be fastened to construction channel with channel compatible pipe clamps.

Raceways of different types shall be joined using approved couplings or transition fittings.

Expansion couplings shall be installed where conduit crosses a building separation or expansion joint.

All floor and wall penetrations shall be sealed water-tight.

Existing underground conduit to be incorporated into a new system shall be cleaned with a mandrel or cylindrical wire brush and blown out with compressed air.

Conduit terminations: Rigid steel conduits shall be securely fastened to cabinets, boxes and gutters using 2 locknuts and specified insulating metallic bushing. Electrical metallic tubing shall be securely fastened to cabinets, boxes and gutters using specified connectors. Conduit terminations at exposed weatherproof enclosures and cast outlet boxes shall be made watertight using specified hubs.

Grounding bushings with bonding jumpers shall be installed on all type of conduits terminating at concentric knockouts and on all conduits containing service conductors, grounding electrode conductor, and conductors feeding separate buildings.

Rigid non-metallic conduits shall be securely fastened to the non-metallic boxes and lighting fixtures using specified connectors.

Rigid non-metallic conduits shall be terminated inside the underground pull boxes with an approved conduit bushings or fittings. All conduits shall enter the pull box at an angle of 45 degrees or more.

All future conduits terminated in underground pull boxes or exposed indoor and outdoor shall be provided with watertight conduit plugs.

Warning Tape: Warning tape shall be placed over each conduit in a trench. Each warning tape shall be centered over the conduit and shall be placed over the 150 mm layer of sand covering the conduit as described elsewhere in these special provisions.

Conductor and cable installation: Conductors shall not be installed in conduit until all work of any nature that may cause injury is completed. Care shall be taken in pulling conductors that insulation is not damaged. An approved non-petroleum base and insulating type pulling compound shall be used as needed.

All cables shall be installed and tested in accordance with manufacturer's recommendations and as specified the following:

Cat 6 cables shall be installed in a continuous length without splices. Cat 6 cables shall have a 2 meters of slack in the ceiling space near the start and end termination points for future use. After Cat 6 cables and associated termination devices are installed they shall be certified to Cat 6 ratings. All existing Cat 5 and Cat 6 cables in the Administration portion of the Translab building shall be recertified to the cable ratings once modifications are complete in that portion of the building. Cat 6 cables installed in the plenum space shall be supported to prevent damage.

Fiber optic cables and IT cables that are damaged during construction shall be replaced in one continuous length without splices. All cables replaced shall be terminated as they were before and recertified to the cable rating.

Cat 6 termination jacks, and associated equipment shall be installed on Cat 6 cable by qualified installers. Cat 6 termination jacks shall be permanently labeled for the user location. The on site IT engineer will provide the user location numbers to the contractor. Any additional hardware required for installing and terminating Cat 6 cables shall be provided and installed by the contractor. Submittals for Cat 6 cables and termination hardware shall all be submitted together for approval.

Splices and joints shall be insulated with insulation equivalent to that of the conductor.

Provide 155 mm of slack at each outlet and device connection. If the outlet or device is not at the end of a run of wire, connection shall be made with correctly colored pigtails tapped to the runs with splices as specified herein.

Branch circuit conductors in panelboards and load centers shall be neatly trained along a path from the breaker terminals to their exit point. The conductors shall have ample length to transverse the path without strain, but shall not be so long as to require coiling, doubling back, or cramming. The path shall transverse the panelboard gutter spaces without entering a gutter containing service conductors and, unless otherwise shown on the plans, without entering the gutter space of any panelboard feeder.

All pressure type connectors and lugs shall be retightened after the initial set.

Splices in underground pull boxes and similar locations shall be made watertight.

Junction boxes in furred or accessible ceiling spaces shall be identified with felt-tip pen denoting the circuits contained in the box.

Conductor identification: The neutral and equipment grounding conductors shall be identified as follows:

Neutral conductor shall have a white or natural gray insulation except that conductors No. 4 and larger may be identified by distinctive white marker such as paint or white tape at each termination.

Equipment grounding conductor shall be bare or insulated. If insulated, equipment grounding conductors shall have green or green with one or more yellow stripes insulation over its entire length except that conductors No. 4 and larger may be permanently identified by distinctive green markers such as paint or green tape over its entire exposed insulation.

Ungrounded feeder and branch circuit conductors shall be color coded by continuously colored insulation, except conductors No. 6 AWG or larger may be color coded by colored tape at each connection and where accessible. Ungrounded conductor color coding shall be as follows:

SYSTEM	COLOR CODE
120/208V-Three phase	Black, red, blue
277/480V-Three phase	Brown, orange, yellow

Once an insulated circuit conductor, including grounded and ungrounded conductors, is identified with a specific color code, that color code shall be used for the entire length of the circuit.

Where more than one branch circuit enters or leaves a conduit, panel, gutter, or junction box, each conductor shall be identified by its panelboard and circuit number. All control conductors including control conductors of manufacturer supplied and field wired control devices shall be identified at each termination with the wire numbers shown on the plans, approved shop drawings, and as directed by the Engineer where deemed necessary. Identification shall be made with one of the following:

1. Adhesive backed paper or cloth wrap-around markers with clear, heat shrinkable tubing sealed over either type of marker.
2. Pre-printed, white, heat-shrinkable tubing.

Each terminal block shall have a molded marking strip attached with screws. The identifying numbers of the terminating conductors, as shown on the plans or on the submittal drawings, shall be engraved in the marking strip.

Outlet, device and junction box installation: Where exposed threaded steel conduits are connected to an outlet, device, or junction box below switch height, the box shall be a cast metal box. Unless otherwise shown on the plans or specified in these special provisions, all other boxes shall be sheet steel boxes. Weatherproof outlet, device and junction boxes shall have cast metal covers with gaskets. Unless otherwise shown on the plans or specified in these special provisions, all other boxes shall have standard galvanized covers.

All boxes shall finish flush with building walls, ceiling and floors except where exposed work is called for.

Raised device covers (plaster rings) shall be installed on all boxes concealed in concrete, masonry or stud walls.

No unused openings shall be left in any box. Knockout seals shall be installed as required to close openings.

Outlet, device, and junction boxes shall be installed at the locations and elevations shown on the plans or specified herein. Adjustments to locations may be made as required by structural conditions and to suit coordination requirements of other trades.

Boxes in stud walls and partitions shall not be mounted back to back. Through-wall boxes shall not be used.

Boxes installed in metal stud walls shall be equipped with brackets designed for attaching directly to the studs or shall be mounted on heavy gauge galvanized steel, snap-in box supports.

Fixture outlet boxes installed in suspended ceilings of gypsum board or lath and plaster construction shall be mounted on 1.52 mm (16-gage) metal channel bars attached to main ceiling runners.

Fixture outlet boxes for pendant-mounted fixtures installed in suspended ceilings supporting acoustical tiles or panels shall be supported directly from the structures above.

Underground pull box installation: Electrical pull box covers or lids shall be marked "ELECTRICAL." Telephone service pull box covers or lids shall have plain, unmarked covers.

The bottom of pull boxes and electrical vaults shall be bedded in 155 mm of clean, crushed rock or gravel and shall be grouted with 40 mm thick grout prior to installation of conductors. Grout shall be sloped to a 25 mm PVC pipe drain hole. Conduit shall be sealed in place with grout.

Top of pull boxes and electrical vaults shall be flush with surrounding grade or top of curb. In unpaved areas where pull box or electrical vaults are not immediately adjacent to and protected by a concrete foundation, pole or other protective construction, the top of pull box shall be set at plus 30 mm above surrounding grade. Pull boxes and electrical vaults shown on the plans in the vicinity of curbs shall be placed adjacent to the back of curb. Pull boxes and electrical vaults shown on the plans adjacent to lighting standards shall be placed on the side of foundation facing away from traffic.

Ground rod(s) installation: The ground rod(s) shall be driven vertically until the top is 155 mm above the surrounding surface. When vertical penetration of the ground rod cannot be obtained, an equivalent horizontal grounding system, approved by the Engineer, shall be installed.

Anchorage: Hangers, brackets, conduit straps, supports, and electrical equipment shall be rigidly and securely fastened to surfaces by means of toggle bolts on hollow masonry; expansion shields and machine screws, or expansion anchors and studs or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood or lag screws on wood construction.

Anchorage devices shall be installed in accordance with the anchorage manufacturer's recommendations.

Mounting heights: Electrical system components shall be mounted at the following mounting heights, unless otherwise shown on the plans. The mounting height dimensions shall be measured above the finished floor to the bottom of the device or component.

Thermostats	1.1 m, office areas 1.25 m, hallways
Wall switches	1.0 m
Convenience outlets	510 mm, office areas 1.25 m, all other areas
Telephone and radio outlets	510 mm

DISPOSING OF ELECTRICAL EQUIPMENT

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of removing and disposing of ballasts and fluorescent lamps which are designated on the plans or specified in these special provisions to be removed and disposed of.

QUALITY ASSURANCE.--

Ballasts and fluorescent lamps shall be disposed of in conformance with California Department of Health Services Regulations set forth in Title 22, Division 4.5, Chapter 11, Article 4.1 and Article 5 , of the California Code of Regulations.

Ballasts that contain polychlorinated biphenyl (PCB) are designated as extremely hazardous wastes and fluorescent tubing are designated as hazardous wastes under Title 22, Division 4.5 Chapter 42, of the California Code of Regulations.

The following electrical materials on the project are presumed to contain polychlorinated biphenyl (PCB):

- A. Fluorescent light ballasts

PART 2.- PRODUCTS (Not applicable.)

PART 3.- EXECUTION

DISPOSAL.--

When 25 or more fluorescent lamps, in combination, are to be disposed of, the lamps shall be treated as recyclable hazardous waste and shall be recycled within the State of California in conformance with Title 22, Division 4.5 Chapter 16 of the California Code of Regulations by a currently certified recycler:

The Engineer shall be furnished with a statement noting which certified recycler is proposed for utilization, together with a copy of the recycler's interim status document or a copy of the variance letter from the Department of Health Services. The statement shall be furnished within 15 calendar days after the contract has been approved by the Attorney General.

16.03 ELECTRICAL EQUIPMENT

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing motor control centers, variable frequency drives, active harmonic control units, panelboards, circuit breaker type combination starters, unit starters, disconnect switches, and related accessories in accordance with the details shown on the plans and these special provisions.

Related work.--Anchorage devices shall be as specified under "Basic Materials and Methods" elsewhere in this Division 16.

SUBMITTALS.--

Product data.--A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions, and component layout shall be included where applicable. All control and power conductors on the shop drawings shall be identified with wire numbers.

PART 2.- PRODUCTS

All variable frequency drive units (VFD), whether equipment mounted type or stand alone type, regardless of whether they are specified under Division 15. "MECHANICAL" or Division 16. "ELECTRICAL" of these special provisions shall be of the same manufacturer. No exceptions will be allowed.

Motor Control Centers (MCC).--

Motor Control Center No. 1 thru No. 3 shall comply with the following requirements:

Each motor control center (MCC) shall consist of enclosed vertical sections joined together to form a rigid, free-standing assembly. The construction of the MCC shall meet the requirements set forth by Underwriters' Laboratories UL 845 and NEMA ICS-2-322 and be UL listed. The MCC shall be constructed in accordance with NEMA standards for Type 1 gasketed enclosure.

The MCC shall be suitable for operation with 480-volt, 3-phase 4-wire plus ground, and 60 Hz electrical system. MCC shall have a minimum fault interrupting capacity of 35,000 amperes (symmetrical) at 480-volts, AC.

MCC1 thru MCC3 shall be manufactured in a manner so that the new material fits through existing building openings.

Vertical sections shall support the vertical buses, feeder circuit breakers, combination starter units, variable frequency drive units, covers, and doors, and shall be designed to allow for easy rearrangement of units. Vertical sections shall have structural supporting members formed of minimum 2.66 mm thick hot rolled steel. Each section shall be maximum 2286 mm high and shall have 4.55 mm thick steel, 76 mm high removable lifting angle, two 38 mm high base channels, and enclosure seismic zone 3&4 end braces. Base channels shall be provided with holes to permit bolting the MCC to the floor.

Vertical sections shall be designed to accommodate plug-on units in front-of-board construction. Vertical sections housing plug-on units shall be 508 mm wide and shall be 508 mm deep, control section shall be 762 mm wide and shall be 508 mm deep. Removable blank plates shall cover all unused unit-mounting spaces. Blank plates shall be flanged on all four sides and shall be mounted with captive screws.

Vertical sections shall be mounted with both horizontal and vertical wire-ways. Sufficient clearances shall be provided in the horizontal wire-way so that no restriction is encountered in running wires from the vertical to horizontal wire-way.

Horizontal wire-ways shall be provided in the top and bottom of each vertical section and shall be arranged to provide full length of continuity throughout the entire assembly. The top horizontal wire-way shall have a cross sectional area of not less than 12 903 square mm with openings between sections of not less than 7 420 square mm. The bottom horizontal wire-way shall extend through the length and depth of the vertical sections and shall also be provided with an opening of not less than 7 420 square mm to allow for full length continuity throughout the entire assembly. The bottom horizontal wire-way shall have a cross sectional area of not less than 5 968 square mm. Covers for all wire-ways shall be equipped with captive screws.

A vertical wire trough shall be located on the right hand side of each vertical section and shall extend from the top horizontal wire-way to the bottom of the available unit mounting space. Each vertical wire trough shall have a cross sectional area of not less than 12258 square mm. A separately hinged door having captive type screws shall cover the vertical wire trough to provide easy access to control wiring without disturbing control units.

Reusable wire ties shall be furnished in each vertical wire trough for the purpose of grouping and securely holding wires in place. All wire-ways shall be isolated from the bus bars.

Main three-conductor horizontal bus and power terminal block for connection shall be provided. Horizontal bus bars shall be rated 1600 A continuous and be mounted edgewise and supported by insulated bus supports of high strength glass reinforced alkyl material.

For distribution of power from the main horizontal bus to each unit compartment, a three-phase vertical bus shall be provided. The rating of the vertical buses shall be minimum 1200 amperes continuous current rating and shall be in accordance with UL, ANSI, and NEMA standards.

Each unit shall have a door securely mounted with concealed type hinges that allow the door to swing open a minimum of 112 degrees. Doors shall be fastened to the structure so that they may remain in place when a unit is withdrawn and may be closed to cover the unit space when the unit has been temporarily removed. Doors shall be held closed with captive screws that engage self-aligning cage nuts. Each starter unit door shall house an external low-profile overload reset button for resetting the overload relay.

Each plug-on unit shall be supported and guided by tilt and lift-out removable pan.

An external operator handle shall be supplied for each switch or circuit breaker. The operator handle shall be color coded to display red in the "ON" position and black in the "OFF" position. The operator handle shall have a conventional up-down motion and shall be designed so that the down position indicates the unit is "OFF". For safety it shall be possible to lock this handle in the "OFF" position with up to three padlocks. The operator handle shall be interlocked with the unit door to prevent switching to the "ON" position while the unit door is open. A defeater mechanism shall be provided for the purpose of defeating this interlock.

A schematic diagram of the control system fused in between transparent protective cover shall be provided with the MCC.

All three MCC's wiring shall be NEMA Class II, Type B, wiring.

MCC No. 1 shall consist of minimum of nine vertical sections and two end seismic braces as shown on the plans. The following equipment shall be mounted inside the MCC No. 1:

Main circuit breaker and all feeder circuit breakers shall be suitable for 600 volts and shall have trip rating as shown on the plans. The interrupting capacity of all circuit breakers shall be 35,000-amperes (symmetrical) at 480-volts, AC.

Starter for EF-3 shall be 480-volt rated, circuit breaker type combination starter with sizes and rating as shown on the plans and shall have 2 normally open and 2 normally closed auxiliary contacts.

Active harmonic control (AHCU) unit shall be rated for 100-ampere, 480-volts, 3-phase, and 4-wire plus ground. Active harmonic control unit shall incorporate state-of-the-art solid state design and shall be designed to reduce harmonic correction down to 5% of total demand distortion (TDD) and less than 5% of total harmonic voltage distortion (THVD) at the point of connection as defined by ANSI IEEE standard 519-1992. Active harmonic control unit shall be designed to have surge withstand capability per ANSI IEEE standard C62.41-1991 without damage. A suitable sized circuit breaker shall be provided and installed to act as a main disconnect and entire assembly shall be installed inside MCC section as shown on the plans. Active harmonic control unit shall perform independent of the impedance of the power source such as back up generator or UPS and shall be able to perform in an ambient temperature of 40 degree centigrade. The AHCU shall be provided with digital interface module that contains alphanumeric display consisting of at least 2 lines with minimum of 20 characters each line. Digital interface module shall have RUN, STOP, SETUP, ENTER, and UP/DOWN scroll buttons for manual functions and for data entry. The display shall provide operating data such as AC line voltages, total RMS load currents, harmonic current of load, reactive current of load, and output harmonic and reactive current of power correction system while functioning. All fault conditions shall be displayed as they occur and diagnostic information shall clearly indicate the nature of the fault. A green pilot shall be provided to indicate that the unit is running.

MCC No. 2 shall consist of minimum of nine vertical sections and two end seismic braces as shown on the plans. The following equipment shall be mounted inside MCC No. 2 as shown on the plans:

All feeder circuit breakers shall be suitable for 600 volts and shall have trip rating as shown on the plans. The interrupting capacity of all circuit breakers shall be 35,000-amperes (symmetrical) at 480-volts, AC.

Starters for condenser water pumps (CWP-1, CWP-2), chilled water return pumps (CHWR-1 and CHWR-2), shall be 480-volt rated, circuit breaker type combination starters with sizes and ratings as shown on the plans. Starter shall be provided with external disconnect handle, unit-mounted hand-off-auto selector switch and a run pilot light with 120-volt rated, red LED lamp. Coil voltage of the combination starters shall be as determined by the control voltage of the building BAS system specified elsewhere in the mechanical section of these special provisions. All starters shall have 2 normally open and 2 normally closed auxiliary contacts.

Transformer for Panel CP shall be open, dry type, mounted inside MCC as shown on the plans, 3-phase, 480-volt primary, 120/208-volt secondary, 15-KVA transformer.

Transformer shall have two 2 1/2 percent full capacity taps above and four 2 1/2 percent full capacity taps below normal primary voltage.

Panelboard CP shall be mounted inside the MCC as shown on the plans, factory assembled, 3-phase, 4-wire, 120/208-volt, AC panelboard with 50-ampere main circuit breaker, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown on the plans.

Active harmonic control unit (AHCU) shall be 50 amperes rated unit complying with all the requirements specified under MCC No. 1.

Variable frequency drive units for chilled water supply pumps (CHWS1 thru CHWS4) and for cooling tower shall be rated for 480-volt input and output and suitable for the motor kilowatt output as shown on the plans. The drive shall incorporate state-of-the-art solid-state circuitry, motor circuit protector type circuit breaker as main disconnect, drive bypass configuration, three contactors (input, output, and bypass) design, motor overload relay, keypad for performing different functions, hand-off-auto selector switch, and a drive bypass button. The keypad shall be menu structured, alphanumeric keypad with four-line backlit display. The keypad must be capable of copying drive parameters as backup or for transferring between drives. A software package that is built into the drive shall ensure quick and easy start-up. The drive unit shall be capable of communicating all desired function such as status of drive, start-stop, and speed signal with and functioning directly under the command of building BAS system as specified under mechanical of these special provisions. The drive unit shall have withstand rating of 65,000 amperes symmetrical at 480 volts and shall be designed and tested per UL standard UL508C. The drive unit shall be installed inside MCC as shown on the plans. The easy-to-use "drive" and "load" software and laptop personal computer shall be provided as part of the package for uploading system application and for commissioning of the system in order to download from the drive, change them, and save them in a file or upload them back to the drive, print the parameters on paper or to a file, set references, start and stop the motor, monitor signals on a graphical display, and to monitor actual values.

MCC No. 3 shall consist of minimum of six vertical sections and two end seismic braces as shown on the plans. The following equipment shall be mounted inside MCC No. 3 as shown on the plans:

All feeder circuit breakers shall be rated for 600 volt and shall have trip rating as shown on the plans. The interrupting capacity of all circuit breakers shall be 35,000-amperes (symmetrical) at 480 volts, AC.

Starters for circulating pumps and boiler pumps (CP1, CP2, and BP1 thru BP4) shall be 480-volt rated, circuit breaker type combination starters with sizes and rating as shown on the plans. Starter shall be provided with external disconnect handle, unit-mounted hand-off-auto selector switch and a run pilot light with 120-volt rated, red LED lamp. Coil voltage of the combination starters shall be as determined by the control voltage of the building BAS system specified elsewhere in the mechanical section of these special provisions. All starters shall have 2 normally open and 2 normally closed auxiliary contacts.

Transformer for Panel BP shall be open, dry type, mounted inside MCC as shown, 3-phase, 480-volt primary, 120/208-volt secondary, 15-KVA transformer. Transformer shall have two 2 1/2 percent full capacity taps above and four 2 1/2 percent full capacity taps below normal primary voltage.

Panelboard BP shall be mounted inside the MCC as shown, factory assembled, 3-phase, 4-wire, 120/208-volt, AC panelboard with 50-ampere main circuit breaker, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown on the plans.

Active harmonic control unit (AHCU) shall be 50 amperes rated unit complying with all the requirements specified under MCC No. 1.

Variable frequency drive units for hot water pumps (HWP1 thru HWP4) shall be rated for 480 volts input and output and suitable for the motor kilowatt output as shown on the plans. The drive shall incorporate state-of-the-art solid-state circuitry, motor circuit protector type circuit breaker as main disconnect, drive bypass configuration, three contactors (input, output, and bypass) design, motor overload relay, keypad for performing different functions, hand-off-auto selector switch, and a drive bypass button. The keypad shall be menu structured, alphanumeric keypad with four-line backlit display. The keypad must be capable of copying drive parameters as backup or for transferring between drives. A software package that is built into the drive shall ensure quick and easy start-up. The drive unit shall be capable of communicating all desired function such as status of drive, start-stop, and speed signal with and functioning directly under the command of building BAS system as specified under mechanical of these special provisions. The drive unit shall have withstand rating of 65,000 amperes symmetrical at 480 volts, AC, and shall be designed and tested per UL standard UL508C. The drive unit shall be installed inside MCC as shown on the plans. The easy-to-use "drive" and "load" software and laptop personal computer shall be provided as part of the package for uploading system application and for commissioning of the system in order to download from the drive, change them, and save them in a file or upload them back to the drive, print the parameters on paper or to a file, set references, start and stop the motor, monitor signals on a graphical display, and to monitor actual values.

The Contractor shall supply a total of two laptop personal computers. The laptop personal computers for the MCC No.2 is specified below and for MCC No.3 is similar.

The laptop personal computer shall be furnished for uploading/downloading the software package built into the variable frequency drive. The minimum specification of the laptop is as follows:

Processor and memory:

- Intel Core Duo Processor at 1.83 GHz
- 2 MB L2 cache
- 667 MHz front side bus
- 2 GB DDR2 5300 memory

Drives:

- Minimum 160GB hard drive
- DVD ± RW double layer combo drive

Video:

- 390 mm or larger WXGA TFT LCD display

Communication:

- Integrated 802.11a/b/g wireless capability
- Internal 56K V.92 modem
- Intergrated 10/100 Ethernet

Audio:

- Built-in stereo speakers

I/O ports:

- RGB port
- S-Video
- Flash memory slot for SD and xD picture card
- Minimum 2 USB 2.0 ports
- RJ-45 and RJ-11

-Audio jack (Headphone output, microphone input)

Operating software:

-Genuine Microsoft Vista Home Premium + Belkin Easy Transfer Cable

Additional software:

-Microsoft Office (latest version) that suits the operating system
-Software for the variable frequency drive

PANELBOARDS.--

Panelboard N2.--

Panelboard N2 shall be indoor type, surface-mounted, factory assembled, 1-phase, 3-wire, 120/208-volt, AC panelboard at least 355 mm wide with 100-ampere main lugs, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown on the plans.

Panelboard LC.--

Panelboard LC shall be outdoor type, surface-mounted, factory assembled, 3-phase, 4-wire, 120/208-volt, AC panelboard with 60-ampere main circuit breaker, insulated groundable neutral, exterior door and molded case branch circuit breakers as shown on the plans.

STARTERS AND EXHAUST FANS VARIABLE FREQUENCY DRIVES.--

All exhaust fan combination starters shall be factory pre-wired, combination 3-pole, 208-volt, rated line voltage starter and circuit breaker with NEMA size, rating and enclosure type as shown on the plans. Each starter shall have selector switch and pilot light as shown on the plans, auxiliary contacts as shown on the plans, dual element, 250-volt fuse with barrier type fuse base; coil voltage as shown on the plans, double-break silver contacts and 3 manual reset, non-adjustable thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Reset button shall be externally operable.

Two speed exhaust fan combination starters where shown on the plans shall be similar to single speed combination starters described above except two speed starter shall employ two contactor arrangements with mechanical and electrical interlock. Time delay relay shall be of the pneumatic type only time delay relay and shall be of the type as shown on the plans and shall be pre-wired at the factory.

All variable frequency drives (VFD) units shall be clean power drives complying with the voltage, number of phases, and kilowatt ratings as shown on the plans. VFD drive units enclosure shall be as shown on the plans. All VFD's shall be "Clean Power VFD's". The harmonics introduced by the variable frequency drives at the Point of Analysis (POA) shall have a maximum current distortion of 5.5% to ensure harmonic compliance. For purposes of this specification, the POA shall be the line side of the disconnect to the VFD.

All other non-combination type exhaust fan starters shall be line voltage starter with NEMA size, NEMA rating, and enclosure type as shown on the plans. Each starter shall have selector switch and pilot light as shown on the plans, auxiliary contact as shown on the plans, 250-volt fuse with barrier type fuse base if shown on the plans, coil voltage as shown on the plans, and shall have double-break silver contacts and manual reset (one for single phase and three for 3-phase), non-adjustable thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Reset button shall be externally operable.

SWITCHES.--

All exhaust fan disconnect switches where required and shown on the plans shall be of the type and size for a particular type application and shall be heavy duty type safety switch in a surface-mounted type enclosure. The NEMA rating of the enclosure shall be as shown on the plans. Specification grade type exhaust fan disconnect switch shall be per the requirements specified elsewhere in these special provisions and shall be installed in a cast iron box with cast iron cover.

MISCELLANEOUS MATERIALS.--

Selector switches.--

All selector switches and hood selector switches as shown on the plans shall be of voltage rating suitable for particular application, heavy duty, and rotary type selector switches with contact arrangement as shown on the plans. Selector switches and/or hood selector switches shall be enclosed in an oil-tight enclosure. All selector switches shall have legend plate with marking as shown on the plans.

Nameplates.--

Nameplates shall be laminated phenolic plastic with white core and black front and back. Nameplate inscription shall be in capitals letters etched through the outer layer of the nameplate material.

Plywood backing board.--

Plywood backing board for mounting electrical or telephone equipment shall be 19 mm, APA plywood panels, C-D PLUGGED and touch-sanded, Exposure 1.

PART 3.- EXECUTION

INSTALLATION.--

Plywood backing board.--Plywood backing board shall be securely fastened to walls or other vertical framing.

Surface to be coated shall be cleaned of all dirt, excess materials, of filler by hand cleaning.

Plywood backing board exposed surfaces shall receive the following paint system: one prime coat, alkyd, interior wood primer and 2 finish coats, acrylic, interior enamel, semi-gloss. Color shall match surrounding surfaces, or shall be as directed by the Engineer.

Coatings shall be applied in accordance with the manufacturer's instructions. Each coat shall be applied to a uniform finish, free of skips, brush marks, laps or other imperfections.

Existing panelboards.--Provide new circuit breakers, where required to match existing type unless otherwise shown on the plans. Provide mounting hardware, bus straps, and related materials for proper circuit breaker installation. Provide new panelboard identification nameplate with designation as shown for each panelboard. Remove existing nameplates where applicable. Provide new typewritten circuit directory reflecting changes made under the Contract.

Panelboard installation.--Set cabinets plumb and symmetrical with building lines. Train interior wiring as specified under "Conductor and Cable Installation" in "Basic Materials and Methods" of these special provisions. Touch-up paint any marks, blemishes, or other finish damage suffered during installation. Replace cabinets, doors or trim exhibiting dents, bends, warps or poor fit which may impede ready access, security or integrity.

Mounting height shall be 1.67 meters to the highest circuit breaker handle, measured above the finished floor.

Where "Future" or "Space" is indicated on the plans, branch connectors, mounting brackets, and other hardware shall be furnished and installed for future breaker.

A typewritten directory under transparent protective cover shall be provided and set in metal frame inside each cabinet door. Directory panel designation for each circuit breaker shall include complete information concerning equipment controlled, including room number or area designated on the plans.

Hood Selector switches.—Selector switches and hood selector switches shall be installed at locations as directed by the Engineer in the field.

Transformer installation.--Connect primary to minimum value taps during construction period and prior to initial building start-up. Make voltage readings and adjust tap connections to nominal voltage during final construction review and prior to building occupancy. Install conduit connections which will prevent transmission of the transformer vibrations to the conduit system. Transformers shall be bolted to floor when floor mounted and bolted to wall with support brackets when wall mounted. Pad mounted transformers (unit substation) shall be installed as shown on the plans.

Equipment identification.—All equipment such as VFD's, exhaust fan combination starters, exhaust fan starters, exhaust fan disconnect switches, selector switches and other equipment as identified by the engineer shall be identified with nameplates fastened with self-tapping, cadmium-plated screws or nickel-plated bolts. Nameplate inscription can be obtained from the Engineer prior to fabrication. All equipments with nameplate as shown on the plans shall be identified with nameplates fastened with self-tapping, cadmium-plated screws or nickel-plated bolts.

16.04 SERVICE AND DISTRIBUTION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing underground pull section adjacent to the existing service and distribution equipment in accordance with the details shown on the plans and these special provisions.

Related work.--Concrete and reinforcement for underground pull section shall conform to the requirements specified for minor work under "Cast-in-Place Concrete," in Division 3, "Concrete and Reinforcement," of these special provisions.

SUBMITTALS.--

Installation details.--The Contractor shall submit complete underground pull section installation details to the Engineer for approval.

PART 2.- PRODUCTS

Enclosure.--

Underground pull section enclosure shall be NEMA 3R enclosure. Exterior shall be 2.66 mm (12-gage) and interior shall be 1.90 mm (14-gage) sheet steel. All screws, latches, hinge pins and similar hardware shall be stainless steel. Exterior door shall be lockable with a padlock. Enclosure finish shall be baked enamel or baked thermosetting polyester finish. Underground pull section dimensions shall match the dimensions of the existing main switchboard.

Concrete.--

Concrete for underground pull section foundation shall be commercial quality concrete, proportioned to provide a workable mix for the intended use; shall contain not less than 285 kilograms of cement per cubic meter.

PART 3.- EXECUTION

Foundation for underground pull section shall be installed in a manner to match the foundation of the existing switchboard. Contractor shall first investigate the existing foundation of the switchboard and then prepare plans for the foundation of the underground pull section. In addition, a concrete platform (of dimensions to match existing switchboard platform dimensions) in front of the underground pull section foundation shall be installed

16.05 LIGHTING

GENERAL.--This work shall consist of furnishing, installing and connecting all lighting equipment in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive information, photometric curves, catalog cuts, and installation instructions shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

PRODUCTS.--

Lighting fixture lamps.--

Lighting fixture lamps shall be type and size as shown on the plans. Lamps shall be General Electric, Phillips, Sylvania, or equal. Fluorescent lamps, unless otherwise noted, shall be 4100 K tri-phosphor with a CRI of 70 or greater.

Ballasts.--

All fixtures shall be equipped with high power factor ballasts suitable for the line voltage and for the type, size and number of lamps required by the fixture. Fluorescent ballasts shall be UL Listed, Class P and ETL Certified ballasts with sound rating A. Fluorescent ballasts shall be high-frequency electronic ballasts with power factor greater than 0.95, nominal ballast factor of 0.88 unless specified otherwise, total harmonic distortion less than 20 percent, crest factor less than or equal to 1.7, complying with ANSI C 62.41 Category A for surge protection, and FCC Part 18 for interference.

Lighting fixtures.--

Lighting fixtures shall be as shown on the plans and as specified herein. Outdoor luminaires shall be listed and labeled "Fixture Suitable For Wet Locations."

F1.--

Ceiling-mounted fluorescent fixture with one 32-watt T8 lamp, 120 volts electronic ballast and one-piece, prismatic acrylic, wrap-around diffuser. The fixture shall be Lithonia, CA series; Columbia, R04 series; or equal.

F2.--

Similar to F1 except F2 shall have an integral factory installed emergency battery pack unit.

F3.--

Ceiling-mounted fluorescent fixture with one 32-watt T8 lamp, 277 volts electronic ballast and one-piece, prismatic acrylic, wrap-around diffuser. The fixture shall be Lithonia, CA series; Columbia, R04 series; or equal.

F4.--

Similar to F3 except F4 shall have an integral factory installed emergency battery pack unit.

F5.--

Stem-mounted louvered commercial fluorescent fixture with two 32-watt T8 lamps, 277 volts electronic ballast, baked white die formed steel finish in high gloss enamel, complete with steel louver, safety chain and end plates. Steel louver assembly shall lock mechanically in the V-section with compression latches and shall be suspended by safety chains for ease of relamping. The fixture shall be Lithonia, HL series; Day Brite, EV series; or equal.

F6.--

Stem-mounted fluorescent fixture with one 32-watt T8 lamp, 277 volts electronic ballast, white body finish and one-piece, injection-molded acrylic wrap-around diffuser. The fixture shall be Day Brite, HW series; Lithonia, AW series; or equal.

F7.--

Ceiling-mounted 600 mm x 600 mm fluorescent fixture with two 31-watt T8 U type lamps, 277 volts electronic ballast, and one-piece, injection-molded acrylic diffuser. Fixture housing shall be exterior finish high-gloss white baked enamel. The fixture shall be Lithonia, 2M series; Day Brite, 2SM series; or equal.

F8.--

Stem-mounted fluorescent fixture with two 32-watt T8 lamps, 120 volts electronic ballast, white body finish and one-piece, injection-molded acrylic wrap-around diffuser. The fixture shall be Day Brite, HW series; Lithonia, AW series; or equal.

F9.--

Similar to F8 except F9 shall have an integral emergency battery pack unit.

F10.--

Ceiling-mounted fluorescent fixture with two 32-watt T8 lamps, 277 volts electronic ballast, white body finish and one-piece, injection-molded acrylic wrap-around diffuser. The fixture shall be Day Brite, HW series; Lithonia, AW series; or equal.

F11.--

Ceiling-mounted fluorescent fixture with one 32-watt T8 lamp, 277 volts electronic ballast, white body finish and one-piece, high impact prismatic acrylic diffuser. The fixture shall be Day Brite, Vaporlume series; Lithonia, DMW series; or equal.

EXECUTION.--

LIGHTING FIXTURES.--Lighting fixtures shall be mounted securely in accordance with the manufacturer's recommendations. Mounting methods shall be suitable for the particular type of ceiling or support at each location.

The Contractor shall provide all supports, hangers, spacers, channels, fasteners and other hardware necessary to support the fixtures.

Fixtures shall be set at the mounting heights shown on the plans, except heights shown shall be adjusted to meet conditions.

BALLASTS.--All fluorescent fixtures shall be equipped with high power factor ballasts suitable for the line voltage and for the type, size and number of lamps required by fixture.

16.06 FIRE ALARM AND DETECTION SYSTEM

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a complete and operational fire alarm and detection system in accordance with the details shown of the plans and these special provisions.

The system shall include all materials, whether mentioned or not, but are necessary for the complete and operational fire alarm and detection system.

SYSTEM DESCRIPTION.--

Design Requirements.--The fire alarm and detection system shall be a low voltage, direct current, zoned, closed circuit, electrically supervised, and Class A addressable fire alarm and detection system. The system shall consist of fire alarm control panel, annunciator panel, manual pull stations, smoke detectors, heat detectors, end-of-line resistors, audio-visual devices, and all other necessary appurtenances. When a device is activated in a specific zone, the fire alarm control panel shall send a signal to the building automation system via an interface panel, specified elsewhere in these special provisions, to indicate the device number and its zone. The building automation system shall start shutting down mechanical equipment located in that zone as shown on the plans and as specified elsewhere in these special provisions.

In addition, when a device is activated in one of the five clean agent systems, the fire alarm control panel shall send two signals. The first signal is to the building automation system via the interface panel as described above. The second signal is to the clean agent interface panel, where the activated device is located, via a clean agent interface panel. The building automation system and the clean agent interface panel(s) shall start shutting down mechanical equipment and releasing clean agent as shown on the plans and specified elsewhere in these special provisions.

All devices and conduit system located in Room 286-F "Paints" shall comply to Class 1 Division 1 locations specified under Article 501 "Class 1 locations" of the National Electrical Code.

The alarm system components shall be listed by U.L. or F.M. and the California State Fire Marshal.

SUBMITTALS.--

Product data.--Manufacturer's descriptive information and installation instructions shall be submitted for approval.

Installation instructions shall include brand name and catalog reference of equipment supplied, wiring diagrams, battery calculations, voltage drop calculations, riser diagrams and floor plans showing all devices and conduit and conductor sizes.

Shop drawings.--Complete shop drawings shall be submitted for approval.

Shop drawings for fire alarm detection system, building automation system, and clean agent fire extinguishing system shall be submitted as "One Package." Shop drawings shall include installation instructions, brand name, catalog reference of equipment supplied, complete schematic/wiring diagrams including system interlocks and various equipment powering up and shut down schedule, battery calculations, voltage drop calculations, all system riser diagrams and floor plans showing all devices, conduit, and conductor/cable sizes. Separate packages of shop submittals shall be returned for resubmission. The fire alarm, clean agent fire extinguishing systems, and the building automation system portion of the submittal shall bear the seal and signature of a Professional Electrical Engineer licensed in the State of California.

State Fire Marshal approval.-- Prior to the submittal of the shop drawings, the Contractor shall have said drawings stamped "APPROVED" by the State Fire Marshal. Allow 12 weeks for State Fire Marshal review and approval.

PART 2.- PRODUCTS

Fire alarm control panel.—

Fire alarm control panel shall be surface-mounted, locking cabinet, completely self-contained control panel suitable for 120-volt, AC, input power with separate terminals for all external wires and end-of-line resistors installed within the control panel. Panel shall be capable of communicating with addressable devices, annunciator panel, building automation system via interface panel, and clean agent control panels via clean agent interface panels. When a device is activated, the panel shall display the zone where the device is located and the zone number shown on the contract plans.

The control panel shall conform to the following requirements:

- Compatible with Radionics 6000 or 6500 receiver or equivalent;
- 16 zones;
- Digital dialer communicator;
- Audible trouble signal, silencing switch and trouble pilot light;
- Solid state, modular construction;

Fan shut down relays;
24-hour standby batteries, battery charger with automatic transfer on loss of utility company power and retransfer upon restitution of utility power;
Indicating lights for normal power failure, battery power failure, audible alarm, and silencing switch;
Low battery reporting.

Manual pull station.--

Manual pull station shall be single-action, addressable, closed circuit, pull down type pull station mounted on a standard electrical outlet box except manual pull station mounted in room 286-F shall be mounted on cast metal box. The manual pull station actuating contact shall function continuously until reset. The pull station shall have provisions for fire drill and testing and shall have integral LED light to indicate operation of the pull station. Manual pull station mounted in room 286-F shall be explosion proof type. Accessible operating hardware at initiating device shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate the manual pull station shall be less than 22.2 N.

Smoke detector.--

Smoke detector shall be addressable and ionization type detector with dual chamber with sensitivity control and plug-in detector head. One chamber shall be for detection and the other for changes in ambient parameters. The smoke detector shall have integral LED light to indicate operation of the smoke detector. Smoke detector mounted in room 286-F shall be explosion proof type.

Heat detector.--

Heat detector for automatic detection of fire shall be addressable, compact and rugged construction employing rate-of-rise and fixed temperature methods of detecting fires. The heat detectors shall have twist-and-lock type plug-in detector head, and low profile.

Audio-visual device.--

Audio-visual device shall be addressable, vibrating type horn with flashing light and adjustable volume control with maximum audible output of 90 dB at 3 meters from the horn. Frequency of audio visual flash shall be not less than one flash per second. Audio-visual device mounted in room 286-F shall be explosion proof type.

Annunciator panel.--

Annunciator panel shall be capable of communicating with the fire alarm control panel to display the same message displayed by the fire alarm panel.

PART 3.- EXECUTION.--

INSTALLATION.--

General.--The fire alarm system shall be installed in accordance with the manufacturer's recommendations. No modification of the recommended alarm system type, components type, or replacement shall be made without prior written approval from the Engineer.

Fire alarm panel zoning.--Fire alarm panel zoning shall be as shown on the contract plans.

Conduit, surface metal raceway, cables and conductors.--Fire alarm system wiring shall be installed in conduits conforming to the requirements of "Basic Materials and Methods" elsewhere in these special provisions. Conduit size shall be as recommended by the fire alarm system manufacturers except that conduits shall be not less than 16 mm diameter, trade size. Conduits and surface metal raceways shall not be filled more than 35%. Conduits shall be concealed in ceiling or walls. If in the opinion of the Engineer that in specific locations conduits can not be concealed, surface metal raceways shall be used for exposed work. All locations of surface metal raceways must be approved by the Engineer prior to their installation.

Conductors and cables for the fire alarm system shall be as recommended by the fire alarm system manufacturer.

FIELD QUALITY CONTROL.--

Testing.--The operational test for the fire alarm system shall be performed by the Contractor in the presence of the Engineer. The operational tests shall demonstrate that all functions of the system operate in the manner described in the manufacturer's literature and that the system is stable under normal vibration and shocks to components. The Contractor shall notify the Engineer in writing not less than 10 days in advance of performing the operational tests.

Monitoring.--The contractor shall provide monitoring services for the facility for one year after the acceptance of the contract. The services shall include a toll-free telephone line connecting to the 24-hour on call monitoring station. Monitoring station shall contact designated site representative in the event of alarm and dispatch an immediate on-site response to the alarm location if the site representative cannot be reached or verification of the cause of the alarm cannot be determined.

Monitoring services after the first year will be handled by the State.

DEMONSTRATION.--

Training.--The Contractor shall provide one hour of on-site training on the use, operation, and, maintenance of the system for not more than 8 designated State employees. The Contractor shall notify the Engineer in writing not less than 10 days in advance of proposed training class.