

BEFORE THE METRO COUNCIL

FOR THE PURPOSE OF AUTHORIZING RELEASE) RESOLUTION NO. 98-2647
OF RFB #98B-26-REM FOR THE CONSTRUCTION)
OF MAINTENANCE BUILDING AT THE ST.) Introduced by Mike Burton,
JOHNS LANDFILL) Executive Officer

WHEREAS, Metro must comply with the regulatory requirements associated with the closure and long term maintenance of the St. Johns Landfill as described in the accompanying staff report; and

WHEREAS, For reasons of ensuring that any risks to humans and/or the surrounding environment of the St. Johns Landfill are detected, predicted and minimized, Metro requires an onsite presence at the landfill; and

WHEREAS, Extensive equipment is required onsite to carry out these responsibilities as described in the accompanying staff report; and

WHEREAS, These responsibilities are of a long term nature, it is appropriate to construct a maintenance building at the site; and

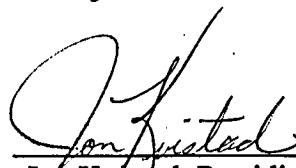
WHEREAS, The project was identified in Metro's Adopted Capital Improvement Plan; and

WHEREAS, The resolution was submitted to the Executive Officer for consideration and was forwarded to the Council for approval; now therefore,

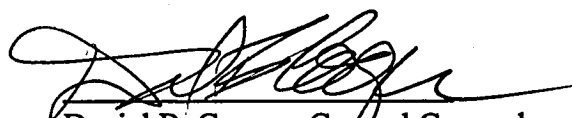
BE IT RESOLVED,

1. That the Metro Council authorizes issuance of RFB #98B-26-REM attached hereto as Exhibit "A".
2. That the Metro Council, pursuant to Section 2.04.026(b) of the Metro Code, authorizes the Executive Officer to execute a contract with the lowest responsive bidder.

ADOPTED by the Metro Council this 21 day of May, 1998.


Jon Kvistad, Presiding Officer

Approved as to Form:


Daniel B. Cooper, General Counsel

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REGIONAL ENVIRONMENTAL MANAGEMENT COMMITTEE REPORT

CONSIDERATION OF RESOLUTION NO. 98-2647, FOR THE PURPOSE OF
AUTHORIZING RELEASE OF rfb #98B-26-REM FOR THE CONSTRUCTION OF A
MAINTENANCE BUILDING AT THE ST. JOHNS LANDFILL

Date: May 19, 1998

Presented by: Councilor Washington

Committee Recommendation: At its May 19 meeting, the Committee considered Resolution No 98-2647 and voted unanimously to send the resolution to the Council with a do pass recommendation. Voting in favor: Councilor McFarland, Washington and Chair Morissette.

Background: Metro will be responsible for providing environmental and maintenance oversight for the St. Johns Landfill for the next 30 years. As part of this oversight, Metro will need to house equipment and personnel at the landfill. During the past two years Metro and the City of Portland have been exploring potential uses for Parcel A (owned by the city) which is immediately adjacent to the landfill site. Metro and the city have agreed that Metro can construct a building on the site to house personnel and equipment related to the landfill.

Committee Issues/Discussion: Bruce Warner, Regional Environmental Management Director, presented the staff report. Warner indicated that the Council-adopted Capital Improvement Plan for FY 98-99 included a \$476,000 project to construct a maintenance building at the landfill. The recently approved also included funding for the project. The purpose of the proposed resolution is to authorize the release of the RFB for the construction of the building.

Warner indicated that the current engineer's cost estimate for the project is \$495,000, which is slightly higher than the original and budgeted amount. He explained that there were two reasons for the increase in costs. First, it was determined that the building site is subject to the provisions of Title 3, which require mitigation of the impact of the building. This will be accomplished by replacing an existing retaining wall at the site at a cost of \$31,400. This option was chosen because it is not possible to do a cut and fill at the site because solid waste is buried so close to the surface. Second, the city is requiring that a new six-inch water line capable of supporting a fire hydrant be installed on the site.

Chair Morissette asked if the project could have still been completed if the option of replacing the retaining wall had not been available to Metro. Warner responded that the building could have been built, but that finding a nearby area on which to do a cut and fill would have been more difficult.

**EXECUTIVE SUMMARY
RESOLUTION 98-2647
CONSTRUCTION OF A MAINTENANCE BUILDING
AT THE ST. JOHNS LANDFILL**

PROPOSED ACTION

- Adopt Resolution No. 98-2647, which authorizes release of RFB #98B-26-REM and authorizes the Executive Officer to execute a contract for the construction of a maintenance building at the St. Johns Landfill.

WHY NECESSARY

- Metro is responsible for the proper closure and long term maintenance and monitoring of the St. Johns Landfill for a period of at least 30 years
- Closure responsibilities include maintenance and repair of the gas, condensate, stormwater, and leachate collection systems, which encompass the entire landfill, the motor blower flare, 230 + acres of the cover cap system, and groundwater monitoring wells. Currently the landfill supplies nearly 4,000 cfm of landfill gas to a compressor station that transmits gas to Ash Grove Cement Company for use as a fuel.
- Metro must monitor groundwater, surface and stormwater, sediment, leachate and gas quality on a routine basis.
- To carry out these responsibilities it is necessary to have a variety of equipment at the site including heavy equipment such as a bulldozer, tractor, backhoe as well as a boat to conduct sampling. This equipment must be properly stored and maintained in order to protect Metro's investment
- Staff is required at the site to conduct the required activities and ensure proper functioning of the closure system
- A facility is needed to house personnel, maintain and service equipment and properly store heavy equipment, tools, spare parts and supplies.

ISSUES/CONCERNS

- The building will be necessary even if Metro eventually contracts out its responsibilities. This is because it is impractical to transport the necessary equipment onto the site daily, and it is a poor maintenance practice to store and maintain the equipment outside.
- The current onsite structures that house personnel and small equipment are inadequate and in a location that is planned for future use by the owner--the City of Portland.
- The current maintenance area and heavy equipment area is on the landfill in unsightly Conex boxes that are not secure and are not properly heated, cooled or illuminated.

BUDGET/FINANCIAL IMPACTS

- The estimate contained in the CIP is \$476,000, which compares favorably with the Engineer's estimate for construction of \$459,000.
- Sufficient construction funds have been budgeted for the project.

STAFF REPORT

IN CONSIDERATION OF RESOLUTION NO. 98-2647, FOR THE PURPOSE
OF AUTHORIZING RELEASE OF RFB #98B-26-REM FOR THE
CONSTRUCTION OF A MAINTENANCE BUILDING AT THE ST. JOHNS
LANDFILL

Date: April 10, 1998

Presented by: Bruce Warner,

PROPOSED ACTION

Adopt Resolution No. 98-2647, which authorizes release of RFB #98B-26-REM and authorizes the Executive Officer to execute a contract for the construction of a maintenance building at the St. Johns Landfill

FACTUAL BACKGROUND AND ANALYSIS

Metro is responsible for the proper closure and long term maintenance of the closure system at the St. Johns Landfill, as well as extensive monitoring of the air, water and soils of both the landfill and the surrounding ecosystem. These responsibilities are carried out by the staff of the Environmental Monitoring & Services program of the Engineering & Analysis Division. The purpose of this program is to ensure that any risks to humans and/or the environment are detected, predicted and minimized.

Beginning in 1991, Metro began environmental improvements to the site in compliance with the closure requirements of its Closure and Financial Assurance Plan as approved by the Department of Environmental Quality (DEQ). Four different programs within DEQ have oversight of the closure and long term maintenance of the site.

These environmental improvements requiring long-term operations and maintenance are: the multi-layered cover cap; gas recovery system of wells, motor blower flare facility and compressor for the sale of the gas; stormwater, condensate, and leachate collection systems. Metro is also attempting to establish a cover of native vegetation at the site in addition to the regular mowing and planting activities associated with fire and erosion control. Extensive sampling of the surrounding ecosystem is also required for analysis in compliance with regulatory requirements.

These responsibilities require an onsite presence of trained staff and associated equipment, including large equipment such as a bulldozer, backhoe, tractor and farm implements, as well as boats and ATVs. Given the long-term nature of these responsibilities (30 years), proper facilities need to be constructed on the site to house both personnel and equipment.

The planned maintenance building is 5,000 square feet. It includes offices, a lab/office, lunch/conference room, restroom/showers, storage for equipment and vehicles, 2 maintenance bays and a shop. It will be located on the northern portion of Parcel "A" just to the west, prior to

crossing the bridge onto the landfill. This area was originally used as a public drop-off area when the landfill was open. The footprint of the building does not fall within the Flood Management Area of Title 3. Therefore, no mitigation is required.

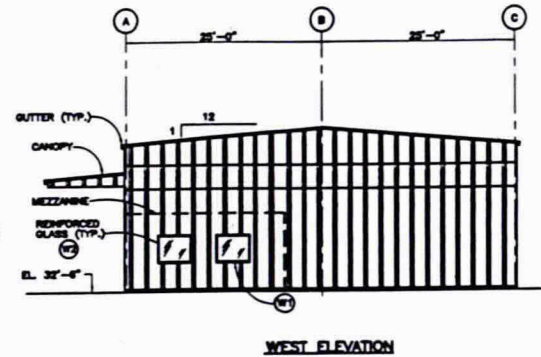
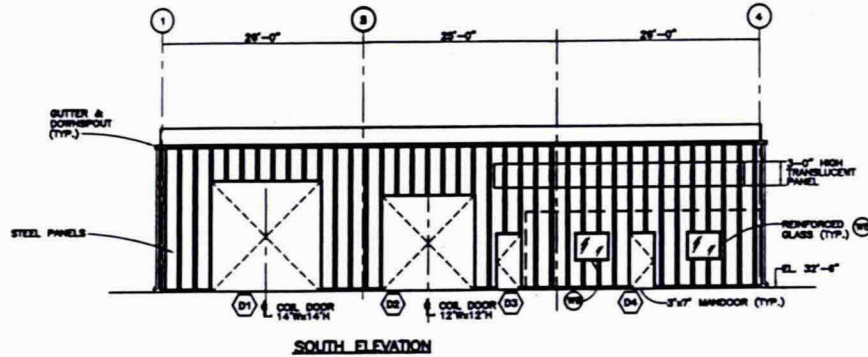
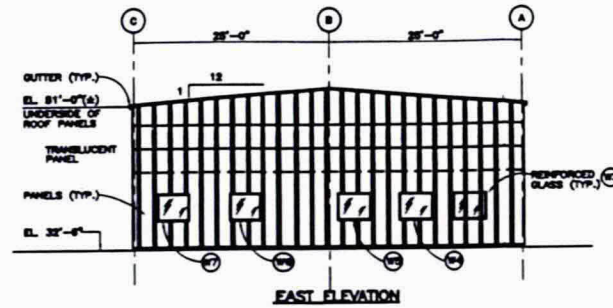
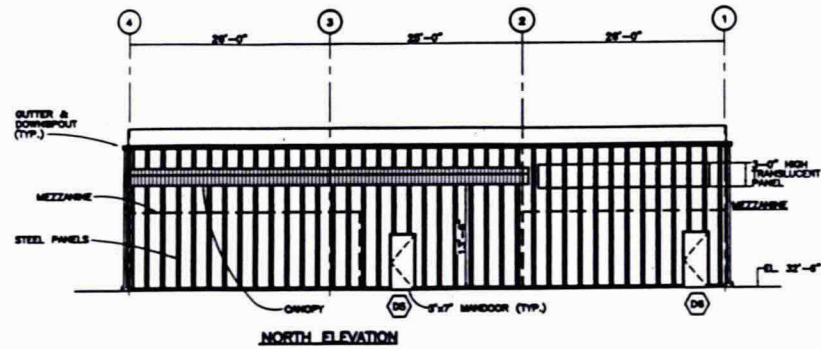
BUDGET IMPACT

The Engineer's Estimate for the project is \$459,000. It is contained in the Capital Improvement Plan with an estimate consistent with the Engineer's. Sufficient funds have been budgeted for the project.

EXECUTIVE OFFICER RECOMMENDATION

The Executive Officer recommends approval of Resolution No. 98-2647.

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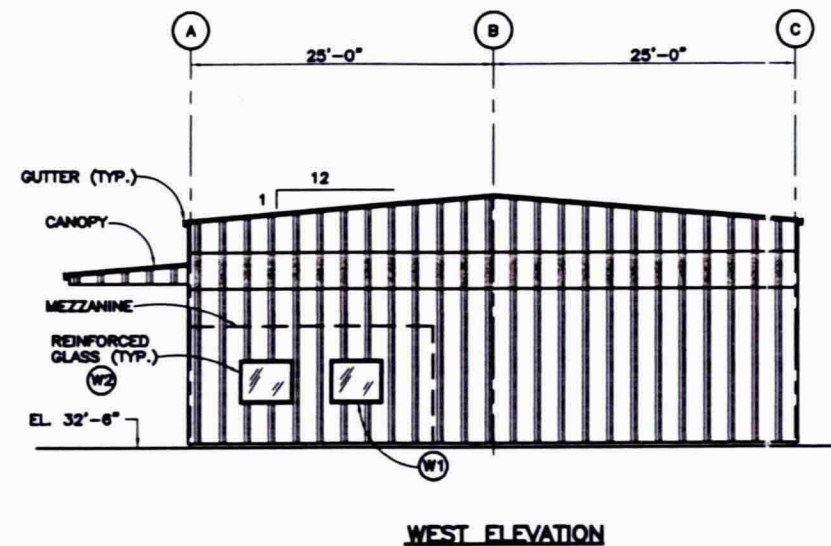
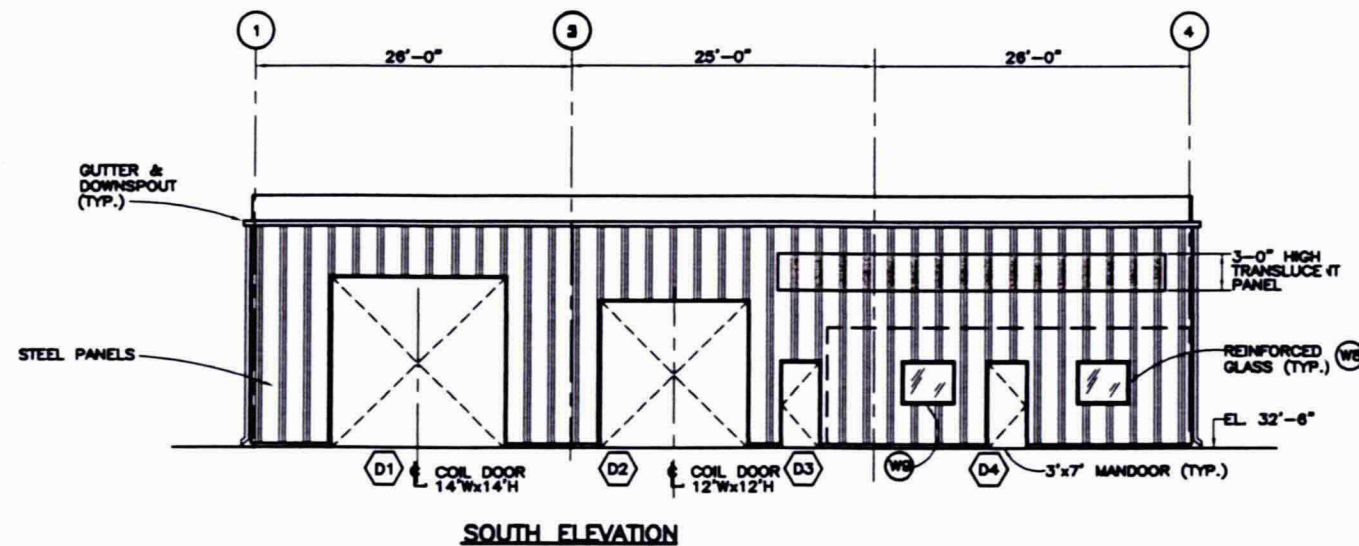
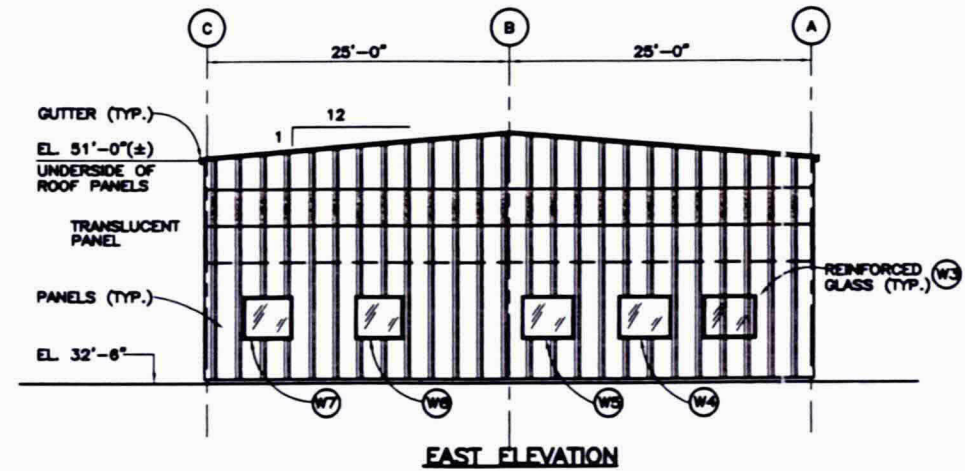
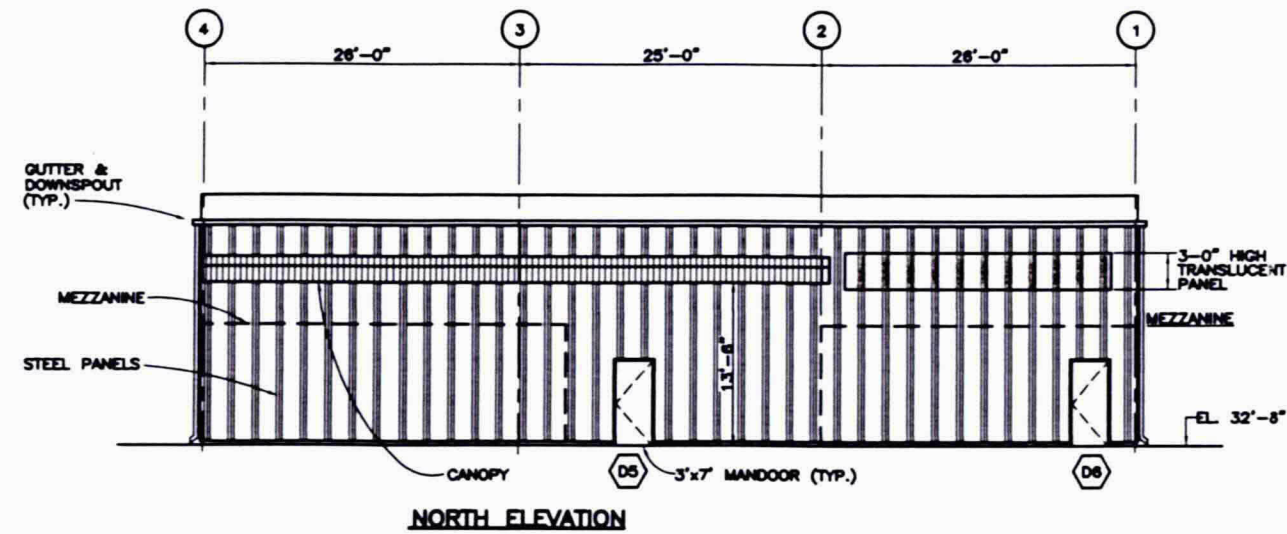


NOTES:

- 1.) FOR GENERAL NOTES, SEE DWG. 9-02.
- 2.) MATERIALS & COLORS:
 - a.) EXTERIOR ROOF & WALL PANELS SHALL BE "Y" RIBBED METAL WITH FACTORY APPLIED FINISH. COLOR: BROWN.
 - b.) TRANSLUCENT PANELS SHALL BE CLEAR FIBERGLASS PANELS RIBBED TO MATCH STEEL PANELS.
 - c.) DOWNSPOUTS SHALL BE FACTORY APPLIED FINISH. COLOR: BROWN.
 - d.) GUTTERS SHALL BE FACTORY APPLIED FINISH. COLOR: BROWN.
 - e.) ALL FLASHINGS AT ROOF, AND LARGE DOORS SHALL BE FACTORY APPLIED FINISH. COLOR: BROWN. ALL OTHER FLASHINGS SHALL BE FACTORY APPLIED FINISH. COLOR: BROWN.
 - f.) ALL HOLLOW METAL WINDOW & FRAMES AND WINDOW FRAMES SHALL BE PAINTED DARK BROWN.
 - g.) ROLL-UP DOOR TO BE PAINTED BROWN OVER FACTORY APPLIED PRIMER COAT.
 - h.) STAIR STRINGERS & POSTS TO BE PAINTED DARK BROWN.
 - i.) ALL HANDRAILS SHALL BE PAINTED SAFETY YELLOW.
 - j.) COLORS "BROWN" & "DARK BROWN" ARE TO MATCH COLORS ON EXISTING SOUTH TRANSFER STATION.
 - k.) INTERIOR SURFACES OF INSULATED PANELS ARE TO BE "OFF WHITE".
 - l.) PRE-ENGINEERED FRAME INCLUDING GIRTS & PURLINS ARE TO BE "OFF WHITE".



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				SCALE 1/8"=1'-0"	DRAWN BY ST	APPROVED BY					CAD FILE NUMBER: SJ-008	DRAWING NUMBER: G-08	REV. B
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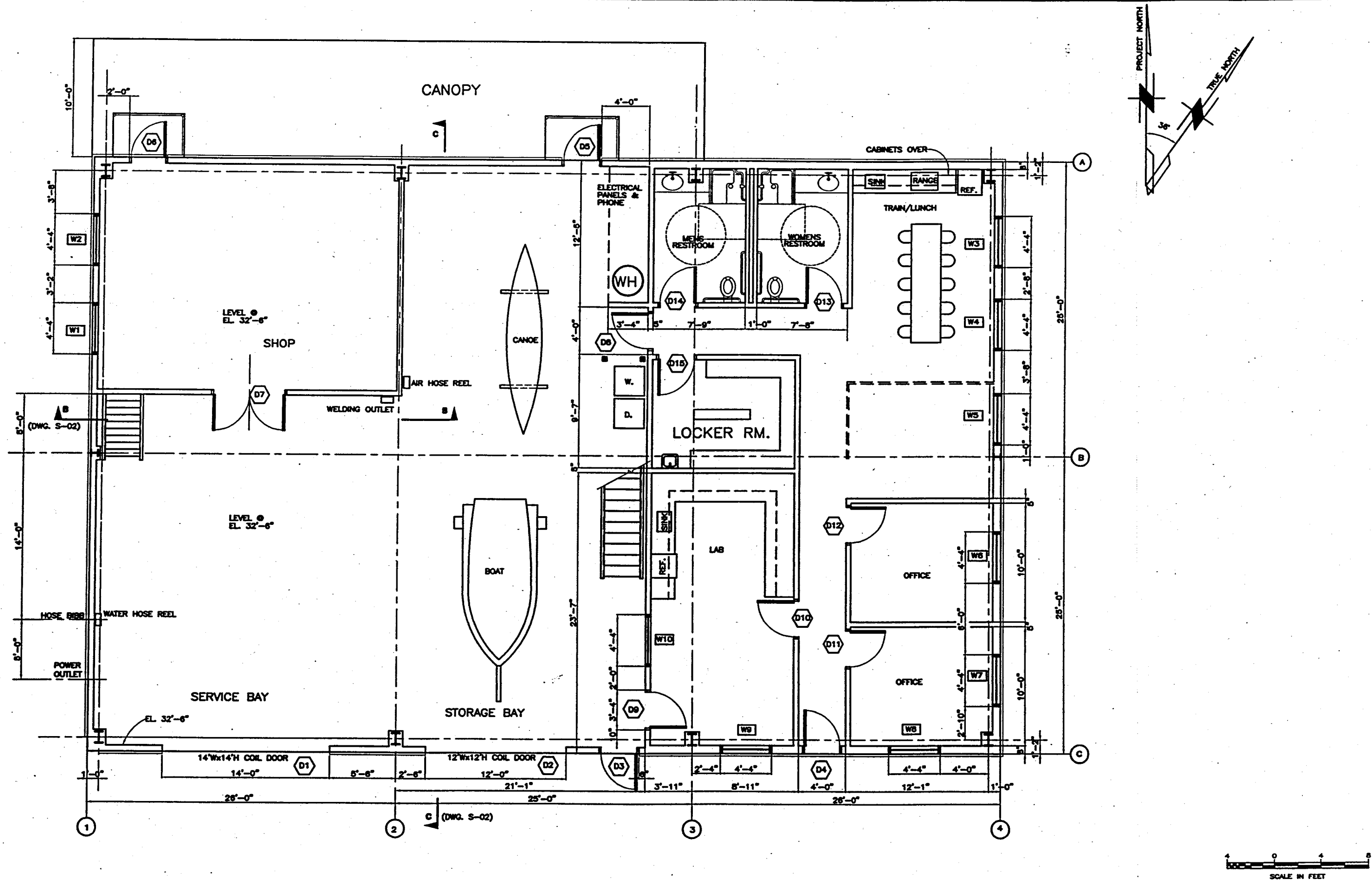


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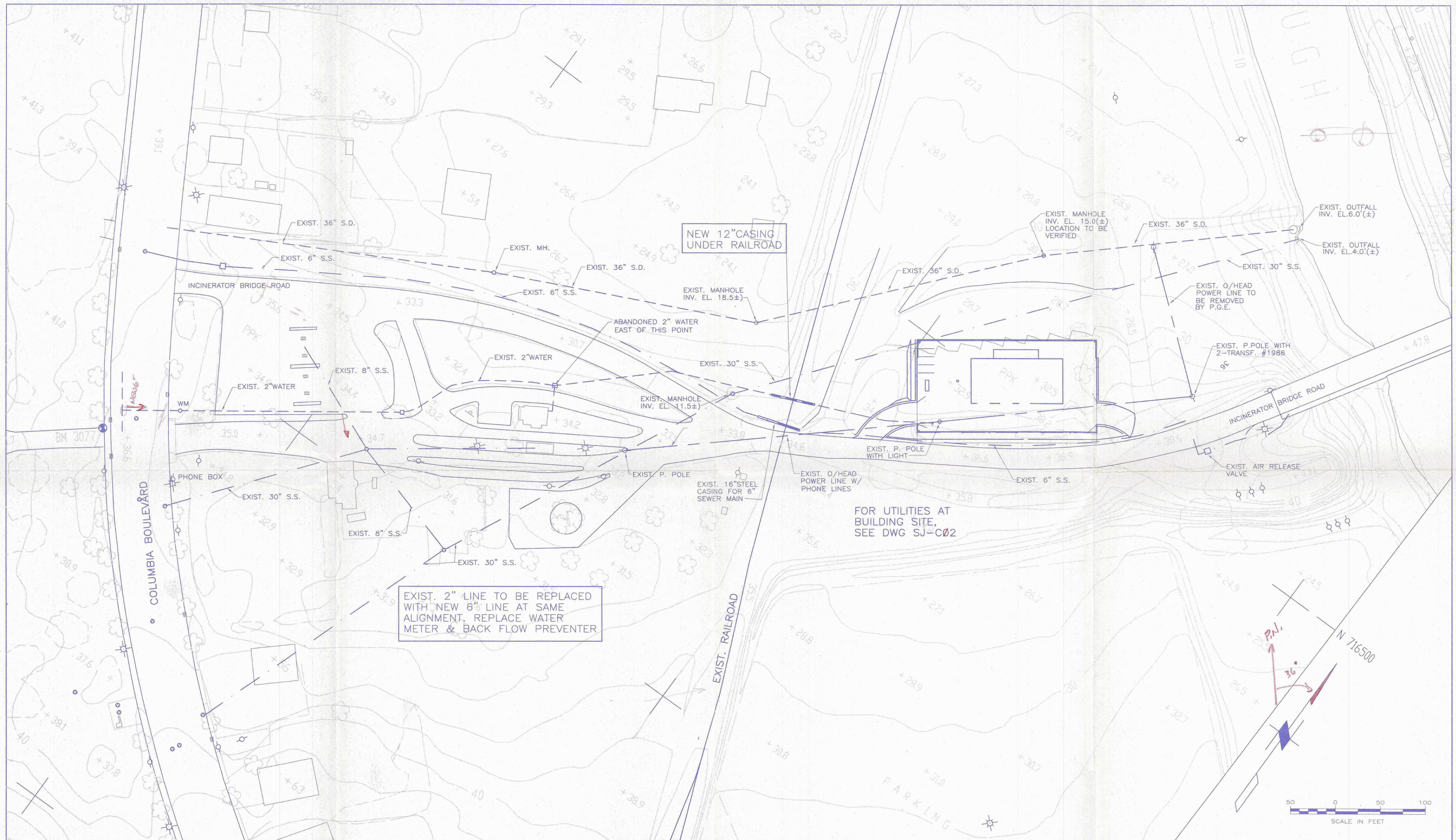
- 1.) FOR GENERAL NOTES, SEE DWG. G-02.
- 2.) MATERIALS & COLORS:
 - a.) EXTERIOR ROOF & WALL PANELS SHALL BE "V" RIBBED METAL WITH FACTORY APPLIED FINISH. COLOR: BEIGE
 - b.) TRANSLUCENT PANELS SHALL BE CLEAR FIBERGLASS PANELS RIBBED TO MATCH STEEL PANELS.
 - c.) DOWNSPOUTS SHALL BE FACTORY APPLIED FINISH. COLOR: BEIGE
 - d.) GUTTERS SHALL BE FACTORY APPLIED FINISH. COLOR: DARK BROWN
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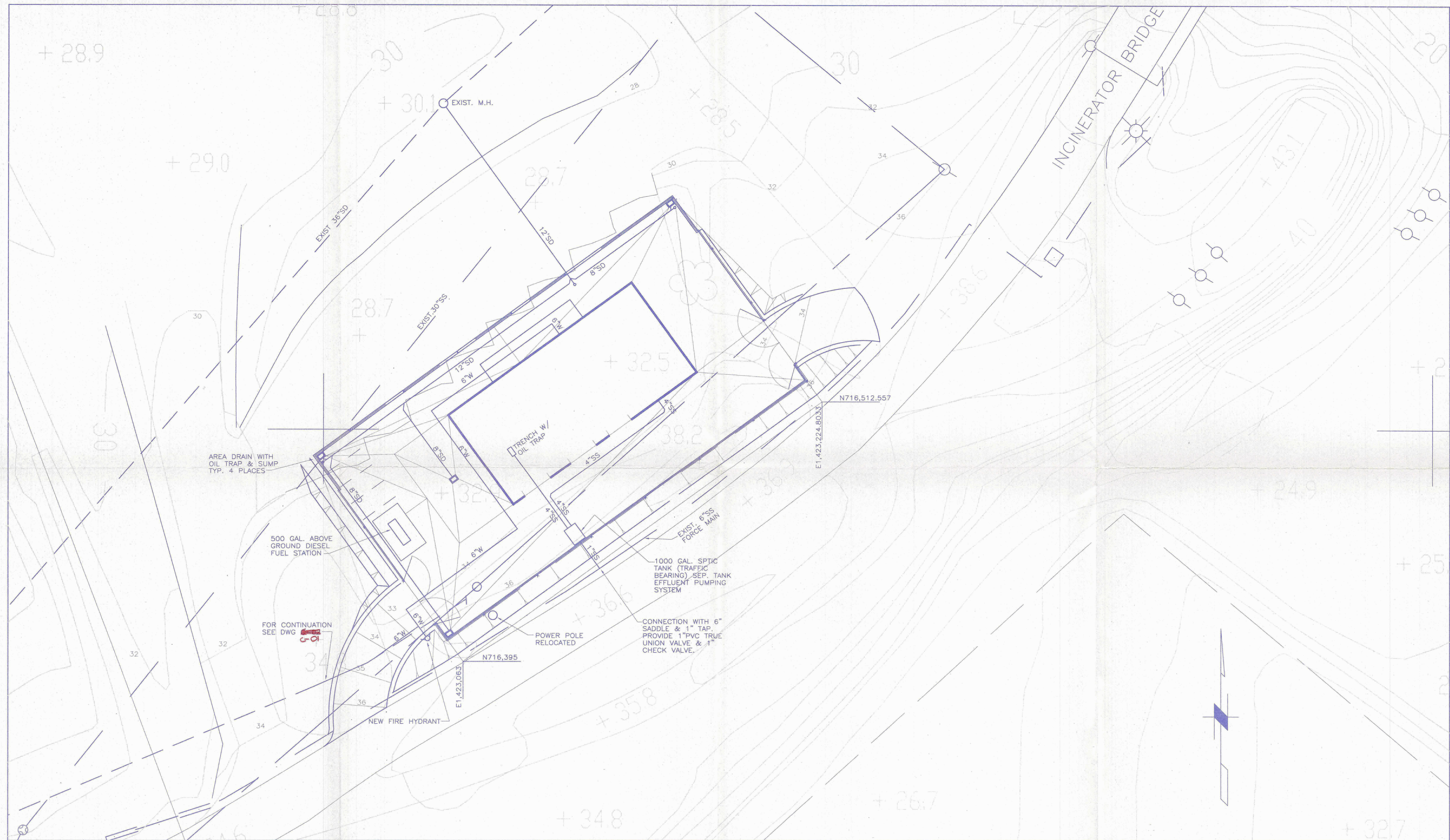
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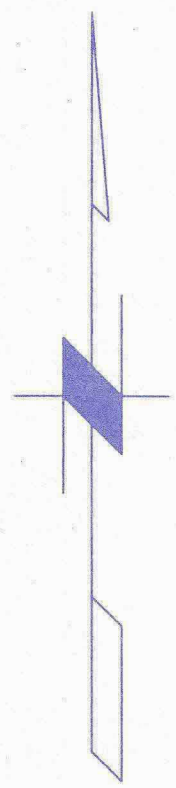
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REQUEST FOR BIDS

FOR

**CONSTRUCTION OF A MAINTENANCE
BUILDING AT THE ST. JOHNS LANDFILL**

RFB # 98B-26-REM

April 1998

Metro
Regional Environmental Management Department
600 N.E. Grand Avenue
Portland, OR 97232-2736

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**SECTION 00030
INVITATION TO BID**

Metro is soliciting bids for a 3,750 square feet pre-engineered steel maintenance building and related utilities and equipment at St. Johns Landfill located in Portland, OR (RFB #98B-26-REM.) Sealed Bids must be delivered to Metro, Regional Environmental Management Department, 600 N.E. Grand Avenue, Portland, OR 97232 to the attention of Maurice Neyman, Project Manager, no later than _____, 1998. At that time, the Bids will be opened and publicly read aloud in Conference Room 270 located in the Metro Regional Center.

The Work contemplated consists of the design and construction of a 3,750 square feet pre-engineered steel building along with the related utilities and equipment at the St. Johns Landfill in Portland, Oregon.

Drawings and Specifications may be examined at the Regional Environmental Management Department in the Metro Regional Center. Copies of the Bidding Documents may be obtained from Maurice Neyman, Project Manager at Metro Regional Environmental Management Department or by calling 797-1650.

Each Bid must be submitted on the prescribed form and accompanied by a certified check or cashier's check or Bid Bond executed on the prescribed form, payable to Metro in the amount of ten percent (10%) of the total bid amount. The Bid and bid security should be delivered in a sealed envelope marked "Maintenance Building, St. Johns Landfill (RFB #98B-26-REM)", Attention: Maurice Neyman.

The successful Bidder will be required to furnish the necessary additional Bonds for the faithful performance of the Contract and for the payment of all persons supplying labor and materials as prescribed in the Contract Documents.

Before a contract is awarded, Metro may conduct such additional investigations as are necessary to determine whether a Bidder is qualified. Upon request, the Bidder shall promptly submit such additional information as deemed necessary by Metro to evaluate the Bidder's qualifications.

Bidders shall use recyclable products to the maximum extent economically feasible in the performance of the contract work set forth in this document.

This is a public works project. The contractor and all subcontractors and suppliers, shall be required to comply with ORS 279.350 through 279.354 and ensure that all workers are paid not less than, and in accordance with, the Prevailing Wages published by the Oregon Labor of Industries. In order to insure compliance with prevailing wage requirements, under Chapter 279, Metro will require that all payrolls be submitted on a schedule to be determined by Metro.

The contractor is required to pay a fee equal to one-tenth of one percent (0.1 percent) of the price of the contract, but not less than \$100 nor more than \$5,000, under ORS 279.352 (2) and section

5 (1), chapter 594, 1995 Oregon Laws. The fee shall be paid on or before the first progress payment or 60 days from the date work first began on the contract, whichever comes first. The fee is payable to the Bureau of Labor and Industries at the following address:

Bureau of Labor and Industries
Wage and Hour Division
Prevailing Wage Unit
800 NE Oregon Street, #32
Portland, OR 97232

Each Bid must contain a statement as to whether the Bidder is a resident bidder, as defined in ORS 279.029.

Bidders and Subcontractors must be registered with the Oregon Construction Contractor's Board pursuant to ORS 701.035-90.

Bidders must comply with Metro's Minority, Women-Owned Business Enterprise and Emerging Small Business Program. The purpose of the program is to establish and implement a program to encourage the utilization by Metro of minority and women-owned businesses, to the greatest extent permitted by law, by creating for such businesses the maximum possible opportunity to compete for and participate in locally-funded Metro contracting activities. All Bidders must certify and document compliance with the Minority and Women-Owned Business Enterprise Program. Failure to complete and submit the Program Compliance Forms, Utilization Forms, and adequately document good faith efforts will constitute a non-responsive Bid. See instructions to Bidders for references to applicable procedures and further details concerning this program. Any questions regarding MBE/WBE/ESB requirements should be addressed to the Metro MBE/WBE/ESB Program Advocate, Mr. James Waki at (503) 797-1714.

The Economic Feasible Units (EFU's) identified for the MBE/WBE/ESB program by Metro for this project are; grading & excavation, site utilities, concrete work, steel erection, plumbing, heating and ventilation, and electrical work.

A Pre-Bid Conference for prospective Bidders will be conducted at 10:00 a.m., on Wednesday, June 10, 1998 in the Metro Construction Trailer at St. Johns Landfill, 9363 N. Columbia Blvd., Portland, OR. Attendance at this meeting is mandatory for all potential prime bidders to comply with Metro's Minority, Women-Owned Business and Emerging Small Business Enterprise Program. A site visit is planned following the meeting.

Metro reserves the right to reject all Bids or any Bids not conforming to the intent and purpose of the Contract Documents, to reject for good cause any and all Bids upon a finding of Metro that it is in the public interest to do so or to waive any informality or irregularity in any Bid or Bids. Metro further reserves the right to award the Contract at any time within sixty (60) days following the Bid opening date.

For information concerning the proposed work, or to make an appointment to visit the site of the proposed work, contact Maurice Neyman, Project Manager, at (503) 797-1650.

SECTION 00110 INSTRUCTIONS TO BIDDERS

1. DESCRIPTION OF WORK

The Work contemplated consists of the design and construction of a 3,750 square feet pre-engineered steel building along with related utilities and equipment.

2. DEFINITIONS

Except as otherwise specifically provided herein, all words and phrases defined in the General Conditions shall have the same meaning and intent in these Instructions to Bidders. Bidders should refer to those definitions as they read these Instructions.

3. DOCUMENT INTERPRETATION

The Contract Documents are intended to be complementary and to provide all details reasonably required for the execution of the proposed Work. Any person contemplating the submission of a Bid shall have thoroughly examined all of the various parts of these Contract Documents. If the Bidder has any doubt as to the meaning or the intent of the Contract Documents or finds any inconsistency or discrepancy within the Contract Documents, the Bidder must provide and Metro must receive a written request for interpretation, at least seven (7) working days prior to Bid opening. Likewise, the Bidder may request substitutions for materials, processes or equipment as described in the Contract Documents. Such requests for interpretation or substitution shall be mailed or delivered to Metro Regional Environmental Management Department, 600 N.E. Grand Avenue, Portland, OR 97232, to the attention of Maurice Neyman, Project Manager. Any interpretations or changes in the Contract Documents will be made only in writing, in the form of Addenda to the Contract Documents which will be furnished to all Bidders receiving a set of the Bidding Documents and which shall be binding upon all Bidders as if set forth in the original Contract Documents. Bidders shall indicate receipt of all Addenda on their Bids. Metro will not be responsible for any other explanation or interpretation of the Bidding Documents. Bidders shall have no right to rely on any oral interpretation or instructions made by Metro or the Architect/Engineer, unless it is also committed to writing and issued as an Addendum.

In the absence of any pre-bid request for clarification, or any interpretation of the Contract Documents, as outlined above, any subsequent interpretation shall be made by Metro, and shall be final and binding on the successful Bidder, and Metro shall pay no extra costs or expenses to such Bidder resulting from such interpretation.

4. EXAMINATION OF CONTRACT DOCUMENTS AND SITE AND COMPLIANCE WITH LAWS

Before submitting a Bid, Bidders shall fully examine and read the Contract Documents; visit the site of the proposed Work, and examine the Site and the surrounding areas; and fully inform themselves of all conditions on, in, at and around the Site, the surrounding areas, and any work that may have been done thereon. The Bidder acknowledges by the submission of its Bid that it understands the nature and location of the Work, the general and local conditions, conditions of the Site, availability of labor, electric power, water, and the kind of surface materials on the Site, the kind of equipment needed, and all other matters which may in any way affect the Work or the cost, including utilities not identified in the Contract Documents.

Information derived from inspection of the Contract Documents and any specific sections thereof showing location of utilities and structures will not in any way relieve the Contractor from any risk, or from properly examining the Site and making such additional investigations as it may elect, or from properly fulfilling all the terms of the Contract Documents. Investigation of Site and soil conditions have been conducted for Metro. Bidders may inspect the records of such investigations at locations specified in Section 00200.

Metro does not in any way warrant the accuracy of any information in such investigations and Bidders shall have no right to rely on the information contained in such records or investigations. Furthermore, if the Bidder determines that additional investigations of site and/or soil conditions are necessary or desirable, Bidder shall cause such additional investigations to be made, at Bidder's expense, prior to submitting a Bid and subject to coordination with Metro.

Any failure of a Bidder to acquaint itself with all of the available information concerning conditions or having such additional investigations of Site and soil conditions conducted, as may be necessary, will not relieve it from responsibility for estimating properly the difficulties or cost of the Work and the Bidder shall, regardless of such failure, be bound to its Bid.

Each Bidder shall inform itself of, and the Bidder awarded a Contract shall comply with, federal, state, and local laws, codes, statutes, ordinances, and regulations, as amended, relative to the execution of the Work. Each Bidder shall prepare its Bid in accordance with, and all Bid prices shall assume compliance with, such laws, codes, statutes, ordinances and regulations. This requirement includes, but is not limited to, applicable regulations concerning minimum wage rates, prevailing wage rates, nondiscrimination in the employment of labor, protection of public and employee safety and health, environmental protection, the protection of natural resources, fire protection, burning and non burning requirements, permits, fees, and similar subjects.

If any portion of the Contract Documents does not conform to such laws, codes, statutes, ordinances or regulations as amended, the Bidder shall so advise Metro in writing at least seven (7) days before Bids are due. If it is shown that the Contractor, as Bidder, knew or should have known that any portion of the Contract Documents does not conform to such laws, codes, statutes, ordinances or regulations and had failed to so advise Metro, it shall be liable for costs of

making any deviation(s) required for compliance with such laws, codes, statutes, ordinances or regulations.

Each Bidder, in submitting its Bid, certifies that the Bidder is eligible to bid on and to receive a contract for a public work, as set forth in ORS 279.361 and agrees, if awarded the Contract, that each of its Subcontractors will be required to certify such compliance, and certification will be filed with Metro prior to such Subcontractor commencing any work under the Contract. A copy of "PREVAILING WAGE RATES for Public Works Contracts in Oregon" is enclosed herein and applies to the work performed under the Contract.

5. MINORITY, WOMEN-OWNED FIRMS AND EMERGING SMALL BUSINESS PROGRAM COMPLIANCE

Minority, Women-Owned Firms and Emerging Small Business Program

In the event that any subcontracts are to be utilized in the performance of this agreement, the Bidder's/Proposer's attention is directed to Metro Code Section 2.04.100.

The following program information is intended to succinctly outline the prime action steps required of all Bidders/Proposers. It is not a substitute for and shall not be construed as a complete recital of all issues, concerns, and program instructions contained within that ordinance. Therefore, all Bidders/Proposers are specifically advised to consult the original document for definition of the specific terminology contained herein and complete insight into all program requirements.

Copies of that document are available from the Contracts Services Division of the Department of Administrative Services, Metro Regional Center, 600 NE Grand Avenue, Portland, OR 97232-2736 or call (503) 797-1717.

Metro Extends Equal Opportunity to all persons and specifically encourages MBE/WBE/ESBs to access and participate in this and all Metro projects, programs and services.

Metro Prohibits Discrimination against any person or firm based upon race, color, national origin, sex, sexual orientation, age, religion, physical handicap, political affiliation or marital status.

Metro Specifically Requires all Bidders/Proposers to demonstrate and document good faith efforts reasonably expected to produce and maximize the opportunities for subcontractor and supplier involvement by MBE/WBE/ESBs.

For purposes of this program, performing, documenting, and certifying compliance with all of the actions outlined on the attached forms shall constitute a rebuttal presumption that the Bidder/Proposer has made the good faith efforts required by this program.

The attached Compliance Forms are the basis for recording and documenting the completion of the above-listed actions. Completion of the Program Form and Documentation of all six (6) actions

outlined therein is mandatory. Failure to complete and submit the forms and all required support documentation at the time of Bid opening/Proposal submission and all required documentation subsequently requested, will result in rejection of the Bid/Proposal as non-responsive to Metro's procurement requirements.

By signing the forms, the Bidder/Proposer thereby certifies that it has not discriminated against MBE/WBE/ESBs in obtaining any subcontracts for this project, and that its documented good faith efforts were reasonably expected to result in participation by those enterprises in this project.

Conversely, failure to provide such documentation by the Bid or submission deadline shall create a rebuttal presumption that the respondent has not made a good faith effort as required by the program.

Furthermore, Metro reserves the right, at all times during the subsequent course of any awarded contract, to monitor compliance with the terms of this program, require additional written documentation or proof of good faith efforts, and depend upon the Contractor's immediate compliance.

6. PREPARATION OF BIDS

All blank spaces in the Bid Forms must be completed either by typing or in ink. Amounts shall be shown in both words and figures. Any Bids which do not include prices on all Bid Items will be considered non-responsive and will be rejected. No changes shall be made in the phraseology of the forms.

Metro reserves the right to declare any bid non-responsive and reject it without further consideration if it is deemed to contain errors, omissions, erasures, alterations, additions, deletions, unbalanced pricing, is conditioned by the Bidder, or in any manner, extent or way fails to conform to each and every specific requirement(s) of these Contract Documents.

Each Bid shall give the full business address of the Bidder and be signed by it with its legal signature.

- a. Bids by partnerships must furnish the full name of all partners and must be signed in the partnership name by one of the members of the partnership authorized to sign contracts on behalf of the partnership, or by an authorized representative, followed by the printed name and title of the person signing.
- b. Bids by corporations must be signed with the legal name of the corporation, followed by the name of the state of incorporation and by the signature and designation of the president, secretary or other person authorized to bind it in the matter. When requested by Metro, satisfactory evidence of the authority of the officer signing in behalf of the corporation shall be furnished.

- c. If a Bid is submitted by a joint venture, a certified copy of the legal agreement constituting the joint venture shall be attached to the Bid.

The name of each person signing shall also be typed or printed below the signature. Signatures of all individuals must be in longhand.

Failure to fulfill any of the above requirements may render the Bid non-responsive.

7. SUBMISSION OF BIDS

All bids must be submitted not later than the time prescribed, at the place, and in the manner set forth in the INVITATION TO BID. Bids must be made on the forms provided under separate cover as the BID BOOK, these forms are also contained herein as the Bid Forms. Each Bid and all other documentation required to be submitted with the Bid must be submitted in a sealed envelope, so marked as to indicate its contents without being opened, and addressed in conformance with the instructions in the INVITATION TO BID and the ADVERTISEMENT FOR BIDS.

8. MODIFICATION OR WITHDRAWAL OF BIDS

Any Bid may be modified after delivery to the location specified in the Invitation to Bid by delivering to the same location before the time fixed for the Bid opening, a written sealed supplement to the original Bid, marked "Supplement to Bid of (Name of Bidder) for the St. Johns Landfill Maintenance Building," Attention Maurice Neyman, Project Manager. A supplement shall clearly identify the Bid item(s) that are changed by setting forth the original Bid item(s), and the modified item(s). Metro may reject any Bid supplement that, in its opinion, does not set forth the proposed modifications clearly enough to determine the definiteness and certainty of the item(s) offered by the Bidder. No Bidder shall be allowed to submit more than one (1) Bid for this Contract.

Bids may be withdrawn by the Bidder prior to the time fixed for the receipt of Bids by having an authorized representative of the Bidder with sufficient identification personally pick up the Bid. Bids may not be withdrawn for a period of sixty (60) days from and after the opening of Bids or on or prior to the last date of any extension of such time as may be agreed upon between Metro and the Bidder.

9. BID SECURITY

Bids must be accompanied by a certified check or cashier's check drawn on a bank in good standing, or a Bid Bond on the form provided herein by Metro, issued by a surety authorized to issue such bonds in Oregon, named on the current list of approved surety companies acceptable on federal bonds, and conforming with the underwriting limitations as published in the Federal

Register by the audit staff of the Bureau of Accounts and the US. Treasury Department, in the amount of not less than Ten Percent (10%) of the bid amount. This bid security shall be given as a guarantee that the Bidder will not withdraw its Bid for a period of sixty (60) days after Bid opening, and that if awarded the Contract, the successful Bidder will execute the attached Agreement and furnish a properly executed Performance Bond and a properly executed Labor and Materials Payment Bond, each in the full amount of the Bid, within the time specified. Bid security deposited in the form of a certified check or cashier's check shall be subject to the same requirements as a Bid Bond.

The Attorney-in-Fact (Resident Agent) who executes these bonds on behalf of the surety must attach a notarized copy of his/her Power of Attorney as evidence of his/her authority to bind the surety on the date of execution of the bond.

10. EXPERIENCE AND ABILITY TO PERFORM THE WORK

Within twenty-four (24) hours following request by Metro, any Bidder may be required to present information indicating that the Bidder has the necessary experience and qualifications in the class of Work to be performed, and the ability, equipment, key personnel and financial resources to perform the Work satisfactorily within the time specified. In determining the award of this Contract, such information will be considered, and the Bidder is cautioned to make complete and comprehensive presentation of its abilities and resources. Failure of any Bidder to comply fully and timely with a request for information under this section shall be grounds for rejection of that Bid.

No Bidder will be considered for contract award unless such Bidder is authorized by law to execute the Contract or perform the Work for which such Bid is received. Should it appear, at any time, that any Bidder is not or might not be authorized by law to execute the Contract or perform such Work, then such Bidder may at any time be rejected and Metro may refuse to execute any contract with such Bidder regardless of whether or not the contract had been previously awarded by the Metro Council and without any liability whatever on the part of Metro, its Council, or any member of its Council, or Metro's officer, employees, or its agents, either as individuals or in official capacities.

11. REJECTION OF BIDS

Metro reserves the right to reject all Bids or any Bid not conforming to the intent and purpose of the Contract Documents, to waive any informality or irregularity in any Bid or Bids, to reject any Bid not in compliance with all prescribed public bidding procedures and requirements and, for good cause, to reject any or all Bids upon a finding by Metro that it is in the public interest to do so.

12. BASIS OF AWARD

Metro reserves the right to make award of this Contract to the lowest responsible Bidder submitting the lowest responsive bid, which shall include the base bid plus any owner selected alternates.

Under Oregon Law ORS 279.570 (included in an Appendix to the bid documents), public agencies, including Metro, must give preference to the purchase of materials and supplies manufactured from recycled materials. All Bidders are required to specify the minimum, if not exact, percentage of recycled product in each product offered, and both the post-consumer and secondary waste content of each product offered. A Bidder may also specify that none of the products offered contain any recycled product. The definitions of "recycled product," "post-consumer waste," and "secondary waste material," as well as other explanatory materials, are included in the Appendix.

A form is included for submittal of recycled product information. The form allows a bidder to specify that different portions of a single bid item contain different amounts of recycled product. If the recycling information form is not submitted with the bid, Metro will assume that none of the products offered contain any recycled product. In addition, Metro will assume that a bid item contains no recycled product if information submitted for the item is in Metro's opinion incomplete, incorrect, or unintelligible.

Metro will calculate the recycled product preference as follows: If any Bidder submits a bid price for an item that (1) meets the definition of "Recycled Product" (see Oregon Laws 1991, Chapter 385, Section 59, in Appendix), (2) meets applicable standards, and (3) can be substituted for a comparable non-recycled product, Metro will subtract 5 percent of that item's materials cost from the Total Bid Price for the purpose of comparing bids. It is Metro's responsibility to calculate any preferences required under Oregon law and to establish the materials cost of any proposed bid item. A Bidder who claims a recycled product preference shall utilize in this Work, all of the recycled product claimed.

In determining the lowest responsive bid and responsible Bidder, Metro shall, for the purpose of awarding the Contract, add a percent increase on the Bid of a non-resident Bidder, as that term is defined in ORS 279.029(6)(c), equal to the percent, if any, of the preference given to that non-resident Bidder in the state in which that Bidder resides. For purposes of determining the percent increases to be applied pursuant to this section, Metro shall rely on the list published by the Oregon Department of General Services pursuant to ORS 279.029(3), and Metro shall not incur any liability to any Bidder by relying on such list.

13. ALTERNATES

Metro will select, at its discretion, any of the proposed alternates described in the SCHEDULE OF BID PRICES, which will be part of the Basis of Award (see Article 12 in this Section - Basis of Award.)

14. LIST OF PROPOSED SUBCONTRACTORS

Metro will require all Bidders to furnish in writing to Metro the names of all Subcontractors and Suppliers which Bidder proposes to use in completing the Work along with a brief description of the subcontract or supply work involved and the subcontract or supply work dollar amount by the close of the next working day following Bid opening. Metro will notify the Bidder in writing within ten (10) days following receipt from Bidder of the above-described information if Metro has any reasonable objection to any such proposed Subcontractor or Supplier. The Bidder shall not subcontract with any proposed Subcontractor or Supplier to whom Metro has made a reasonable objection. In the event of such objection, Bidder shall propose another entity to whom Metro has no reasonable objection. No amounts or prices bid by the Bidder shall be increased by any difference occasioned by such substitution. Failure of Metro to reply within the above-described time period shall be construed to mean that Metro has no objection at that time. Failure of the Bidder to comply with this section shall be cause for rejection of Bidder's Bid and, in such event, the bid security submitted by Bidder shall be taken by Metro and considered as liquidated damages.

Prospective Bidders are encouraged to verify the qualifications of proposed subcontractors/suppliers and be prepared to furnish Metro with a list of similar projects performed by the proposed subcontractors/suppliers.

15. AWARD AND EXECUTION OF CONTRACT

Within sixty (60) days after the opening of bids, Metro will accept one of the Bids or reject all of the bids. The acceptance of the Bid will be by written Notice of Award, mailed or delivered to the office designated in the Bid. The Notice of Award shall not entitle the party to whom it is delivered to any rights whatsoever.

The successful Bidder shall, within seven (7) days after award of the Contract by the Metro Council, sign and deliver to Metro the Agreement attached hereto together with an acceptable Performance Bond and a Labor and Materials Payment Bond, certificates of insurance and certified copies of insurance policies as required in these Contract Documents.

Upon receipt of the signed Agreement and all other documents required to be submitted by the successful Bidder, as prescribed herein, Metro shall sign the Agreement and issue a written Notice to Proceed to Contractor. Contractor shall commence work within five (5) days of issuance of the Notice to Proceed.

In the event of failure of the lowest responsible Bidder to sign and return the construction Agreement and all other documents required to be submitted, as prescribed herein, Metro may award the Contract to the next lowest responsible Bidder.

16. PERFORMANCE BOND AND LABOR AND MATERIALS PAYMENT BOND

The successful Bidder shall file with Metro a Performance Bond on the form bound herewith and in the amount described below, as security for the faithful performance of this Contract and to cover all guarantees against defective workmanship or materials, or both. The successful Bidder shall additionally file a Labor and Materials Payment Bond on the form bound herewith and in the amount described below, as security for the payment of all persons supplying labor and materials for the performance of the Work. The surety furnishing these bonds shall have a sound financial standing and a record of service satisfactory to Metro, shall be authorized to do business in the state of Oregon, and shall be named on the current list of approved surety companies acceptable on federal bonds and conforming with the underwriting limitations as published in the Federal Register by the audit staff of the Bureau of Accounts and US. Treasury Department. If more than one surety is on a bond, then each surety must agree that it is jointly and severally liable on the bond for all obligations on the bond. A Letter of Credit, in a form suitable to Metro and otherwise in conformance with the Contract, may be substituted for a bond.

The amount of each bond described above shall be a sum not less than 100 percent of the Contract Amount. The Attorney-in-Fact (Resident Agent) who executes the Performance Bond and the Labor and Materials Payment Bond on behalf of the surety must attach a notarized copy of his/her Power of Attorney as evidence of his/her authority to bind the surety on the date of execution of the bond.

17. FAILURE TO EXECUTE CONTRACT AND FURNISH BONDS

The Bidder to whom a Contract is awarded who fails to promptly and properly execute this Contract and furnish the required bonds, certificates of insurance and certified copies of insurance policies shall forfeit the bid security that accompanied its Bid and the bid security shall be retained as liquidated damages by Metro. It is agreed that this sum is a fair estimate of the amount of damages Metro will sustain if the Bidder fails to enter into a Contract and furnish the bonds, certificates of insurance and certified copies of insurance policies required.

18. BID BACK-UP (Bid Preparation Documents)

Within five (5) days after Notice of Award and as a condition precedent to the award of the Contract, the apparent low responsible Bidder shall submit to Metro in a sealed envelope their complete bid summary, along with corresponding back-up including, but not limited to: quantity take-off sheets, pricing sheets and information/data substantiating the Total Bid amount. The back-up data provided will include that of all Subcontractors listed in the Bid, as well as all

lower-tier Subcontractors. This bid summary and back-up data will be held in strict confidence by Metro in its original sealed envelope and will not be opened except in the event of dispute between Metro and Contractor. Bid back-up shall be delivered to Metro Regional Environmental Management Department, 600 N.E. Grand Avenue, Portland, OR 97232, Attention Maurice Neyman, Project Manager, enclosed in a double envelope to prevent accidental opening. The envelope shall be marked "Bid Back-Up Documents of (Name of Bidder) for the Maintenance Building, St. Johns Landfill."

SECTION 00200
INFORMATION AVAILABLE TO BIDDERS

A copy of the following permits and reports are available for review at the Metro Regional Center, Regional Environmental Management Department Office, 600 N.E. Grand Avenue, Portland, OR 97232.

Kleinfelder, Inc., Limited Environmental Site Assessment, Triangle Property (Parcel "A") and Skirt Property, N. Columbia Blvd., St. Johns Landfill Access Road, Portland, Oregon., January 1997

Parametrix Inc., Technical Memorandum, Phase II Environmental Sampling and Analytical Program (SAP) and Groundwater Quality Impacts Study, Proposed Ramsey Lake Constructed Wetland Treatment System, Triangle Property, Portland, Oregon., July 1992.

* * * END OF SECTION * * *

**SECTION 00300
BID FORMS**

NOTE TO BIDDER: Bidders must provide all of the information requested in this Bid. Bidder should type or use ink for completing this Bid.

To: Metro Regional Environmental Management Department

Address: 600 N.E. Grand Avenue, Portland, OR 97232

Contract: Maintenance Building, St. Johns Landfill
(RFB #98B-26-REM).

Bidder: _____

Address: _____

Bidder's Contact: _____

Date: _____ Telephone: () _____

BIDDER'S DECLARATION AND UNDERSTANDING

The undersigned, hereinafter called the Bidder, declares that the only persons or parties interested in this Bid are those named herein, that this Bid is, in all respects, fair and without fraud, that it is made without collusion with any official of Metro, and that the Bid is made without any connection or collusion with any person submitting another Bid on this Contract.

The Bidder further declares that it has carefully examined the Contract Documents for the completion of the Work, has personally inspected the Site, has satisfied itself as to the Work involved, and that this Bid is made in accordance with the provisions and under the terms of the Contract Documents which are hereby made a part of this Bid.

Any printed matter on any letter or paper enclosed herewith which is not part of the Bidding Documents or which was not requested by Metro is not to be considered a part of this Bid, and the undersigned agrees that such printed matter shall be entirely disregarded and, notwithstanding such printed matter, that the Bid is a bid to do the Work and furnish the labor and materials and all other things required by the Contract Documents strictly within the time and in accordance with such Specifications. This Bid is irrevocable for sixty (60) days following the date of the opening of Bids.

BID SECURITY

Bid security in the form of a certified check, cashier's check or bid bond as further described in the Instructions for Bidders and in the amount of TEN PERCENT (10%) of the total bid amount is enclosed herewith and is subject to all the conditions stated in the Instructions for Bidders.

CONTRACT EXECUTION, BONDS AND INSURANCE

The Bidder agrees that if this Bid is accepted, it will, within seven (7) days after award of the Contract by the Metro Council, sign the Construction Agreement in the form annexed hereto, and will at that time deliver to Metro the Performance Bond and the Labor and Materials Payment Bond required herein and in the form annexed hereto, along with all certificates of insurance and certified copies of insurance policies specified and required in these Contract Documents, and will, to the extent of its Bid, furnish all machinery, tools, apparatus, and other means of operation and construction and do the Work and furnish all the materials necessary to complete all Work as specified or indicated in the Contract Documents.

COMMENCEMENT OF WORK AND CONTRACT COMPLETION TIME

The time frame for the award and execution of this Contract shall be as described in the Instructions for Bidders and other Contract Documents. The Successful Bidder further agrees to commence the Work within five (5) days of issuance of the Notice to Proceed and to diligently prosecute the Work to its final completion in accordance with the Contract Documents.

ADJUSTED PAYMENTS

In the event the Bidder is awarded the Contract and fails to complete the Work in compliance with the time required by the Contract Documents, adjusted payments shall be paid to Metro as described in the General Conditions.

SALES AND USE TAXES

The Bidder agrees that all applicable federal, state and local sales and use taxes are included in the stated bid prices for the Work.

LUMP SUM AND UNIT PRICE WORK

The Bidder further proposes to accept as full payment for the Work proposed herein the amounts computed under the provisions of the Contract Documents and based on the listed lump sum and unit price amounts. The amounts shall be shown in both words and figures. In case of a discrepancy, the amount shown in words shall govern.

PREVAILING WAGES FOR PUBLIC WORK

Bidder hereby certifies that the provisions of ORS 279.350, regarding prevailing wages, shall be complied with on this project.

SCHEDULE OF BID PRICES

The Bidder, whose legal signature binding the Bidder to the bid prices indicated on these pages is found on the signature page, hereby bids as follows:

NOTE: If any of the items for this project contain "recycled product" (See Appendix), the Bidder shall specify the amounts of such product in an attachment to the Bid Form. If no attachment is included, the amount of "recycled product" to be used by Bidder will be considered to be zero for the purpose of this Bid. Metro reserves the right to reject any or all Bids.

Bid Price for Mobilization \$ _____
(_____ DOLLARS)

TOTAL BID PRICE (sum of all of the above) \$ _____
(_____ DOLLARS)

RECYCLED PRODUCT* ATTACHMENT TO SCHEDULE OF BID PRICES

BID ITEM NO. & DESCRIPTION	SUPPLIER	QUANTITY OF RECYCLED PRODUCT IN BID ITEM	RECYCLED PRODUCT (%)	POST- CONSUMER CONTENT (%)	SECONDARY WASTE CONTENT (%)	BID AMOUNT OF RECYCLED PRODUCT (\$)

* NOTES:

1. For definitions refer to Appendix, Oregon Law 1991, Chapter 385, Section 59 and 61.
2. It is the Bidder's responsibility to determine if the recycled product meets the Contract specifications. Metro reserves the right to confirm information submitted by contacting the manufacturer.

ADDENDA

The Bidder is presumed to have read and hereby acknowledges receipt and acceptance of Addenda Numbers:

(Insert No. and Date of Each Addendum Received)

SURETY

If the Bidder is awarded a Contract on this Bid, the surety or sureties who provide(s) the Performance Bond and Labor and Materials Payment Bond will be:

SURETY

ADDRESS

1. _____
2. _____

GOOD FAITH PROGRAM

The Metro Council is committed to doing business with minority, woman-owned firms and emerging small businesses. The Council recognizes that supporting these firms will result in a stronger economy and increased competition.

To this end, the Metro Executive Officer has established these procedures to maximize utilization of MBEs, WBEs and ESBs for Metro projects. The following six steps are required to help us monitor the usage of these firms.

Good Faith Efforts Steps:

1. Identify areas in which you intend to use sub-contractors.
2. Attend the Pre-Bid meeting if held. Meet any MBE/WBE/ESB firms at the Pre-Bid meeting.
3. Contact several (or all) certified MBE/WBE/ESB firms listed (with the State of Oregon) to perform the work needed. (Metro's Risk & Contracts Office will be happy to provide you with a list of firms)
4. Negotiate with interested, available and capable MBE/WBE/ESB firms who submit competitive bids.
5. Report to Metro all sub-contractors contacted, please include their response and price quoted.
6. List all sub-contractors that you intend to use on this project.

Please note a selected MBE/WBE/ESB firm must be used unless the Executive Officer authorizes a substitution.

Thank you for your assistance in this important area. Attached are forms to complete and return as part of your bid document. Please contact our Risk & Contracts Division at 797-1714 if you have any questions.

**MBE/ WBE/ESB
PROGRAM FORM**

Project Name _____

Bidder/Proposer _____

Address _____

Phone & Fax _____

Step 1. Identify areas in which you intend to use sub-contractors.

Step 2. Attend the Pre-Bid meeting if mandatory. Meet any MBE, WBE, ESB firms at the Pre-Bid meeting.

(Name of person who attended pre-bid)

Step 3 & 5. List all firms contacted for sub-contracting work. (Use more sheets if necessary)

Sub contract for _____

MBE, WBE, ESB, Other	Name of Firm	Date contacted	Amount of Bid	Comments

Sub contract for _____

MBE, WBE, ESB, Other	Name of Firm	Date contacted	Amount of Bid	Comments

Sub contract for _____

MBE, WBE, ESB, Other	Name of Firm	Date contacted	Amount of Bid	Comments

Sub contract for _____

MBE, WBE, ESB, Other	Name of Firm	Date contacted	Amount of Bid	Comments

Step 6. List all sub-contractors used for this project.

BIDDER/PROPOSER INTENDS TO SUBCONTRACT WITH THE FOLLOWING

SUBCONTRACTOR/ SUPPLIER	MBE WBE ESB	NATURE OF WORK BY BY SERVICE PROVIDED (ex. electrical)	DOLLAR VALUE OF PARTICIPATION

Total Bid/Proposal Amount _____

Authorized Signature _____ Date _____

THIS FORM MUST BE SUBMITTED AT THE TIME OF BID OPENING OR PROPOSAL SUBMISSION

RESIDENT/NON-RESIDENT BIDDER STATUS

Oregon law requires that Metro, in determining the lowest responsive Bidder, must add a percent increase on the Bid of a non-resident Bidder equal to the percent, if any, of the preference given to that Bidder in the state in which that Bidder resides. Consequently, each Bidder must indicate whether it is a resident or non-resident Bidder. A resident Bidder is a Bidder that has paid unemployment taxes or income taxes in the state of Oregon during the twelve (12) calendar months immediately preceding submission of this Bid, has a business address in Oregon, and has stated in its Bid that the Bidder is a "resident Bidder." A "non-resident Bidder" is a Bidder who is not a resident Bidder (ORS 279.029).

The undersigned Bidder states that it is: (check one)

- 1. _____ A resident Bidder
- 2. _____ A non-resident Bidder

Indicate state in which Bidder resides: _____

SIGNATURE PAGE

The name of the Bidder submitting this Bid is _____ doing business at

Street City State Zip

which is the full business address to which all communications concerned with this Bid and with the Contract shall be sent.

The names of the principal officers of the corporation submitting this Bid, or of all of the partners, if the Bidder is a partnership or joint venture, or of all persons interested in this Bid as individuals are as follows:

If Individual

IN WITNESS hereto the undersigned has set his/her hand this ____ day of _____, 19____.

Signature of Bidder _____

Printed Name of Bidder _____

Title _____

If Partnership or Joint Venture

IN WITNESS hereto the undersigned has set his/her hand this ____ day of _____, 19__.

Name of Partnership or Joint Venture

By: _____

Printed Name of Person Signing

Title: _____

If Corporation

IN WITNESS WHEREOF the undersigned corporation has caused this instrument to be executed and its seal affixed by its duly authorized officers this ____ day of _____, 19__.

Name of Corporation

State of Incorporation

By: _____

Printed Name of Person Signing

Title: _____

NON-COLLUSION AFFIDAVIT

STATE OF _____) County of _____)

I state that I am _____(Title) of _____(Name of Bidder) and that I am authorized to make this Affidavit on behalf of the Bidder. I am the person authorized by the Bidder and responsible for the price(s) and the amount of this Bid.

I state that: (1) The price(s) and amount of this Bid have been arrived at independently and without consultation, communication or agreement with any other contractor, Bidder or potential Bidder, except as disclosed in the attached appendix.

(2) Neither the price(s) nor the amount of this Bid, and neither the approximate price(s) nor approximate amount of this Bid, have been disclosed to any other person who is a Bidder or potential Bidder, and they will not be disclosed before bid opening.

(3) No attempt has been made or will be made to induce any person to refrain from bidding on this contract, or to submit a Bid higher than this Bid, or to submit any intentionally high or non-competitive bid or other from of complementary Bid.

(4) This Bid is made in good faith and not pursuant to any agreement or discussion with, or inducement from, any person to submit a complementary or other noncompetitive Bid.

(5) _____(Name of Bidder), its affiliates, subsidiaries, officers, directors and employees (as applicable) are not currently under investigation by any governmental agency and have not in the last four years been convicted of or found liable for any act prohibited by state or federal law in any jurisdiction, involving conspiracy or collusion with respect to bidding on any public contract, except as listed and described in the attached appendix.

I state that I and _____(Name of Bidder) understand and acknowledge that the above representations are material and important, and will be relied on by Metro in awarding the Contract for which this Bid is submitted. Any misstatement in this Affidavit will be treated as fraudulent concealment from Metro of the true facts relating to the submission of Bids for this Contract.

Signature of Affiant

Printed Name of Affiant

Sworn to and subscribed before me this ____ day of _____, 19____.

Notary Public for

My Commission Expires: / /

BID BOND

(NOTE: BIDDERS MUST USE THIS FORM, NOT A SURETY COMPANY FORM)

KNOW ALL PERSONS BY THESE PRESENTS:

We the undersigned, _____, as PRINCIPAL,
and _____, a corporation organized and existing under and by virtue of the laws of
the state of _____ and duly authorized to do surety business in the state of Oregon
and name on the current list of approved surety companies acceptable on federal bonds and conforming with the
underwriting limitations as published in the Federal Register by the audit staff of the Bureau
of Accounts and the U.S. Treasury Department and is of the appropriate class for the bond amount as determined
by Best's Rating System, as SURETY, hereby hold and firmly bind ourselves, our heirs, executors,
administrators, successors and assigns, jointly and severally, unto the METRO, as OBLIGEE, in the sum of
\$ _____ in lawful money of the United States of America, for the payment of which sum well and truly
to be made as agreed and liquidated damages.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT whereas the PRINCIPAL has submitted to
METRO a certain Bid for work required for the Maintenance Building, St. Johns Landfill which work is
specifically described in the accompanying Bid;

NOW, THEREFORE, if Metro does not award a contract to the PRINCIPAL within the time specified
in the Instructions to Bidders for the work described in said Bid, or in the alternate, if said Bid shall be accepted
and the PRINCIPAL, within the time and in the manner described under the Contract Documents, enters into a
written contract in accordance with the Bid, files the two bonds, one guaranteeing faithful performance of the
work to be done and the other guaranteeing payment for labor and materials as required by law, and files the
required certified copies of insurance policies and certificates of insurance, then the obligation shall be null and
void; otherwise, the same shall remain in full force and effect.

The SURETY, for value received, hereby stipulates and agrees that the obligation of said SURETY and this
bond shall be in no way impaired or affected by any extension of the time within which Metro may accept such
Bid; and said SURETY does hereby waive notice of any such extension.

If more than one surety is on this bond, each surety hereby agrees that it is jointly and severally liable for all
obligations on this bond.

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

SURETY

PRINCIPAL

By: _____

By: _____

Title: _____

Title: _____

SECTION 00500
CONSTRUCTION AGREEMENT

This Construction Agreement is made by and between _____, hereinafter called Contractor and Metro, a metropolitan service district organized under the laws of the State of Oregon and the Metro Charter, hereinafter called Metro.

Contractor and Metro agree as follows:

1. Contract Documents

The Contract Documents consist of this Construction Agreement, the Advertisement for Bids, the Invitation to Bid, the Instructions to Bidders, the Bid Forms (including Schedule of Bid Prices, Surety, MBE/WBE/ESB Business Program Compliance, Prevailing Wage Rate Compliance, Resident/Non-resident Bidder Status, Signature Page, Non-Collusion Affidavit, Bid Bond, MBE and WBE Utilization), the Performance and the Labor and Materials Payment Bonds, the General Conditions, the Supplementary Conditions, the Technical Specifications, the Drawings, the approved and updated Construction Schedule, and other information and data as listed in the Supplementary Conditions, and any modifications of any of the foregoing in the form of Addenda or Change Orders in accordance with the terms of the Contract. Where applicable, reference to this Construction Agreement herein shall be deemed to refer to all of the Contract Documents.

These documents form the Contract and are, by this reference, expressly incorporated herein. All are as fully a part of the Contract as if attached to this Construction Agreement and repeated fully herein. No amendment made to this Contract nor Change Order issued shall be construed to release either party from any obligation contained in the Contract Documents except as specifically provided in any such amendment or Change Order.

2. Scope of Work

Contractor agrees to provide all labor, tools, equipment, machinery, supervision, transportation, permits, and every other item and service necessary to perform the Work described in the Contract Documents. Contractor agrees to fully comply with each and every term, condition and provision of the Contract Documents.

3. Contract Amount

As consideration for Contractor's performance hereunder, Metro agrees to pay contractor the Contract Amount as adjusted by approved Change Orders issued pursuant to the Contract Documents and subject to the availability of monies in the Construction Fund. Contractor agrees to accept the Contract Amount as full payment for contractor's performance of the above described Work.

The Contract Amount is _____

Metro shall make payments to Contractor in the manner and at the times provided in the Contract Documents.

4. Additional or Deleted Work

Contractor shall, when so instructed by Metro under the procedures of the contract Documents, perform additional Work or delete Work in accordance with the Contract Documents. Any increase or decrease in the Contract Amount shall be determined pursuant to the applicable provisions of the Contract Documents.

5. Time of Completion; Adjusted Payments

Time is of the essence of this Construction Agreement. The Contract Time shall commence upon issuance of the Notice to Proceed. Contractor shall commence work under this Contract within five (5) calendar days after issuance of written Notice to Proceed. Contractor shall bring the work to substantial completion no later than one hundred fifty (150) days after notice to proceed. By executing this Construction Agreement, Contractor confirms and accepts that the Contract Time so stated is a reasonable period for performance of all of the Work.

If Contractor fails to substantially complete the Work, within the Contract Time, as determined by Metro in accordance with the Contract Documents, Contractor shall be liable for adjusted payments to Metro as described in the Contract Documents.

6. Bonds

Contractor submits herewith a Performance Bond and a separate Labor and Materials Payment Bond, both in a form acceptable to Metro and otherwise in accordance with the Contract Documents and each in the Contract Amount to ensure full compliance, execution and performance of this Contract by Contractor and payment by Contractor of labor and material Suppliers as more fully described in the Contract Documents.

7. Remedies for Default

If Contractor fails to perform as specified in the Contract Documents, Metro shall be entitled to all the rights and remedies which this Contract provides, as well as all remedies provided by law. This Contract shall not be construed as limiting or reducing the remedies provided by law which Metro would have in the absence of any provision of the Contract.

8. Laws of Oregon Apply

The law of Oregon shall govern the interpretation and construction of this Construction Agreement and all of the Contract Documents.

For public work subject to ORS 279.348 to 279.365, the Contractor shall pay prevailing wages and shall pay an administrative fee to the Bureau of Labor and Industries pursuant to the administrative rules established by the Commissioner of the Bureau of Labor and Industries.

9. Entire Agreement

The Contract Documents constitute the final written expression of all of the terms of this Construction Agreement and are a complete and exclusive statement of those terms. Any and all representations, promises, warranties, or statements by either party that differ in any way from the terms of this written agreement shall be given no force and effect. This Contract shall be changed, amended, or modified only by written instrument signed by both Metro and Contractor. This Contract shall not be modified or altered by any course of performance by either party.

CONTRACTOR

METRO

By: _____

By: _____

Title: _____

Title: _____

Date: _____

Date: _____

SECTION 00600
PERFORMANCE BOND

(NOTE: CONTRACTORS MUST USE THIS FORM, NOT A SURETY COMPANY FORM)

KNOW BY ALL PERSONS BY THESE PRESENTS:

We the undersigned _____ as PRINCIPAL (hereinafter called CONTRACTOR), and _____, a corporation organized and existing under and by virtue of the laws of the state of _____, duly authorized to do surety business in the state of Oregon and named on the current list of approved surety companies acceptable on federal bonds and conforming with the underwriting limitations as published in the Federal Register by the audit staff of the Bureau of Accounts and the U.S. Treasury Department and is of the appropriate class for the bond amount as determined by Best's Rating System, as SURETY, hereby hold and firmly bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, to pay to Metro as OBLIGEE (hereinafter called Metro), the amount of _____ Dollars (\$ _____), in lawful money of the United States of America.

WHEREAS, the CONTRACTOR entered into a contract with Metro dated _____, 19____, which contract is hereunto annexed and made a part hereof, for accomplishment of the project described as follows: Maintenance Building, St. Johns Landfill.

NOW, THEREFORE, the condition of this obligation is such that if the CONTRACTOR shall promptly, truly and faithfully perform all the undertakings, covenants, terms, conditions, and agreements of the aforesaid Maintenance Building, St. Johns Landfill, Metro having performed its obligations thereunder, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Whenever CONTRACTOR shall be declared by Metro to be in default under the Contract Documents for the project described herein, the SURETY may promptly remedy the default, or shall promptly complete the Maintenance Building, St. Johns Landfill in accordance with the Contract Documents and the project Specifications. SURETY, for value received, further stipulates and agrees that all changes, extensions of time, alterations, or additions to the terms of the Contract or Specifications for the Maintenance Building, St. Johns Landfill are within the scope of the Surety's undertaking on this bond, and SURETY hereby waives notice of any such change, extension of time, alteration or addition to the terms of the Maintenance Building, St. Johns Landfill or to the Work or to the Specifications. Any such change, extension of time, alteration or addition to the terms of the Maintenance Building, St. Johns Landfill or to the Work or to the Specifications shall automatically increase the obligation of the SURETY hereunder in a like amount, provided that such increase shall not exceed twenty-five percent (25%) of the original amount of the obligation without the consent of the SURETY.

This obligation shall continue to bind the PRINCIPAL and SURETY, notwithstanding successive payments made hereunder, until the full amount of the obligation is exhausted.

No right of action shall accrue on this bond to or for the use of any person or corporation other than Metro or its heirs, executors, administrators, successors or assigns.

If more than one SURETY is on this bond, each SURETY hereby agrees that it is jointly and severally liable for obligations on this bond.

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

SURETY

By: _____

Title: _____

Street Address

City, State ZIP

Phone Number

CONTRACTOR

By: _____

Title: _____

Street Address

City, State ZIP

Phone Number

SECTION 00650
LABOR AND MATERIALS PAYMENT BOND

(NOTE: CONTRACTOR MUST USE THIS FORM, NOT A SURETY COMPANY FORM)

KNOW ALL PERSONS BY THESE PRESENTS:

We the Undersigned _____ as PRINCIPAL and _____, a corporation organized and existing under and by virtue of the laws of the state of _____, and duly authorized to do surety business in the state of Oregon and named on the current list of approved surety companies acceptable on federal bonds and conforming with the underwriting limitations as published in the Federal Register by the audit staff of the Bureau of Accounts and the U.S. Treasury Department and which carries an "A" rating and is of the appropriate class for the bond amount as determined by Best's Rating System, as SURETY, hereby hold and firmly bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, unto Metro, as OBLIGEE, in the sum of _____ Dollars (\$ _____) in lawful money of the United States of America, for the payment of that sum for the use and benefit of claimants as defined below.

The condition of this obligation is such that whereas the PRINCIPAL entered into a contract with Metro dated _____, 19____, which contract is hereunto annexed and made a part hereof, for accomplishment of the project described as follows: Maintenance Building, St. Johns Landfill.

NOW THEREFORE, if the PRINCIPAL shall promptly make payments to all persons, firms, subcontractors, corporations and/or others furnishing materials for or performing labor in the prosecution of the Work provided for in the aforesaid Maintenance Building, St. Johns Landfill, and any authorized extension or modification thereof, including all amounts due for materials, equipment, mechanical repairs, transportation, tools and services consumed or used in connection with the performance of such Work, and for all labor performed in connection with such Work whether by subcontractor or otherwise, and all other requirements imposed by law, then this obligation shall become null and void; otherwise this obligation shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is as specified in ORS 279.526.
2. The above-named PRINCIPAL and SURETY hereby jointly and severally agree with the OBLIGEE and its assigns that every claimant as above-specified, who has not been paid in full, may sue on this bond for the use of such claimant, prosecute the suit to final judgment in accordance with ORS 279.536 for such sum or sums as may be justly due claimant, and have execution thereon. The OBLIGEE shall not be liable for the payment of any judgment, costs, expenses or attorneys' fees of any such suit.

PROVIDED, FURTHER, that SURETY for the value received, hereby stipulates and agrees that all changes, extensions of time, alterations to the terms of the Maintenance Building, St. Johns Landfill or to Work to be performed thereunder or the Specifications accompanying the same shall be within the scope of the Surety's undertaking on this bond, and SURETY does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Maintenance Building, St. Johns Landfill or to the Work or to the Specifications. Any such change, extension of time, alteration or addition to the terms of the contract or to the Work or to the Specifications shall automatically increase the obligation of the SURETY hereunder in a like amount, provided that the total of such increases shall not exceed twenty-five percent (25%) of the original amount of the obligation without the consent of the SURETY.

This obligation shall continue to bind the PRINCIPAL and SURETY, notwithstanding successive payments made hereunder, until the full amount of the obligation is exhausted, or if the full amount of the obligation is not exhausted and no claim is pending resolution, until such time as no further claims can be made pursuant to law with regard to the above-described project, by any claimant specified in ORS 279.526.

If more than one SURETY is on this bond, each SURETY hereby agrees that it is jointly and severally liable for all obligations of this bond.

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

SURETY

By: _____

Title: _____

Street Address

City, State ZIP

Phone Number

CONTRACTOR

By: _____

Title: _____

Street Address

City, State ZIP

Phone Number

SECTION 00700

GENERAL CONDITIONS

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GENERAL CONDITIONS

ARTICLE 1 GENERAL PROVISIONS

- 1.1. Definitions. Unless otherwise defined or specified in the Contract Documents, the following terms shall have the meanings indicated:
 - 1.1.1. Act of God -- means an earthquake, flood, typhoon, cyclone or other natural phenomenon of catastrophic proportions or intensity.
 - 1.1.2. Addendum (Plural: Addenda) -- means a document issued by Metro during the bidding period which modifies, interprets, supersedes or supplements the Contract Documents and becomes a part of the Contract Documents. It is the Bidder's responsibility to determine how addenda impact the Work. All Bids submitted shall include the cost of the Work included in any addenda issued prior to award.
 - 1.1.3. Alternate Bids -- are portions of the Work for which a Bidder must submit a separate Bid amount. Alternate Bid items may or may not be awarded at Metro's discretion.
 - 1.1.4. Architect/Engineer -- is the firm representing Metro as designers and its agents, representatives, employees and consultants or such other firm as Metro may appoint. The Architect/Engineer will have authority to act on behalf of Metro only to the extent provided in these Contract Documents.
 - 1.1.5. "As-Builts" or Record Documents -- are those drawings made, revised or annotated by Contractor and approved by Metro during the performance of the Contract, fully illustrating how all elements of the work were actually installed and completed.
 - 1.1.6. Authorized Representative -- is a person, corporation, partnership or other legal entity acting on behalf of another through expressly delegated authority as specified in these Contract Documents.
 - 1.1.7. Bid -- is the written offer of a Bidder to perform the Work as defined in these Contract Documents, when made out in accordance with all of the Contract Documents and submitted on the appropriate Bid Forms.
 - 1.1.8. Bidder -- is any individual, partnership, corporation, or joint venture, acting directly or through a duly and legally authorized representative, submitting or intending to submit a Bid for the Work as described in these Contract Documents.
 - 1.1.9. Bidding Documents -- See "Contract Documents."

- 1.1.10. Bid Forms -- include the following: the Bid proposal (including Schedule of Bid Prices and Recycled Product Attachment), Surety, Minority and Women-Owned Business Program Compliance Form, Resident/Non-Resident Bidder Status form, Signature Page, the Non-Collusion Affidavit, Bid Bond, Minority Business Enterprise Utilization Form and the Women Business Enterprise Utilization Form.
- 1.1.11. City -- means the City of Portland, Oregon.
- 1.1.12. Change Order -- is a written document signed by Metro and Contractor stating their agreement upon all of the following:
- 1.1.12.1. a change in the Work;
 - 1.1.12.2. the amount of the increase or decrease in the Contract Amount, if any;
and
 - 1.1.12.3. the extent of the adjustment to the Contract Time, if any.
- 1.1.13. Clarification -- is a written document consisting of supplementary details, instruction or information issued by Metro after the award of Contract which clarifies, or supplements the Contract Documents and becomes a part of the Contract Documents. A Clarification may or may not affect the scope of work.
- 1.1.14. Completion -- See "Substantial Completion" and "Final Completion and Acceptance."
- 1.1.15. Construction Coordinator -- is the Metro representative on the construction site. The Construction Coordinator will be an employee of Metro, who will represent Metro to the extent of his authority as delegated by the Executive Officer. For purposes of administering this contract the terms "Construction Coordinator", "Construction Manager", and will refer to the on site Metro representative and to any duly appointed assistants who may be designated in writing. The Architect/Engineer of Record will be called upon as required by and at the direction of Metro for technical assistance and for interpretation of the Contract Documents.
- 1.1.16. Construction Manager See "Construction Coordinator."
- 1.1.17. Construction Schedule or Schedule -- is the timeline described in Section 01310 of the Specifications.
- 1.1.18. Contract Amount -- is the total amount shown in the Construction Agreement as revised by Change Orders.
- 1.1.19. Contract Documents or Contract or Bidding Documents -- consist of the Advertisement for Bids, the Invitation to Bid, the Instructions to Bidders, the Bid

Forms, the Construction Agreement, the Performance Bond, the Labor and Materials Payment Bond, the General Conditions, the Supplementary Conditions, the Specifications, the Drawings, the approved and updated Construction Schedule, and any modifications of any of the foregoing in the form of Addenda, Clarifications, Change Orders or Force Account Work.

- 1.1.20. Contractor -- is the party who has entered into this Contract with Metro and who is responsible for the complete performance of the Work contemplated by the Contract Documents and for the payment of all legal debts pertaining to the Work, including its officers, agents, employees and representatives.
- 1.1.21. Contract Time -- is the period of time, including adjustments approved by Metro, which is allowed in the Contract Documents for Contractor to substantially complete the Work.
- 1.1.22. Critical Path Method or CPM. -- means the critical path method of scheduling as understood and interpreted by standard industry practice.
- 1.1.23. Days -- means calendar day including Saturdays, Sundays and legal holidays.
- 1.1.24. Direct Costs -- are those costs of labor (including benefits), material and equipment incurred by the person, corporation, partnership or joint venture whose employees are actually performing the task.
- 1.1.25. Minority Business Program. -- is Metro's program to provide maximum opportunities to Minority and Women-Owned Business Enterprises in contracts, which is contained in Metro Code Section 2.04.100.
- 1.1.26. Drawings. 1.26 -- means the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.
- 1.1.27. Equal, Approved, Approved Equal -- is used to indicate that the material or product to be supplied or installed must be equal to or better than that named in function, performance, reliability, quality and general configuration and that the substitute must be approved by Engineer. Equality in reference to the Project design requirements shall be determined by Engineer prior to installation of any material or product in the Project. Where the term "or equal" is not used and a sole product is specified, the term "or equal" is implied.
- 1.1.28. Final Completion and Acceptance -- means the completion by Contractor of all of the Work called for under the Contract, whether expressly or impliedly required, including but not limited to, satisfactory operation of all equipment, completion

and correction of all punch list items to the satisfaction of Metro, settlement of all claims, delivery of all warranties and agreements to correct Work, equipment operation and maintenance manuals, as-built drawings, required approvals and acceptances by federal, state or local governments or other authorities having jurisdiction over the Work, and removal of all rubbish, tools, scaffolding and surplus materials and equipment from the Site.

- 1.1.29. Final Payment -- is the balance of the Contract Amount to be paid to the Contractor upon Final Completion and Acceptance of the Work.
- 1.1.30. Force Account Work -- is work, ordered in writing by Metro, for which Contractor must report its actual costs in accordance with Paragraph 8.4 of the General Conditions.
- 1.1.31. Furnish -- means, unless the context requires otherwise, supply and deliver materials, systems and equipment to the Site, ready for unpacking, assembly, installation, etc., as applicable in each instance.
- 1.1.32. General Contractor -- is the party who enters into the Contract with Metro. See also "Contractor".
- 1.1.33. Geotechnical Engineer -- The Geotechnical Engineer is an agent of the Engineer.
- 1.1.34. Inclement Weather -- is a meteorological condition or conditions, abnormal to the Portland metropolitan area for the time of year in question, which cannot be reasonably anticipated and which has a significantly adverse effect on the Construction Schedule. Abnormality of the weather is defined as the number of days the weather parameters exceed the normal adverse weather days at the project.

For work under this contract, Metro defines adverse weather days as days on which Contractor is impacted by weather, normally defined as days with an average daily temperature of less than 32°F, significant daily precipitation or snow. Contractor will be cognizant of adverse weather days based upon long term averages when preparing project schedule, and shall refer to the annual publication of Local Climatological Data for Portland Oregon available at the Portland Weather Service Office.
- 1.1.35. Install -- includes, unless the context requires otherwise, unload, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, connect to electrical power and/or piping, and similar operations at the Site, as applicable in each instance.

- 1.1.36. Lump Sum -- means all costs and expenses of whatever nature, including Overhead and Profit, associated with the Work involved.
- 1.1.37. Material or Materials -- shall be construed to include machinery, equipment, manufactured articles, materials of construction such as formwork, fasteners, etc., and any other classes of items to be provided in connection with the Contract, except where a more limited meaning is indicated by the context.
- 1.1.38. Metro -- is a metropolitan service district organized under the laws of the State of Oregon and the Metro Charter.
- 1.1.39. Metro Executive Officer or Executive Officer -- means the Executive Officer of Metro.
- 1.1.40. Metro Council or Council -- means the elected Council of Metro.
- 1.1.41. Miscellaneous Phrases -- in the Contract Documents shall be interpreted as follows:
- Wherever the words "as directed," "as instructed," "as required," "as permitted," or words of like effect are used, it shall be understood that the direction, requirement, or permission of Metro is intended.
- The words "sufficient," "necessary," "proper," and the like shall mean sufficient, necessary or proper in the judgment of Metro.
- The words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to, Metro.
- 1.1.42. Notice of Award -- is the document issued by Metro to the lowest responsive, responsible Bidder whose Bid complies with all the requirements prescribed by the Contract Documents. The Notice of Award shall be given pursuant to the provisions of the Instructions to Bidders. It shall not entitle the party to whom it is given to any payment under the Contract, nor shall Metro be liable to such party or to any person for any alleged damages for any action taken in reliance upon such notice.
- 1.1.43. Notice to Proceed -- is the written notice given Contractor to commence the prosecution of its Work as defined in the Contract Documents. The Notice to Proceed will also establish the date and time of a preconstruction conference.
- 1.1.44. Other Metro Contractors -- are all individuals, corporations, partnerships, or joint ventures (except Contractor or Engineer) with whom Metro has a contract to perform work on, or related to, the Project.

1.1.45. Overhead -- when applied to the cost of the work, shall include the following items, when reasonable and necessary for completion of the work:

1.1.45.1. All on-site payroll costs, taxes, insurance fringe benefits and bonuses of same, for supervising, estimating, expediting, purchasing, drafting and clerical/secretarial services where directly incurred in the performance of the Contract.

1.1.45.7. Permit fees.

1.1.45.8. Cost of reproduction.

1.1.45.9. Field office costs.

Home or branch office overhead shall not be included, but shall be part of Contractor's profit and shall include, but is not limited to, the following:

1.1.45.9.1. Accounting functions of Contractor's Home and Branch Office.

1.1.45.9.2. General expenses of Contractor's Home and Branch Office.

1.1.45.9.3. Interest on capital.

1.1.45.9.4. Salaries of any home and branch office estimators and administration.

1.1.46. Owner -- means Metro.

1.1.47. Plans -- means Drawings.

1.1.48. Profit -- means that portion of Contractor's Bid price that is not Direct Costs or Overhead.

1.1.49. Project -- means the Work described in the Contract Documents.

1.1.50. Provide -- means furnish and install complete and in place and ready for operation and use.

1.1.51. Punch List -- is the list prepared by the Construction Manager at the time of Substantial Completion which reflects Contractor's incomplete, nonconforming work. Punch list items must be completed to the satisfaction

of the Engineer and Metro in order for the Project to reach Final Completion and Acceptance.

- 1.1.52. Request for Clarification -- is a written request made by Contractor for additional information to clarify an ambiguity in the Contract Documents.
- 1.1.53. Retainage or Retention -- is the difference between the amount earned by Contractor on the Contract and the amount paid on the Contract by Metro.
- 1.1.54. Schedule of Values -- is the detailed breakdown of a lump sum contract amount as required in Section 01025 of the Specifications.
- 1.1.55. Separate Contract -- is a contract between Metro and a party other than Contractor for the construction or furnishing of a portion of the Project.
- 1.1.56. Shown, As Shown -- work shown on the Drawings which is a part of the Contract Documents.
- 1.1.57. Site.1.57 -- is the real property upon which the Project is located.
- 1.1.58. Special Inspector -- is a representative of the Owner, Architect/Engineer, Engineer or Geotechnical Engineer with specialized knowledge applicable to the installation of certain elements of the work.
- 1.1.59. Specifications -- are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.
- 1.1.60. Subcontractor -- means a person, partnership, corporation or joint venture which has a direct contract with Contractor to perform a portion of the Work at the Site.
- 1.1.61. Submittals -- include shop drawings, samples, manufacturer's brochures, pamphlets, catalog cuts, color charts or other descriptive data, clearly defining the article, material, equipment or device proposed by Contractor for use in the Work. "Shop drawings" are the drawings and diagrams showing details of fabrication and erection that Contractor is required to submit to the Engineer.
- 1.1.62. Substantial Completion -- is the stage in the progress of the Work, as determined by Metro, when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that Metro can occupy or use the Work for its intended use.

- 1.1.63. Supplier -- means an individual, partnership, corporation or joint venture entering into an agreement with Metro or Contractor for furnishing a portion of the Work which requires no labor at the Site, other than common carriers.
- 1.1.64. Unit Prices -- are the costs for specific units of work as defined in the Bid and Supplementary Conditions and include all costs, including, but not limited to, equipment, labor, materials, incidentals, Overhead and Profit, for the unit of work described.
- 1.1.65. Work -- means, unless the context requires otherwise, the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by Contractor to fulfill Contractor's obligations. The Work may constitute all or a portion of the Project as the context requires.

1.2. Intent and Interpretation of Contract Documents

- 1.2.1. Intent -- The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all. The intent of the Contract Documents is to include in the Contract price the cost of all labor and materials, water, fuel, tools, plant, scaffolding, equipment, power, light, transportation, and all other facilities, services and expense as may be necessary for the proper execution of the Work, unless otherwise indicated in these Contract Documents. In interpreting the Contract Documents, words describing materials or work which have a well-known technical or trade meaning, unless otherwise specifically defined in the Contract Documents, shall be construed in accordance with such well-known meaning recognized by Architect/Engineer, Engineer and Metro.
- 1.2.2. Divisions and Headings -- Titles and headings are for the convenience of organizing the Contract Documents and shall not be construed to limit Contractor's obligations hereunder. The General Conditions are divided into fifteen (15) Articles. The first-tier subheadings of each Article shall be referred to as Paragraphs; the second-tier sub-headings shall be referred to as Subparagraphs; and the third-tier subheadings shall be referred to as Clauses.
- 1.2.3. Mandatory Nature of Specifications and Drawings -- mention in the Specifications or indication on the drawings of articles, materials, operations, sequence or methods requires Contractor to furnish and install (i.e., provide) each article mentioned or indicated, of quality or according to qualifications noted, to perform each operation called for, in the sequence called for, and to provide therefor, all necessary labor, equipment and incidentals. The determination of the type of operations and methods to be utilized in the performance of the Work shall be the responsibility of Contractor unless the Contract Documents prescribe a specific

type of operation, sequence or method, in which case Contractor shall comply with the prescribed operation, sequence or method. Sentences in the imperative tense or command format in these Contract Documents shall be deemed to be directed to Contractor and to require Contractor to perform the services and/or provide the materials described.

- 1.2.4. Precedence of Contract Documents -- all determination of the precedence of, or discrepancy in, the Contract Documents shall be made by Metro, but in general, precedence will be in accordance with the following list with the highest precedence item at the top:

1.2.4.1. Signed Construction Agreement.

1.2.4.2. Supplementary Conditions.

1.2.4.3. General Conditions, Advertisement for Bids, Instructions to Bidders, Invitation to Bid, Bid Forms, Performance Bond and Labor and Materials Payment Bond.

1.2.4.4. Specifications

1.2.4.5. Drawings.

Within each of the above documents, detailed information takes precedence over general information and words take precedence over numbers unless obviously incorrect.

Addenda, Clarifications and all Change Orders to the Contract Documents take the same order of precedence as the specific sections that they are amending.

- 1.2.5. Discrepancies, Errors and Omissions -- the intent of the Contract Documents is to require Contractor to perform and provide every detail and item necessary for completion of the Project. The Contract Documents are not complete in every detail, however, and Contractor shall comply with their intent and meaning, taken as a whole, and shall not avail itself of any manifest errors or omissions to the detriment of the Work. Should any error, omission, discrepancy or ambiguity appear in the Contract Documents, instructions or work done by others, Contractor shall immediately upon discovery submit a Request for clarification to Metro pursuant to Paragraph 3.2. If Contractor proceeds with any such work without receiving a Clarification, Contractor shall be responsible for all resulting damage and defects, and shall perform any work necessary to comply with Metro's Clarifications at no cost to Metro. Any work or material not indicated in the Contract Documents, which is manifestly necessary for full and faithful performance of the Work in accordance with the intent of the Contract Documents

shall be indicated by Contractor on the shop drawings and provided by Contractor to the same extent as if both indicated and specified. Any work indicated on the drawings but not specified, or vice versa, shall be furnished in the manner specified above as though fully set forth in both. Work not particularly detailed, marked or specified shall be the same as similar parts that are detailed, marked or specified. In case of discrepancy or ambiguity, in quantity or quality, the greater quantity or better quality as determined by Metro, shall be provided at no extra cost to Metro.

- 1.2.6. Standards to Apply Where Detailed Specifications Are Not Furnished --wherever in these Contract Documents or in any directions given by Metro pursuant to or supplementing these Contract Documents, it is provided that Contractor shall furnish materials or manufactured articles or shall do work for which no detailed Specifications are set forth, the materials or manufactured articles shall conform to the usual standards for first-class materials or articles of the kind required, with due consideration of the use to which they are to be put. Work for which no detailed Drawings or Specifications are set forth herein shall conform to the usual standards for first-class work of the kind required.
- 1.3. Supply of Contract Documents -- Metro shall supply Contractor, without charge, a maximum of ten (10) sets of Contract Documents. Contractor shall contact Metro for additional sets of documents for which Contractor shall be charged the cost of printing.
- 1.4. Use of Contract Documents -- the Contract Documents were prepared for use in the construction of this Project only. No part of the Contract Documents shall be used for any other construction or for any other purpose except with the written consent of Metro. Any unauthorized use of the Contract Documents is at the sole responsibility of the user and such unauthorized use shall be deemed an activity in the performance of the Contract for purposes of Contractor's duty to indemnify under Article 11.
- 1.5. Copyright -- all submittals, record documents and any other products or documents produced by Contractor pursuant to this Contract are the property of Metro and it is agreed by the parties hereto that such documents are works made for hire. Contractor does hereby convey, transfer and grant to Metro all rights of reproduction and the copyright to all such documents.
- 1.6. Severability Clause -- should any provision of this Contract at any time be in conflict with any law, regulation or ruling, or be legally unenforceable for any reason, then such provision shall continue in effect only to the extent that it remains valid. In the event that any provision of this Contract shall become legally unenforceable, in whole or in part, the remaining provisions of this Contract shall nevertheless remain in full force and effect.
- 1.7. Notice or Service -- any written notice required or allowed under the Contract shall be deemed to have been communicated to the other party and service thereof shall be

deemed to have been made if such notice is delivered in person to the individual, a member of the partnership or joint venture, or an officer of the corporation for whom it was intended or if delivered at or sent by regular, registered or certified mail to the last business address of the relevant person or party known to the person or party giving the notice or to Contractor's Site office if the notice is directed to Contractor. The date or time of service for purposes of all notices required or allowed under the Contract shall be the date and/or time upon which the relevant document was mailed or delivered as above-described.

The address given in the Bid is hereby designated as the legal business address of Contractor, but such address may be changed at any time by ten (10) days prior notice in writing, delivered to Metro.

ARTICLE 2 CONTRACTOR'S ORGANIZATION

- 2.1. Contractor's Authorized Representatives -- prior to commencing any work under this Contract, Contractor shall submit in writing to Metro a list of Contractor's authorized representatives. Such list shall include the name and title of each representative along with the extent to which each representative is authorized to represent, bind and act for Contractor. The description of extent of representation shall include, but not be limited to, the maximum dollar value of Change Orders which the individual may authorize, whether the individual may respond to Request for Proposals and for what maximum dollar amount and whether the individual may submit a claim pursuant to Paragraph 3.3. Contractor shall be fully liable for the acts, omissions and decisions of such representatives to the extent stipulated in the written list submitted to Metro.

Contractor shall at all times be represented at the Site by one or more of such authorized representatives, who, cumulatively, shall have complete authority to represent, bind and act for Contractor in all matters pertaining or related to this Contract. In the event that Contractor does not comply with this paragraph and, consequently, is not fully represented at the Site at all times, Contractor shall be deemed to acquiesce in all actions taken by Metro which pertain or relate to this Contract.

- 2.2. Contractor's Office at the Site -- prior to commencement of work at the site, Contractor shall establish a field office at the site acceptable to the Construction Coordinator. This office shall be located in a job trailer or temporary building. This office shall be the headquarters of Contractor's representatives authorized to receive notices, instructions, drawings or other communications from the Construction Manager on behalf of Metro or the Architect/Engineer and to act on Change Orders or other actions. Such notices, instructions, drawings or other communications given to such a representative or delivered to Contractor's site office in his/her absence shall be deemed to have been given to Contractor.

- 2.3. Key Personnel -- Contractor shall submit, in writing, to Metro a list of the names, addresses, and telephone numbers of its key personnel who are to be contacted in case of emergencies on the job during non-working hours, including Saturdays, Sundays and holidays and all other key personnel as may be required.
- 2.4. Contractor's Employees. -- Contractor shall enforce strict discipline and good order among Contractor's employees and other persons carrying out the Work. Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

Whenever Metro shall notify Contractor that any employee on the Work is, in the judgment of Metro, incompetent, unfaithful, disorderly or refuses to carry out the provisions of the Contract, such employee shall be discharged or transferred from the Work.

Contractor shall give Metro, at its request at any time, full and correct information as to the number of workers employed in connection with each subdivision of the Work, the classification and rate of pay of each worker, the cost to Contractor of each class of materials, tools and appliances used by it in the Work, and the amount of each class of materials used in each subdivision of the Work.

- 2.5. Daily Construction Reports -- each day Contractor shall deliver to the Construction Manager a daily construction report which shall include, at a minimum, the following information:
- 2.5.1. Name of Contractor and Project.
 - 2.5.2. Weather, temperature and any unusual Site conditions for the day in question.
 - 2.5.3. A brief description and location of the day's work activities and any special problems and/or serious accidents or environmental releases, including preventative or mitigation measures taken. (including work of Subcontractors)
 - 2.5.4. A description of significant progress in construction for that day as well as any problems encountered that might affect the progress of the Project as they relate to the Construction Schedule.
 - 2.5.5. A detailed listing of labor employed on the Work for that day. The listing shall include a description of both Contractor's and Subcontractor's workers employed that day and shall have breakdowns for minority, female trade and worker classifications and hours worked.
 - 2.5.6. Equipment in use that day (other than hand tools).

2.5.7. Daily summary and accumulated quantity amounts of items listed above.

2.5.8. Any other information as requested by Metro or its representative.

2.6. Contractor to Supply Sufficient Material and Workers -- Contractor shall at all times keep on the premises sufficient material and employ sufficient supervision and workers to prosecute the Work at the rate necessary to substantially complete the Work herein required within the time specified in the Contract and in accordance with the Construction Schedule. Contractor shall coordinate the Work of its Subcontractors so that information required by one will be provided by others involved in time for incorporation in the Work in proper sequence and without delay of any materials, devices or provisions for future work.

2.7. Construction Plant, Equipment and Methods --the construction plant and equipment provided by Contractor, and Contractor's methods and organization for handling the Work shall be such as will secure a good quality of work and rate of progress which will ensure the completion of the Work within the time specified, in accordance with the Construction Schedule, and without violating city, local, state or federal environmental regulation during construction.

Contractor shall give Metro full information in advance as to Contractor's plans for carrying on any part of the Work. If at any time before the commencement or during the progress of the Work, any part of Contractor's plant or equipment, or any of Contractor's methods of executing the Work, appears to Metro to be inadequate to ensure the required quality, environmental protection or rate of progress of the Work, Metro may order Contractor to increase or improve its facilities or methods, and Contractor shall promptly comply with such orders. Neither compliance with such orders nor failure of Metro to issue such orders shall relieve Contractor from obligation or liability to secure the quality of work and the rate of progress required by the Contract. Contractor shall be responsible for overload of any part or parts of structures beyond their safe calculated carrying capacities, and for release of pollutants into surrounding waters resulting from Contractor's activities on the Site.

Contractor shall provide temporary utilities pursuant to the Specifications and shall be responsible for the safety and adequacy of its plant, equipment and methods.

2.8. Contractor's Temporary Structures -- Contractor shall obtain all necessary permits for and shall erect and maintain at its own expense, and remove upon completion of the Work or as ordered by Metro temporary structures, sheds, barriers, walks, hoisting equipment, scaffolds, etc., as are necessary for the Work pursuant to these Contract Documents.

Contractor's temporary structures, equipment, stored materials, stored equipment, etc., shall be located so as not to interfere with the prosecution of the Work. If not so located, they shall be moved by Contractor, as directed by Metro, at no cost to Metro. Contractor's

temporary structures, equipment or materials that obstruct progress of any portion of the work shall be removed or relocated by Contractor at Contractor's expense.

ARTICLE 3 ADMINISTRATION OF THE CONTRACT

3.1. Authority and Relationships of Metro and Architect/Engineer -- the following provisions shall govern the authority of the various officers, agents, representatives, consultants and employees of Metro, and Architect/Engineer. Except as specifically provided in this section, no individual acting or purporting to act as an officer, agent, representative, consultant or employee of Metro or Architect/Engineer shall have any authority to make representations, statements or decisions of whatever nature binding Metro or Architect/Engineer regarding any aspect of this Contract. Except as specifically provided in this Article, Contractor shall have no right to, and shall not rely on any such representation, statement or decision. Any reference to action by Metro in this Contract requires the written approval of the Metro Executive Officer or a person who is designated in writing by the Metro Executive Officer as having authority to act for Metro but only to the extent that such authority is expressly delegated in writing.

3.1.1. Authority of Metro -- except as otherwise provided herein, Metro shall determine the amount, quality, acceptability, fitness, and progress of the Work covered by the Contract. Metro and Architect/Engineer will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the work, and they will not be responsible for Contractor's failure to carry out the Work in accordance with the Contract Documents. Metro and Architect/Engineer will not be responsible for or have control over the acts or omissions of Contractor, Subcontractors, or any of their agents or employees, or any other persons performing any of the Work. Nothing contained in this Contract is intended nor shall be construed to create any third-party beneficiary relationship between Metro and Contractor's subcontracting agents or employees.

It shall be the duty of Contractor to comply with all procedures established and/or implemented by Metro as stated above. In the event any such procedures are at variance with other provisions of these Documents, such procedures shall prevail.

Metro may call for meetings of Contractor, Contractor's Subcontractors and Suppliers as Metro deems necessary for the proper supervision and inspection of the Work. Such meetings shall be held at the Site on regular working days during regular working hours, unless otherwise directed by Metro. Attendance shall be mandatory for all parties notified to attend.

Contractor shall immediately comply with any and all orders and instructions given in accordance with the terms of this Contract by Metro.

Contractor has no right to, and shall not, rely on representations of whatever nature made by any individual, whether or not employed by or purporting to represent Metro or Architect/Engineer, unless such individual has been specifically and expressly delegated authority to make such representations pursuant to these Contract Documents. Likewise Contractor has no right, and shall not rely on any representations of authorized changes in the contract of whatever size or nature unless such change is in writing and signed by Metro.

Nothing contained in this Paragraph shall obligate Metro or Architect/Engineer to supervise Contractor's work under this Contract and Contractor shall remain fully responsible for the complete and proper supervision of all of the Work.

- 3.2. Clarifications -- should it appear that the Work to be done or any of the matters relative to the Contract Documents are not sufficiently detailed or explained in the Contract Documents, or should there be any questions which may arise as to the meaning or intent of the Contract Documents, Contractor shall immediately submit to Metro a written Request for Clarification which shall fully describe the information sought. It is Contractor's responsibility to request information under this Paragraph in sufficient time for review by Architect/Engineer and Metro so that the orderly progress and prosecution of the Work is not delayed.

The Architect/Engineer, in consultation with Metro, shall interpret the meaning and intent of the Contract Documents and shall issue, within ten (10) working days of receiving a Request for Clarification from Contractor, a written Clarification describing such meaning and intent. Additionally, the Architect/Engineer, after consulting with Metro, may at any time issue written Clarifications as deemed necessary to carry out the Work included in the Contract Documents. Notwithstanding any dispute or disagreement which Contractor may have concerning any such Clarifications, Contractor shall perform the Work as prescribed and in accordance with all such Clarifications.

If notified by Metro that a Clarification is forthcoming, any related work done before the receipt of the Clarification shall be coordinated with Metro so as to minimize the effect of the Clarification on work in progress. Any related work not coordinated with Metro done before receipt of the Clarification shall be at Contractor's risk and at no cost to Metro if that work does not conform to the Clarification.

If Contractor proceeds with work which is not sufficiently detailed or explained in the Contract Documents without requesting and obtaining a Clarification pursuant to this Paragraph, Contractor shall do so at its own risk and shall, at no cost to Metro, perform any additional work which may be required by Metro to bring the work into conformance with the intent of the Contract Documents.

3.3 Contractor's Claims

3.3.1. Generally -- no claims of any sort whatsoever by Contractor shall be considered or allowed under this Contract except as specifically provided and prescribed under this Paragraph. Failure to make a claim as specifically prescribed by this Paragraph or failure to perform disputed work, if any, as directed by Metro shall bar Contractor from any recovery of any sort or extension of time resulting from the facts surrounding the claim. Contractor's full and complete compliance with this Paragraph shall be a condition precedent to any right of Contractor to further prosecute any claim against Metro arising out of or related to Work described in the Contract Documents. Every decision and action of Metro shall be considered final unless Contractor makes a claim concerning such decision or action pursuant to this Paragraph.

3.3.2. Types of Claims -- the types of claims which Contractor may make are limited to the following:

3.3.2.1 Claims based upon justifiable delays as described in Subparagraph 3.3.3

3.3.2.2. Claims based upon differing Site conditions as described in Subparagraph 3.3.4;

3.3.2.3. Claims based upon Clarifications or Change Orders issued by Metro or any other decision, action or failure to act by Metro as described in subparagraph 3.3.5.

As a condition precedent to any such claim, Contractor shall comply with all applicable procedural and substantive requirements of this Contract.

Contractor may make claims which include requests for extensions of the Contract Time and/or requests for increases in the Contract Amount. If Contractor believes that a single circumstance or set of facts gives rise to both a claim for an extension to the Contract Time and an increase in the Contract Amount, Contractor must state both such allegations in one written claim or waive the unstated allegation.;

3.3.3. Claims For Justifiable Delays

3.3.3.1. Definition of Justifiable Delay -- if Contractor is significantly and justifiably delayed in the prosecution of the Work due to any of the acts, events or conditions described as justifiable delays below, Contractor may make a claim for an increase in the Contract Time and/or Contract Amount pursuant to Clause 3.3.3.2.

"Justifiable Delay" shall mean, and is limited to, the acts, events or conditions described in sections (a) through (j) below, if such act, event or condition has a materially adverse effect on the ability of Contractor to obtain the benefits of its rights or to perform its obligations under this Contract or materially increases the cost to Contractor to obtain the benefits of such rights or to perform such obligations and if such act, event or condition and its effect:

1. are beyond the reasonable control of Contractor (or any third party for whom Contractor is directly responsible);
2. do not arise out of (a) strikes, labor disputes or other labor difficulties involving Contractor or its Subcontractors or Suppliers or entities providing transportation to Contractor or its Subcontractors or Suppliers, (b) labor shortages, or (c) changing economic conditions; and
3. could not have been reasonably anticipated by Contractor.

The acts, events and conditions are:

- (a) An Act of God.
- (b) Inclement Weather.
- (c) Acts of a public enemy, war (whether or not declared) or governmental intervention resulting therefrom, blockage, embargo, insurrection, riot or civil disturbance.
- (d) The failure to issue or renew, or the suspension, termination, interruption or denial of, any permit, license, consent, authorization or approval essential to the Work, if such act or event shall not be the result of the willful or negligent action or inaction of Contractor, or of any third party for whom Contractor is directly responsible, and if Contractor shall be taking or have taken or shall cause to or have caused to be taken, all reasonable actions in good faith to contest such action (it being understood that the contesting in good faith of any such action shall not constitute or be construed as a willful or negligent act of Contractor).
- (e) The failure of any appropriate federal, state, municipal, county or other public agency or authority or private utility having operational jurisdiction over the Work or Site to provide and

maintain utilities, services, water and sewer lines and power transmission lines to the Site, which are required for and essential to the Work.

- (f) Epidemics or quarantines.
- (g) Material, equipment or fuel shortages or freight embargoes.
- (h) Priorities or privileges established for the manufacture, assembly or allotment of material by order, decree, or otherwise of the U. S. or by any department, bureau, commission, committee, agent or administrator of any legally constituted public authority.
- (i) Changes in the work ordered by Metro if they require additional time to complete the work and adversely impact the Critical Path.
- (j) The prevention by Metro of Contractor from commencing or prosecuting the Work.

Acts, events, or conditions outside the control of the Architect/Engineer, Metro or Contractor which are found to be justifiable delay under 3.3.3.1.3 (a) through (h), may result in a time extension but the risk for bearing the cost of extended overhead will remain with Contractor.

No claim for extension of the Contract Time will be considered for Inclement Weather unless Contractor submits documentation that such weather conditions are abnormal for the area and period of time in question; that they could not have been reasonably anticipated; and that the Inclement Weather had a significantly adverse effect on the Construction Schedule.

Delays in delivery of equipment or material purchased by Contractor or its Subcontractors or Suppliers (including Metro-selected equipment) shall not be considered as a just cause for delay if timely ordering would have made the equipment available. Contractor shall be fully responsible for the timely ordering, scheduling, expediting, delivery, and installation of all equipment and materials.

The term "delay" shall specifically not include and no extension of the Contract Time or increase in the Contract Amount shall be allowed for (i) any delay which could have been avoided by the exercise of care, prudence, foresight and diligence on the part of Contractor; (ii) any delay in the prosecution of parts of the Work, which may in itself be

unavoidable but which does not necessarily prevent or delay the prosecution of other parts of the Work, nor the Substantial Completion of the Work of this Contract within the time specified; (iii) any reasonable delay resulting from the time required by Metro for review of Submittals or Shop Drawings submitted by Contractor and for the making of surveys, measurements and inspections; (v) any delay arising from an interruption in the prosecution of the Work on account of the reasonable interference from Other Metro Contractors which does not necessarily prevent the Substantial Completion of the Work of this Contract within the time specified; and (vi) any delay resulting in any manner from labor disputes, strikes or difficulties or any delay resulting in any manner from any labor-related event, act or condition whether or not Contractor has any control over such event, act or condition.

3.3.3.2. Justifiable Delay Claims Procedure -- Contractor shall, within twenty-four (24) hours of the start of the occurrence or Contractor's first knowledge of the occurrence which is the basis of the claim for justifiable delay, which ever is earlier, notify Metro in writing of such delay. The written notice by Contractor shall indicate the cause of the delay and shall estimate the possible time extension requested. Within ten (10) days after the cause of the delay has been remedied, Contractor shall give written notice to the Construction Manager of any actual time extension and any increase in the Contract Amount requested as a result of the aforementioned occurrence in accordance with this Contract.

Within Twenty-one (21) days after Contractor submits to the Construction Manager such a written notice for an extension of time and/or increase in the Contract Amount, the Construction Manager will issue the decision on each request. If Contractor is dissatisfied with such decision, Contractor may preserve its claim as provided and prescribed by Subparagraph 3.3.6.

3.3.4. Claims for Differing Site Conditions -- Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Construction Manager of (i) subsurface or latent physical conditions at the Site which differ materially from those indicated in this Contract, or (ii) unknown physical conditions at the Site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

The Construction Manager shall investigate the Site conditions promptly after receiving the notice. If the conditions do materially so differ as to cause an increase or decrease in Contractor's cost of, or the time required for performing

any part of the Work under this Contract, whether or not changed as a result of the conditions, an equitable adjustment shall be made and a Change Order issued.

If Contractor is dissatisfied with the decision of the Construction Manager under this Subparagraph, Contractor may preserve its claim as provided and prescribed by Subparagraph 3.3.6.

- 3.3.5. Other Contractor Claims -- Contractor claims based upon Clarifications or Change Orders issued by Metro or any other decision, action or failure to act by Metro shall be made according to this Subparagraph.

Contractor shall, within twenty-four (24) hours following discovery of the facts which give rise to its claim, notify the Construction Manager in writing of its intent to make the claim. Within ten (10) days following discovery of the facts which give rise to its claim and prior to commencing the work or conforming to the Clarification on which the claim is based, if any, Contractor shall submit its formal written claim to the Construction Manager. Contractor's formal claim shall include a description of:

- 3.3.5.1. the factual occurrences upon which Contractor bases the claim including the decision, action or failure to act by Metro or its authorized representatives that allegedly give rise to the claim;
- 3.3.5.2. how Metro's decision, action or failure to act has affected Contractor's performance or otherwise affected Contractor;
- 3.3.5.3. whether the claim is for an extension in the Contract Time or increase in the Contract Amount or both and the specific extension or increase requested;
- 3.3.5.4. the provisions of the Contract upon which the claim is based.

Submission of written notice of intent to make a claim and formal claim as specified above shall be mandatory and failure to comply shall be a conclusive waiver to any claim by Contractor. Oral notice or statement will not be sufficient nor will notice or statement after commencing the work in question.

After the written notification is submitted by Contractor (if the claim is not resolved or withdrawn in writing) and only upon written direction by the Construction Manager, Contractor shall proceed without delay to perform the work pursuant to the direction of the Construction Manager. While the work on an unresolved claim is being performed, Contractor shall keep track of costs and maintain records in the manner set forth in the section on Force Account Work, at no cost to Metro. Such notice by Contractor and the fact that Contractor is

keeping track of costs and maintaining records shall not in any way be construed as proving the validity of the claim nor the costs thereof.

Provided the claim or claims have been submitted in accordance with the requirements of this Article, the Construction Manager will consider and investigate the claim or claims of Contractor. Within twenty-one (21) days of receipt of the above-described written notification of claim the Construction Manager will advise Contractor of the Construction Manager's decision to accept or reject the claim or claims, in full or in part. If Contractor is dissatisfied with the decision of the Construction Manager under this Subparagraph, Contractor may preserve its claim as provided and prescribed by Subparagraph 3.3.6.

- 3.3.6. Preservation of Claims -- Within thirty (30) days after a rejection of claim, in whole or in part, by Metro under Subparagraphs 3.3.3, 3.3.4 or 3.3.5, Contractor may preserve its claim by submitting a fully documented claim package to Director of Regional Facilities, Metro. That package shall include substantiating documentation with an itemized breakdown of Contractor and Contractor's Subcontractor's costs on a daily basis which shall include, but not be limited to, labor, material, equipment, supplies, services, Overhead and Profit. All documentation that Contractor believes is relevant to the claim shall be provided in the claim package including without limitation, payroll records, purchase orders, quotations, invoices, estimates, correspondence, profit and loss statements, daily logs, ledgers and journals. Failure to submit the claim package in full compliance with this requirement, and/or maintain cost records as herein required, will constitute a waiver of the claim.

If Contractor elects to pursue any claims by filing a lawsuit against Metro, it must commence such lawsuit within six (6) months after the date of Substantial Completion. Failure to commence a lawsuit within this time limitation shall constitute a waiver of all such claims by Contractor.

3.4. Metro's Right to Adjust Payments

- 3.4.1. Adjusted Payments for Delay -- Time is of the essence in this Contract. Metro and Contractor understand and agree that Metro will be damaged if Contractor fails to substantially complete the Work within the Contract Time, and that Metro will be vulnerable to further damages if Metro is obligated to continue paying Contractor for work performed after the Contract Time has expired. It is therefore agreed that after the Contract Time, Metro may adjust its payments to Contractor by any combination of the following : (1) making no further payments to Contractor until the Work is substantially complete, (2) paying the Subcontractor costs incurred by Contractor without any overhead, profit or fee of any kind going to Contractor, and/or (3) by collection of liquidated damages in the amount of five hundred dollars (\$500.00) per day.

Permitting Contractor to continue and finish the work or any part thereof after the Contract Time has expired shall in no way operate as a waiver on the part of Metro of any of its rights under this subparagraph or the balance of the Contract Documents.

- 3.4.2. Adjusted Payments Not a Bar to Metro's Right to Other Damages -- Payment of adjusted payments shall not release Contractor from obligations in respect to the complete performance of the Work, nor shall the payment of such adjusted payments constitute a waiver of Metro's right to collect any additional adjusted payments which it may sustain by failure of Contractor to fully perform the Work, it being the intent of the parties that the aforesaid adjusted payments be full and complete payment only for failure of Contractor to complete the Work on time. Metro expressly reserves the right to make claims for any and all other damages which Metro may incur due to Contractor's failure to perform in strict accordance with this Contract.
- 3.5. Arbitration -- Both parties shall, in good faith, attempt to negotiate resolutions to all disputes arising out of this Contract. Subject to the conditions and limitations of this paragraph, any controversy or claim arising out of or relating to this Contract which remains unresolved after such negotiations shall be exclusively settled by arbitration under the laws of the state of Oregon, in accordance with the Commercial Arbitration Rules of the American Arbitration Association. All disputes shall be heard and decided by one arbitrator and all arbitration proceedings shall be held in Portland, Oregon. However, all disputes concerning Metro's right to the equitable remedy of specific performance shall not be subject to arbitration, but shall be decided exclusively by a court of competent jurisdiction in Multnomah County, Oregon, under the laws of the state of Oregon.

Contractor agrees to consolidation of any arbitration between Metro and Contractor with any other arbitration involving, arising from, or relating to this Contract.

In the event that Metro determines, in its sole opinion, that the public interest requires a speedy resolution of any controversy or claim regardless of the amount, Metro shall have the option of electing resolution of the controversy or claim by the Expedited Procedures of the Commercial Arbitration Rules of the American Arbitration Association (Rules 54 through 58).

In no event shall submission of a dispute arising out of this Contract, by either party, relieve Contractor of its obligation to fully perform the requirements of the Contract as directed by Metro, pending resolution of the dispute pursuant to the procedures set forth in this Article. In the event Contractor, in Metro's opinion, fails to fully perform the requirements of the Contract pending resolution of a dispute, Metro shall be entitled to

exercise its rights to impose adjusted payments pursuant to Subparagraph 3.4.1, and/or terminate the Contract pursuant to Article 15 of this Contract.

Each party hereto and Contractor's Surety accepts jurisdiction of the courts of the state of Oregon for the purposes of commencing, conducting and enforcing such arbitration proceedings and agrees to accept notice in writing sent by certified letter addressed to said party of intention to proceed with arbitration and of any other step in connection therewith or enforcement thereof, with the same effect as though personally served therewith in the state of Oregon. The decision of the arbitrator shall be final and binding upon both parties and Contractor's Surety who hereby agree to comply therewith. The parties agree that proper venue for any judicial proceeding to enforce any decision or award made by an arbitrator under this section shall be exclusively in the county of Multnomah in the state of Oregon.

ARTICLE 4 SUBCONTRACTING AND ASSIGNMENT OF THE CONTRACT

- 4.1. Contractor's Responsibility for the Work -- Contractor shall perform or cause to be performed all labor, services and work of whatever nature and shall provide or cause to be provided all materials, equipment, tools and other facilities of whatever nature necessary to complete the Work and shall otherwise cause the Work to be completed in accordance with the Contract Documents.

Contractor shall take and assume all risk for all work and material involved in the Project until the entire Project has been finally accepted by Metro.

Contractor shall supervise and direct the Work, using Contractor's best skill and attention. Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters.

- 4.2. Subcontracting -- Contractor shall arrange and delegate its work in conformance with trade practices and union regulations, if applicable, but shall remain responsible to Metro for performance of all work required or implied by the Contract Documents. Contractor shall also be responsible for coordinating the efforts of its Subcontractors and Suppliers.

- 4.2.1. Objection to Subcontractors or Suppliers -- Metro reserves the right to make reasonable objection to any of Contractor's Subcontractors or Suppliers if Metro discovers any data or information at any time during the performance of the Contract which gives Metro a basis for such reasonable objection.

Metro will notify Contractor in writing if Metro has any reasonable objection to any of Contractor's Subcontractors or Suppliers. Contractor shall not subcontract with any Subcontractor or Supplier to which Metro has made a reasonable

objection. In the event of Metro's reasonable objection to any Subcontractor or Supplier, Contractor shall propose another entity to which Metro has no reasonable objection. The Contract Amount shall not be increased by any difference in cost occasioned by such substitution, nor shall the Contract Time be extended.

- 4.2.2. Substitution, Change or Addition of Subcontractors or Suppliers -- At any time that Contractor intends to substitute, change or add a Subcontractor or Supplier during the performance of the Contract, Contractor shall give Metro prior written notice of such intention. Contractor shall not substitute, change or add any such Subcontractor or Supplier if Metro gives Contractor reasonable objection in writing within ten (10) days after Metro receives such notice.

When any Subcontractor fails to prosecute a portion of the Work in a satisfactory manner, Metro may so notify Contractor. If the Subcontractor fails to cure the unsatisfactory work promptly, Contractor shall remove such Subcontractor immediately upon written request of Metro and Contractor shall request approval from Metro of a new Subcontractor to perform this section of the Work at no increase in the Contract Amount, and with no change in the Contract Time.

- 4.2.3. Metro Not Obligated to Detect Unsatisfactory Work -- Nothing contained in this Contract shall obligate Metro or place on Metro an affirmative duty to detect or discover unsatisfactory work or materials of Contractor's Subcontractors or Suppliers. Failure of Metro to detect or discover such unsatisfactory work or materials shall not relieve Contractor of any of its obligations under this Contract.

- 4.2.4. No Contractual Relationships Between Metro and Contractor's Subcontractors and Suppliers -- Nothing contained in this Contract is intended nor shall be construed to create any contractual or third-party beneficiary relationship between Metro and any of Contractor's Subcontractors, Suppliers or agents, save and except in relation to the Labor and Materials Payment Bond .

- 4.2.5. Contractor's Agreements with Subcontractors -- Contractor shall provide in all subcontract and supply agreements that the Subcontractor or Supplier will be bound by the terms and conditions of this Contract to the extent that they relate to the Subcontractor's or Supplier's work. Where appropriate, Contractor shall require each Subcontractor to enter into similar agreements with sub-tier Subcontractors and Suppliers. Contractor shall make available to each proposed Subcontractor and Supplier, prior to the execution of the subcontract or supply agreement, copies of the Contract Documents which apply to the work and materials to be provided by the Subcontractor or Supplier. Subcontractors and Suppliers shall similarly make copies of applicable portions of such documents available to their respective proposed sub-tier Subcontractors and Suppliers.

All Subcontractor's and Supplier's agreements shall also provide that they are assignable to Metro at Metro's option, in the event that Metro terminates the Contract. Contractor will provide to Metro, a copy of all subcontracts and supply contracts for permanent materials.

Nothing contained in this Subparagraph shall be construed as creating a direct or indirect contractual relationship between Metro and any of Contractor's Subcontractors or Suppliers. No such Subcontractor or Supplier shall have, or shall claim to have, any third-party beneficiary rights or status in relations to this Contract, save and except in relation to the Labor and Materials Payment Bond provided by Contractor.

- 4.3. Assignment -- Contractor shall constantly give its personal attention to the faithful prosecution of the Work. Contractor shall keep the Work under its personal control and shall not assign any or all of Contractor's rights, by power of attorney or otherwise, nor delegate any of its duties except with the prior written approval of the Metro Council.

ARTICLE 5 TIME OF COMPLETION AND SCHEDULE FOR THE WORK5TIME OF COMPLETION AND SCHEDULE FOR THE WORK

- 5.1. Prosecution of Work Generally.1Prosecution of Work Generally -- Contractor shall commence the Work within five (5) days after issuance of written Notice to Proceed from Metro and will diligently prosecute the Work to its Final Completion and Acceptance. The start of Work shall include attendance at preconstruction conferences, preparation and submittal of shop drawings, equipment lists, Schedule of Values, CPM construction schedules, requests for substitutions and other similar activities, as described by these Contract Documents.

- 5.2. Time of Completion -- Contractor shall bring the Work to Substantial Completion within the Contract Time as set forth in the Construction Agreement.

The time limits stated in these Contract Documents are of the essence of this Contract. By executing the Construction Agreement, Contractor confirms that the Contract Time is a reasonable period for performing all of the Work.

Failure of Contractor to substantially complete the Work within the Contract Time and according to the provisions of these Contract Documents shall subject Contractor to damages pursuant to the applicable sections of these Contract Documents.

- 5.3. Extensions of Time -- Extensions of the Contract Time shall be made pursuant to the procedure and according to the provisions and requirements contained in Articles 3 and 8 of these Contract Documents.
- 5.4. Project Scheduling -- Contractor shall submit to Metro a detailed Construction Schedule for completion of the work pursuant the Specifications. The Construction Schedule shall,

when approved and as updated and approved by Metro, become a part of the Contract Documents.

- 5.5. Use of Completed Parts of the Work Before Acceptance -- Whenever, in the opinion of Metro, the Work or any part thereof is in a condition suitable for use and it is in the best interest of Metro to require such use, Metro may take possession of, connect to, open for public use, or use the Work or a part thereof. When so used, maintenance and repair due to ordinary wear and tear or vandalism will be made at Metro's expense and Metro will defend liability claims which may result from such use by Metro. The use by Metro of the Work or part thereof as contemplated in this Paragraph shall in no case be construed as constituting acceptance of the Work or any part thereof. Such use shall neither relieve Contractor of any of its responsibilities under the Contract Documents, nor act as a waiver by Metro of any of the conditions thereof.

ARTICLE 6 COORDINATION WITH OTHER METRO CONTRACTORS6COORDINATION WITH OTHER METRO CONTRACTORS

- 6.1. Other Metro Contractors Generally -- Metro reserves the right to award other contracts in connection with the work. Contractor shall afford all such Other Metro Contractors reasonable opportunity for storage of their materials and execution of their Work, shall provide that the execution of Contractor's Work properly connects and coordinates with work of all Other Metro Contractors, and shall cooperate with Other Metro Contractors to the end of facilitating the Work in such a manner as Metro may direct. Connection between the work of the Contractor and other Metro Contractors will be the responsibility of the party which is last in time to construct, unless otherwise directed in the Contract Documents.
- 6.2. Duty to Inspect Other Metro Contractors' Work -- Where Contractor's Work is associated with that of Other Metro Contractors, or is to interface in any way with such Other Metro Contractor's work, Contractor shall examine, inspect and measure the adjacent or in-place work of such Other Metro Contractors. If Contractor determines that any defect or condition of such adjacent or in-place work will impede or increase the cost of Contractor's performance or otherwise prevent the proper execution of Contractor's Work, Contractor shall immediately, and before performing any work affected by the Other Metro Contractors' work, submit a Request for Clarification to Metro pursuant to Paragraph 3.2. If Contractor proceeds without examining or inspecting the work and submitting a Request for Clarification, Contractor shall be held to have accepted the Other Metro Contractors' work or material and the existing conditions, and shall be responsible for any defects in Contractor's Work resulting therefrom and shall not be relieved of any obligation or any warranty under this Contract because of any such condition or imperfection. This provision shall be included in any and all of Contractor's subcontracts for Work to be performed.

The foregoing does not apply to latent defects. Contractor shall report latent defects in any Other Metro Contractors' work at any time such defects become known or Contractor should have known, and Metro shall promptly thereafter take such steps as may be appropriate. If Contractor in the exercise of reasonable care should have known of such defects but did not report them, such defects shall not be considered latent.

- 6.3. Duty to Maintain Schedule -- It shall be the responsibility of Contractor to maintain its schedule so as not to delay the progress of the Project or the work of Other Metro Contractors. Contractor is required to cooperate in every way possible with Other Metro Contractors. Except as otherwise specifically provided in this Contract, no additional compensation will be paid for such cooperation. If Contractor delays the progress of the Project or the progress of Other Metro Contractors, it shall be the responsibility of Contractor to take all of the steps necessary to bring the affected work into compliance with any affected schedules and to indemnify Metro from all liability for such delays pursuant to Article 11.

Metro shall be under no duty to monitor or detect any delays of Contractor or any Other Metro Contractor on the Project or any lack of coordination on the Project. Consequently, the failure of Metro to so monitor or detect shall not be construed as relieving Contractor of its duties to fully perform all of its obligations under the Contract.

- 6.4. Failure to Maintain Schedule -- If, in the opinion of Metro, Contractor falls behind the Construction Schedule or delays the progress of Other Metro Contractors and is not entitled to an extension of time pursuant to the Contract Documents, Contractor shall perform all steps which are necessary, in the opinion of Metro, to bring Contractor's Work into compliance with the Construction Schedule or to remedy any delay to the progress of Other Metro Contractors. Contractor shall submit operation plans to Metro, which plans shall fully demonstrate the manner of intended compliance with this Paragraph. The steps referred to above shall include, but not be limited to:

- 6.4.1. Increase manpower in such quantities and crafts as will substantially eliminate the backlog of work.
- 6.4.2. Increase, when permitted, the number of working hours per shift, shifts per working day, working days per week, or the amount of equipment or any combination of the foregoing, sufficient to eliminate the backlog of work.
- 6.4.3. Reschedule activities to achieve maximum practical concurrence of accomplishment of activities.
- 6.4.4. Expedite delivery of materials and equipment such as use of air freight.

If Metro directs Contractor to take measures described in this Paragraph, or if Contractor takes such measures without direction from Metro, Contractor shall bear all costs of

complying. Metro shall, however, reimburse Contractor for reasonable costs of complying if such directive to accelerate from Metro was issued to overcome delay caused by the acts or omissions of Metro or persons acting for Metro, provided Contractor has complied with all applicable provisions of Articles 3 and 8 of this Contract.

Failure to maintain the construction schedule or to take action to regain the schedule or to furnish a schedule as outlined in the specifications may result in withholding of all or part of the monthly progress payments.

- 6.5. Failure to Coordinate Work -- If Contractor fails to coordinate its work with the work of Other Metro Contractors as directed by Metro, Metro may, upon written notice to Contractor:
- 6.5.1. Withhold any payment otherwise due hereunder until Contractor complies with Metro's directions.
 - 6.5.2. Direct others to perform portions of the affected Work and charge the cost of such Work against the Contract Amount or deduct the cost from sums held in Retainage.
 - 6.5.3. Terminate any or all portions of the Work for Contractor's failure to perform in accordance with the Contract.
- 6.6. Other Metro Contractors' Failure to Coordinate -- If Contractor determines that any Other Metro Contractor on this Project is failing to coordinate its work with the Work of Contractor, Contractor shall immediately and before performing any affected Work submit a Request for Clarification to Metro pursuant to Paragraph 3.2.
- 6.7. Conflicts Among Contractors -- Any difference or conflict that may arise between Contractor and Other Metro Contractors in regard to their work shall be adjusted as determined by Metro. If directed by Metro, Contractor shall suspend any part of the Work specified or shall carry on the same in such manner as may be prescribed by Metro when such suspension or prosecution is necessary to facilitate the work of Other Metro Contractors.
- 6.8. Coordination Drawings -- Contractor shall prepare coordination drawings as determined necessary by Metro, to satisfactorily coordinate and interface its Work with the work of all Other Metro Contractors, thereby avoiding conflicts which may arise.
- 6.9. Conferences -- At any time during the progress of the Work, Metro shall have authority to require Contractor to attend any conference of any or all of Contractors engaged in the Project or related projects.

ARTICLE 7 CONTROL AND QUALITY OF WORK AND MATERIAL

7.1. Quality Control

7.1.1. Generally -- Contractor has the primary responsibility for quality control.

Contractor will provide continuous superintendence and inspection to insure that the work is completed in accordance with the plans and specifications.

Additionally, during the performance of the Work, Metro, the Architect/Engineer, and Special Inspectors, or any other persons deemed necessary by any of them acting within the scope of the duties entrusted to them, including representatives of federal, state, and local agencies having jurisdiction over the Work, may at any time, and for any purpose, enter upon the Site, the shops where any part of such Work may be in preparation, or the factories or sites where any materials for use in the Work are being or are to be manufactured or derived. Contractor shall provide proper and safe facilities therefor, and shall make arrangements with manufacturers or other suppliers to facilitate inspection of their processes and products to such extent as Metro's interest may require.

No claims for extension of the Contract Time or increase in the Contract Amount shall be allowed for any access allowed to Metro under this Paragraph.

7.1.2. Quality Control Plan -- Contractor shall prepare and submit to the Construction Manager within thirty (30) days following Notice to Proceed a Quality Control Plan which describes Contractor's procedures for implementing the Quality Control Program. The Plan shall include, but not be limited to, the Quality Control Organization, inspection procedures, tests anticipated, materials control, contingency plans related to fire protection and remediation of contaminated releases or other environmental improvement, and reports. Metro reserves the right to accept or reject or modify the Quality Control Plan. Contractor will submit an interim Quality Control Plan prior to the start of work to cover the first thirty (30) days of construction.

7.1.3. Quality Control Manager -- Prior to initiation of construction Contractor shall designate in writing a Quality Control Manager who shall be responsible for coordinating Contractor's Quality Control Program. The individual so designated shall be the interface with the Construction Manager on matters relating to submittals, inspection, scheduling, unacceptable work product and corrective actions. Metro reserves the right to accept or reject the Quality Control Manager designated by Contractor.

7.2. Inspection -- Contractor has the primary responsibility for providing inspection and testing, except as otherwise set forth in the specifications. Metro and its agents will also inspect at their discretion or as outlined in the specifications.

- 7.2.1. Generally -- Contractor shall at all times commencing with the issuance of the Notice to Proceed until Final Completion and Acceptance of the Work, permit Metro, the Architect/Engineer, and Special Inspectors, or any other persons deemed necessary by any of them acting within the scope of the duties entrusted to them, including representatives of federal, state, and local agencies having jurisdiction over the Work, to visit and monitor the progress of the Work for conformance of the Work with the Contract Documents.
- 7.2.2. Special Inspections -- Contractor shall at all times, commencing with the issuance of the Notice to Proceed until Final Completion and Acceptance of the Work, permit Metro, the Architect/Engineer, and Special Inspectors, or any other persons deemed necessary by any of them acting within the scope of the duties entrusted to them, including representatives of federal, state, and local agencies having jurisdiction over the Work, to visit and inspect the Work, the materials and the manufacture and preparation of such materials, and subject the Work and materials to inspection and testing to determine if the Work conforms to the requirements of the Contract Documents. Contractor shall maintain proper facilities and safe access for all such inspections. Where the Contract requires work to be inspected or tested, it shall not be covered up until inspected, tested and approved by Metro. Contractor shall be solely responsible for notifying Construction Manager at least two (2) working days prior to performing such work, so that necessary arrangements for inspection and testing can be made. Should any work be covered without such inspection or test and approval, it shall be uncovered and repaired at Contractor's expense.
- 7.2.3. Notice to Metro for Certain Work Days -- Whenever Contractor intends to perform work on Saturday, Sunday or any legal holiday, it shall give written notice to Metro of such intention at least two (2) working days prior to performing such work, or such other period as may be specified by Metro, so that Metro may make the necessary arrangement for testing and inspection.
- 7.2.4. Correction of Defective Work Before Acceptance -- Any defective work or work which otherwise fails to conform to the Contract Documents, which is discovered before Final Completion and Acceptance of the Work, shall be corrected immediately by Contractor, and any unsatisfactory materials shall be rejected and replaced with satisfactory materials, notwithstanding that they may have been overlooked by the authorized inspector. The inspection of the Work by Metro, the Engineer or any other agency shall not relieve Contractor of any of its obligations to perform fully all of the terms and provisions of the Contract Documents.
- 7.2.5. Acceptance Not Implied by Failure to Object -- Failure or neglect on the part of Metro or any of its authorized representatives to condemn or reject defective, improper or inferior work or materials shall not be construed to imply a final acceptance of such work or

materials and shall not be construed as relieving Contractor of its duties to perform fully all requirements of the Contract Documents.

7.3. Unsatisfactory Materials and Workmanship

7.3.1. Generally -- Material, work or workmanship which, in the opinion of the Construction Manager, does not conform to the Contract Documents, or is not equal to the samples submitted to and approved by the Construction Manager, or is in any way unsatisfactory or unsuited to the purpose for which it is intended, will be rejected. Contractor shall bear the cost of correcting or removing as deemed necessary by Metro, all non-conforming materials, work or workmanship. Contractor shall make a close inspection of all materials as delivered, and shall promptly replace all defective materials with conforming materials without waiting for their rejection by Metro.

7.3.2. Removal of Rejected or Non-Conforming Work or Material -- All rejected material or work, and all defective or non-conforming work or material, shall be removed from the Site without delay. If Contractor fails to do so within forty-eight (48) hours after having been so directed by Metro, the rejected material may be removed by Metro and the cost of removal charged against Contractor and deducted from Retainage held by Metro or offset against payments due Contractor, at Metro's option.

If in the judgment of Metro it is undesirable or impracticable to replace any defective or non-conforming work or materials, the compensation to be paid to Contractor shall be reduced by Change Order or Force Account, as applicable, by such amount as, in the judgment of Metro, shall be equitable.

7.4. General Warranty of Contractor -- Contractor warrants to Metro that materials and equipment provided under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects and contaminants not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by Metro, Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

The warranty made by Contractor under this Paragraph shall be in addition to any other specific warranties and certifications required elsewhere in these Contract Documents.

- 7.5. Correction of Work by Contractor -- Contractor shall be responsible for and shall promptly correct or replace any defective Work, whether due to faulty or contaminated materials or errors in workmanship, or Work failing to conform to the requirements of the Contract Documents which may be discovered or which may develop within one (1) year after the date of Substantial Completion or within such longer period as is specified below or otherwise in these Contract Documents.

In the case of equipment manufactured by others and supplied and/or installed by Contractor, the one (1) year period shall commence upon the date of first beneficial operation of such equipment by Metro. In the case of Work which is corrected or replaced by Contractor, the one (1) year period shall commence again on the date of acceptance by Metro of such corrected or replaced Work. Testing shall not be construed to mean acceptance.

If Metro does not require correction or replacement of defective Work or Work failing to conform to the Contract Documents, Contractor, if required by Metro, shall repay to Metro such portion of the Contract Amount as is equitable under the circumstances, as determined by Metro.

Contractor's responsibilities under this Paragraph shall not extend to correction or replacement of defects which are attributable to mistreatment by Metro or to normal wear and tear.

7.6. Warranty and Correction Agreements by Subcontractors

7.6.1. Generally -- In addition to any requirements for written warranties required by the Specifications, Contractor shall require all of its Subcontractors and Suppliers of any tier to make the same warranty to Metro as Contractor makes under Paragraph 7.4. Contractor shall also require all of its Subcontractors and Suppliers of any tier to agree to correct or replace defective Work or Work not conforming to the Contract Documents, and to take full responsibility for defective materials, in the same manner as Contractor agrees to correct or replace such Work under Paragraph 7.5.

7.6.2. Form of Submissions -- Contractor shall require all of its Subcontractors and Suppliers of any tier to sign documents evidencing the promises made pursuant to Subparagraph 7.6.1 above and shall submit such documents to Metro with its request for Final Payment. Such documents shall be signed by both Contractor and the applicable Subcontractor or Supplier and shall be in the following form:

"We the undersigned hereby warrant that the _____

(describe work performed and/or materials provided)

which we have provided for the Elephant Yard Expansion has been done in accordance with the Contract Documents and that the work as provided will fulfill the requirements of the warranty included in Article 7 of the Contract Documents.

"We agree to correct or remove and replace any or all of our work, together with any other adjacent work which may be displaced or affected by so doing, that may be defective in its workmanship or materials or which may fail to conform to the requirements of the Contract Documents within a period of one (1) year following the applicable date described in Paragraph 7.5 without any expense whatsoever to Metro, normal wear and tear and mistreatment excepted.

"In the event of our failure to comply with the above-mentioned conditions within twenty (20) calendar days after Metro notifies Contractor in writing, we collectively and separately do hereby authorize Metro to proceed to have said defects repaired and corrected at our expense and we will honor and pay the costs and to dispose of nonconforming materials and charges therefore upon demand."

- 7.7. Remedies Not Restrictive -- The remedies provided for in this Article shall not be restrictive of but shall be cumulative and in addition to all other remedies of Metro in respect to latent defects, frauds or failure to perform all work as required by the Contract Documents.
- 7.8. Proof of Compliance with Contract Provisions -- For Metro to determine whether Contractor has complied or is complying with the requirements of the Contract which are not readily enforceable by inspection and test of the Work, Contractor shall, upon request, promptly submit to Metro such properly authenticated documents as may be necessary to demonstrate compliance with the Contract or other satisfactory proof of its compliance with such requirements.
- 7.9. Patents, Copyrights, Trademarks -- All fees or costs of claims for any patented invention, article or arrangement or any copyrights or trademarks that may be used upon or in any manner connected with the performance of the Work or any part thereof, shall be included in the Bid for doing the Work. Contractor shall save, keep, hold harmless, and fully indemnify Metro and Architect/Engineer from all damages, claims for damage, lawsuits, costs, expenses or liabilities of whatever nature in law or equity, including attorney's fees and court costs, which may at any time arise or be set up for any infringement of the patent rights, copyrights or trademarks of any person or persons in consequence of the use by Metro of articles to be supplied under the Contract and of which Contractor is not the patentee or assignee or has not the lawful right to sell the same. This is in addition to all other hold harmless and indemnification clauses in these Contract Documents.

- 7.10. Anti-Trust Claims -- By entering into this Contract, Contractor, for consideration paid to Contractor under the Contract, does irrevocably assign to Metro any claim for relief or cause of action which Contractor now has or which may accrue to Contractor in the future, including, at Metro's option, the right to control any such litigation on such claim for relief or cause of action, by reason of any violation of 15 USC Section 1-15, ORS 646.725 or ORS 646.730, in connection with any goods or services that are used, in whole or in part, for the purpose of carrying out Contractor's obligations under this Contract.

Contractor shall require all Subcontractors and Suppliers to irrevocably assign to Metro, as a third party beneficiary any right, title or interest that has accrued or may accrue to the Subcontractors or Suppliers by reason of any violation of 15 USC Section 1-15, ORS 646.725 or ORS 646.730, including, at Metro's option, the rights to control any litigation arising thereunder, in connection with any goods or services provided to the Subcontractors or Suppliers by any person, in whole or in part, for the purpose of carrying out the Subcontractors' or Suppliers' obligations as agreed to by Contractor in pursuance of the completion of the Contract.

In connection with Contractor's, Subcontractors' or Suppliers' assignment, it is an express obligation of Contractor, Subcontractor or Supplier that it will take no action which will in any way diminish the value of the rights conveyed or assigned hereunder to Metro. It is an express obligation of Contractor, Subcontractor or Supplier to advise the General Counsel of Metro:

7.10.1. In advance, of its intention to commence any action on its own behalf regarding such claims for relief or causes of action;

7.10.2. Immediately, upon becoming aware of the fact that an action has been commenced on its own behalf by some other person or persons, of the pendency of such action; and

7.10.3. The date on which it notified the obligor(s) of any such claims for relief or causes of action of the fact of its assignment to Metro.

Furthermore, it is understood and agreed that in the event that any payment under any such claim is made to Contractor, Subcontractor or Supplier, it shall promptly pay over to Metro its proportionate share thereof, if any, assigned to Metro hereunder.

ARTICLE 8 CHANGES IN THE WORK

- 8.1. Change Orders Generally -- Metro may order changes in the Work herein required, including deletions of work, and may order additional materials and work in connection with the performance of the Work.

If such changes in the Work increase or decrease the cost of any part of the Work or change the time necessary to complete the Work, the Contract Amount shall be increased or decreased by such amount and the Contract Time changed as Contractor and Metro may agree upon as reasonable in a written Change Order. Contractor shall promptly comply with such Change Orders and carry them out in accordance with the Contract Documents.

No order for any alteration, modification or additional work which shall increase or decrease the Contract Amount or change the Contract Time shall become part of the Contract unless the resulting Change Order shall have been agreed upon in writing and the Change Order signed by Contractor and Metro, unless the work is Force Account work. Metro may, at its discretion, also require the signature of Contractor's surety on the Change Order. Prior to the approval of such Change Order, the Engineer shall have approved any design modifications entailed thereby.

8.2. Procedure for Determining Impact of Change Orders on Contract Amount

8.2.1. Price before Proceeding -- If Metro intends to order changes in the Work, it may request a proposal by Contractor for the proposed added or deleted work before directing Contractor to commence work. Within fourteen (14) days after issuance of such request by Metro, Contractor shall furnish three copies of a complete breakdown of costs of both credits and additions directly attributable to the change in the Work proposed, itemizing materials, labor, taxes, affect on Contract Time, if any, and Overhead and Profit on a form approved by Metro and in accordance with the limitations described in the following Paragraph.

Subcontract work shall be so indicated and written proposals from Subcontractors or Suppliers shall be included with similar breakdowns provided. Following submission of its cost breakdown, Contractor shall meet with Metro to discuss all aspects of scope, costs, scheduling and construction methods.

8.2.2. Proceed While Pricing -- If Metro finds it necessary to make changes in the Work in an expeditious manner, it may direct Contractor to proceed with the change while preparing a proposal for the added or deleted Work. In such an instance, Metro may assign an estimated value to the change which Contractor shall not exceed without further authorization by Metro. Within fourteen (14) days after issuance of such by Metro, Contractor shall furnish three copies of a complete breakdown of costs of both credits and additions directly attributable to the change in the Work proposed, itemizing materials, labor, taxes, affect on Contract Time, if any, and Overhead and Profit on a form approved by Metro and in accordance with the limitations described in the following Paragraph.

Subcontract work shall be so included with similar breakdowns provided. Following submission of its cost breakdown, Contractor shall meet with Metro to discuss all aspects of scope, costs, scheduling and construction methods.

8.2.3. Unit Prices -- If the proposed additional or deleted work is the subject of Unit Prices stated in the Contract Documents or subsequently agreed upon, such Unit Prices shall be binding upon Contractor in calculating the increase or decrease in the Contract Amount attributable to the proposed additional or deleted work.

8.3. Limitations when Change Orders Impact Contract Amount-- The following limitations shall apply in the calculation of the costs of changes in the Work:

8.3.1. Overhead and Profit -- Contractor will be permitted a reasonable allowance for Profit and Overhead on its increased Direct Cost resulting from any changes in the Work ordered by Metro. Likewise, Profit and Overhead will be deducted for any portion of the Work which is deleted. In the case of a change involving both credits and extras, Overhead and Profit shall be applied to the net extra after subtraction of credits.

Overhead and Profit for the entity performing the work with its own crews shall not exceed twenty percent (20%) of the Direct Cost of the changed work.

Overhead and Profit for Contractor or Subcontractor who has had the work performed by a lower tier Subcontractor shall not exceed five percent (5%) of the Direct Cost of the changed work.

If the Work is performed by a second-tier or inferior Subcontractor, the total Overhead and Profit for all tiers shall in no event exceed thirty percent (30%) of the Direct Cost of the changed work. Distribution of this Overhead and Profit among the tiers is the responsibility of Contractor.

8.3.2. Taxes and Insurance -- Federal, state, regional, county and local taxes, including, but not limited to, income taxes, excise taxes, sales and use taxes and payroll taxes and insurance shall be shown separately and will be allowed on extras and shall be credited on credits. No Overhead and Profit will be allowed on taxes and insurance.

8.3.3. Bond Premiums -- The actual rate of bond premium as paid on the additional Direct Cost plus the cost of taxes defined in 8.3.2 will be allowed. No Overhead and Profit will be allowed on such premiums.

8.3.4. Equipment Costs -- The allowance for equipment costs (both rental as well as Contractor-owned equipment) shall be limited to those rates in the Rental Rate Bluebook published by Dataquest Incorporated, 1290 Ridder Park Drive, San Jose, California 95131-2398, (800) 227-8444.

8.4. Force Account Work -- If Contractor does not respond to Metro's Request for Proposal with a cost breakdown within the fourteen (14) day period as required above, or if Metro

determines that Contractor's breakdown of costs is unreasonable in consideration of the work proposed to be added or deleted, or if Metro determines that the proposed work must be commenced promptly to avoid delay to the Project, Metro may issue an order for Force Account work and Contractor shall promptly perform or delete the work described in such order. Change, if any, in the Contract Amount due to such Force Account work shall be the sum total of the following items:

- 8.4.1. Actual labor cost, including premium on compensation insurance and charge for social security taxes, and other taxes pertaining to labor.
- 8.4.2. The proportionate cost of premiums of public liability property damage and other insurance applicable to the extra work involved and required by these Contract Documents.
- 8.4.3. Actual cost of material, including applicable taxes pertaining to materials.
- 8.4.4. Actual cost of plant and equipment rental, at rates to be agreed upon in writing before the work is begun or at rates per Subparagraph 8.3.4 above. No charge for the cost of repairs to plant or equipment will be allowed. Equipment items having a capital cost of under \$250.00 are considered small tools and classified as Overhead.
- 8.4.5. Overhead and Profit as provided and limited in Paragraph 8.3.
- 8.4.6. The proportionate actual costs of premiums for bonds required by these Contract Documents.

Whenever any Force Account work is in progress, Contractor shall furnish each working day to Metro a detailed written report signed by Contractor and Metro's representative of the amount and cost of all of the items listed in (1) through (6) above, and no claim for compensation for such extra work will be allowed unless such report shall have been made. Metro reserves the right to provide such materials as it may deem expedient and no compensation, overhead or profit will be allowed to Contractor for such materials.

- 8.5. Oral Modifications -- No oral statement of any person whomsoever shall in any manner or degree modify or otherwise affect the terms of this Contract.

- 8.6. Contractor Proposals for Changes in Work

- 8.6.1. Generally -- At any time during the performance of the Work, Contractor may propose to Metro changes in work which Contractor believes will result in higher quality work, improve safety, shorten the Contract Time, decrease the Contract Amount, or otherwise result in better or more efficient work.

- 8.6.2. Purpose -- Metro encourages Contractor to submit Value Engineering Change Proposals (VECPs) in order to avail Metro of potential cost saving that may result. Contractor and Metro will share any savings, computed in accordance with instructions herein. Contractor is encouraged to submit VECPs whenever he identifies an area which can be improved, using the format described herein.
- 8.6.3. Application -- This clause applies to a contractor developed and documented VECP which: (1) requires a change to this Agreement to implement the VECP; and (2) reduces the Contract Price without impairing essential functions or characteristics of the Work, provided it is not based solely on a change in specified quantities.
- 8.6.4. Documentation -- At a minimum, the following information shall be submitted by Contractor with each VECP: (1) description of the existing requirements of the Contract Documents which are involved in the proposed change; (2) description of the proposed change; (3) discussion of differences between existing requirements and the proposed change, together with advantages and disadvantages of each changed item; (4) itemization of the requirements which must be changed if the VECP is accepted (e.g., Drawing numbers and Specifications); (5) justification for changes in function or characteristics of each such affected item and effect of the change on the performance of the end item; (6) effect of proposed change on life-cycle costs, including operation and maintenance, replacement costs, and life expectancy; (7) date or time by which a Change Order adopting the VECP must be issued in order to obtain the maximum cost reduction, noting any effect on Contract Time or delivery schedule; and (8) cost estimate for existing contract requirements correlated to his lump sum breakdown and proposed changed requirements. Costs of development and implementation by Contractor shall be identified. Estimated Metro costs (e.g., cost of testing and redesign) shall also be identified.
- 8.6.5. Submission --Proposals will be processed expeditiously; however, Metro will not be liable for any delay in acting upon any proposal submitted pursuant to this clause. Contractor shall have the right to withdraw, in whole or in part, any VECP at any time prior to acceptance by Metro.
- 8.6.6. Acceptance -- Metro may accept, in whole or in part, by Change Order, any VECP submitted pursuant to this clause. Until a Change Order is issued, Contractor shall remain obligated to perform in accordance with this Agreement. The decision as to acceptance or rejection of any VECP will be at the sole discretion of Metro and will be final and not subject to review by arbitration or otherwise.
- 8.6.7. Sharing -- If a VECP submitted by Contractor pursuant to this clause is accepted, Contractor shall proceed with the change and the Contract Price will be adjusted in accordance with the following provisions:

Definitions

- 8.6.7.1. Estimated Gross Savings to Contractor (GS): The difference between cost of performing the Work according to the existing requirement and the cost if performed according to the proposed change. In each instance, Contractor's profit shall not be considered part of the cost.
- 8.6.7.2. Contractor Costs (CC): Reasonable costs incurred by Contractor in preparing the VECP and making the change such as cancellation or restocking charges where required.
- 8.6.7.3. Estimated Net Savings to Contractor (NS): Gross savings (GS) less Contractor costs (CC).
- 8.6.7.4. Metro's Costs (OC): Reasonable costs incurred by Metro for evaluating and implementing the VECP, such as testing and redesign, where required.

Calculations

- 8.6.7.5. The Contract Price shall be reduced by an amount equal to 50 percent of (NS) plus 50 percent of (OC), expressed by the formula:

$$\text{Reduction} = 0.5 (\text{NS}) + 0.5 (\text{OC}).$$

- 8.6.7.6. Contractor's profit will not be reduced by application of the VECP.
- 8.6.8. Subcontracts -- Contractor shall include appropriate value engineering incentive provisions in all subcontracts of \$25,000 or greater. He may include such provisions in any Agreement. Subcontracts shall contain a provision that any benefits accruing to Contractor as a result of an accepted VECP initiated by a Subcontractor shall be shared by Contractor and Subcontractor. To compute any adjustment in the Contract Price under Paragraph 6.45 above, Contractor's costs of preparation and charge for a VECP shall include any preparation and change costs. Examples are cancellation or restocking charges when required.
- 8.6.9. Disclosure Restrictions -- Contractor may restrict Metro's right to use any sheet of a VECP or of the supporting data submitted pursuant to this clause, in accordance with the terms of the following legend if it is marked on such sheet:

Legend

To the extent allowed by law, data furnished pursuant to the value engineering incentive clause of the Agreement shall not be: (1) disclosed to any outside

person or agency, (2) duplicated, or (3) used. Metro may disclose, duplicate, or use furnished data to evaluate a VECP submitted under said clause. This restriction does not limit Metro's right to use information that has been obtained, or is otherwise available, from Contractor or from another source without limitations. If such a VECP is accepted, Metro shall have the right to duplicate, use, and disclose any data reasonably necessary to the full utilization of such VECP as accepted, in any manner and for any purpose whatsoever, and have others so do.

- 8.7. Impact of Authorized Changes in the Contract -- Changes in the Work made pursuant to this Article and extensions of the Contract Time allowed by Metro due to such changes shall not in any way release any warranty or promises given by Contractor pursuant to the provisions of the Contract Documents, nor shall such changes in the Work relieve or release the sureties of bonds executed pursuant to said provisions. The sureties, in executing such bonds, shall be deemed to have expressly agreed to any such change in the Work and to any extension of Contract Time made by reason thereof.

ARTICLE 9 PAYMENTS AND COMPLETION

- 9.1. Scope of Payment -- Payment to Contractor of the Contract Amount for performing all Work required under the Contract, as adjusted for any Change Orders approved as hereinbefore specified, shall be full compensation for furnishing all labor, materials, equipment and tools necessary to the Work, and for performing and completing, in accordance with these Contract Documents, all Work required under the Contract, and for all expenses incurred by Contractor for any purpose in connection with the performance and completion of said Work.

Whenever it is specified herein that Contractor is to do work or provide materials of any class for which no price is fixed in the Contract, it shall be understood that Contractor is to do such work or provide such materials without extra charge or allowance or direct payment of any sort, and that the cost of doing such work or providing such materials is included in its Bid.

- 9.2. Schedule of Values

9.2.1. Generally -- Within thirty (30) days after the Notice to Proceed and at least 15 days prior to Contractor's application for the first progress payment, Contractor shall submit a detailed breakdown on its lump sum bid. The format and detail of the breakdown shall be as directed by Metro and in accordance with Section 01025 of the Specifications to facilitate and clarify future progress payments to Contractor. This breakdown shall be referred to as the Schedule of Values.

9.2.2. Review of Schedule of Values -- Metro will review the Schedule of Values to ascertain that the dollar amounts of the Schedule of Values are in fact fair cost

allocations for the work item listed. Upon concurrence by Metro, a formal approval of this Schedule of Values will be issued. Metro shall be the sole judge of fair cost allocations. Contractor's monthly progress payment requests shall reflect the cost figures included in the approved Schedule of Values and shall be based upon completed work items or percentages of work items completed prior to the end of the payment period as more fully described below.

9.3. Progress Payment Procedure

- 9.3.1. Generally -- Subject to the approval of Metro, disbursements shall be made by Metro of progress payments upon written request of Contractor and pursuant to the Contract Documents as specified in Section 01025 of the Specifications.

Before the end of each calendar month, Contractor shall file with the Construction Manager in duplicate on a form approved by Metro, a proposed payment estimate for the period commencing on the 26th day of the previous month through midnight on the 25th day of the calendar month in question. Metro and the Construction Manager shall review Contractor's estimate and shall determine the value of Contractor's work based upon the Schedule of Values and incorporated labor and materials for the payment period. Contractor shall not be paid for any work which is, in Metro's opinion, defective or improper or for work needed to correct Contractor's defective or improper work. Contractor shall be paid 95 percent (95%) of the determined value of work accomplished less any offset or withholding of sums by Metro allowed under the Contract Documents within thirty (30) days after receipt by Metro of Contractor's payment estimate. Metro will routinely withhold five percent (5%) as Retainage.

No inaccuracy or error in any monthly progress payment estimates shall operate to release Contractor or its surety from damages arising from such work or from the enforcement of each and every provision of the Contract Documents, and Metro shall have the right subsequently to correct any error made in any estimate for progress payments.

- 9.3.2. Retainage -- If, in Metro's opinion, work on the Project is progressing satisfactorily, Metro may eliminate additional Retainage on any remaining monthly progress payments after 50 percent (50%) of the Work under the Contract is, in Metro's opinion, completed. Elimination of additional Retainage under this Subparagraph shall be allowed by Metro only upon written application by Contractor, which application shall include written approval of Contractor's surety.

If after Metro allows such an elimination of additional Retainage, Metro determines that progress of the Work is not satisfactory or that Contractor has breached any provision of the Contract, Metro may again retain and continue to

retain, in addition to that Retainage already being held by Metro, five percent (5%) of any future progress payments made to Contractor.

When Metro determines that the Work is 97-½ percent (97-½%) complete, Metro may, at its discretion and without application by Contractor reduce the retained amount to 100 percent (100%) of the value of the Work remaining to be done.

All funds retained by Metro under this section shall be retained in a fund by Metro and paid in accordance with ORS 279.435.

Contractor may elect to deposit bonds or securities of the type described below with Metro or in any bank or trust company to be held in lieu of the cash retainage described above and for the benefit of Metro. In such event, Metro shall reduce the Retainage in an amount equal the value of the bonds and securities and shall pay the amount of the reduction to Contractor in accordance with ORS 279.435. Interest on such bonds or securities shall accrue to Contractor.

Bonds and securities deposited or acquired as described above shall be of a character approved by the Director of Oregon's Department of General Services including, but not limited to:

- 9.3.2.1. Bills, certificates, notes or bonds of the United States.
- 9.3.2.2. Other obligations of the United States or its agencies.
- 9.3.2.3. Obligations of any corporation wholly owned by the federal government.
- 9.3.2.4. Indebtedness of the Federal National Mortgage Association.

Contractor may elect to require Metro to deposit the accumulated Retainage in an interest bearing account in a bank, savings bank, trust company or savings association for the benefit of Metro. Interest on such an account shall accrue to Contractor.

If Metro incurs additional costs as a result of Contractor's exercise of any of the above-described options, Metro may recover such costs from Contractor by reduction of the Final Payment. Metro shall inform Contractor of all such accrued costs.

- 9.3.3. Payment for Material Stored Off Site --Payment for material stored off of the Site will not be allowed unless the payment for such material benefits Metro in terms of lead time, scarcity, schedule, etc. Metro has sole discretion as to what materials will be paid for in advance of delivery to or installation on Site. Proof

of off-site material purchases (invoice or checks) and appropriate insurance coverage will be required for payment. Title to all equipment and materials shall pass to Metro upon payment therefore or incorporation in the Work, whichever shall first occur, and Contractor shall prepare and execute all documents necessary to effect and perfect such transfer of title. Contractor must provide to Metro written consent from Contractor's surety approving the advanced payment for materials stored off-site.

The maximum prepayment allowed by Metro shall be 75 percent of the actual fair market value of the item being considered. Metro shall be the sole judge of fair market value. Contractor shall protect stored materials from damage, and damaged or otherwise unacceptable materials, even though paid for, shall not be incorporated into the Work.

- 9.3.4. Other Conditions Precedent to Payment -- It is a condition precedent to Contractor's rights to any payments under the Contract that all bills for labor and materials, including labor and materials supplied by or to Contractor, shall have been paid in full and, if requested by Metro, Contractor shall submit receipted invoices and/or lien waivers, as evidence of payment in full of all such accounts. As a further condition precedent to Contractor's right to any payments under this Contract, if requested by Metro, Contractor shall submit a claims release before any payment, and a final claims release stating Contractor has been paid in full prior to the Final Payment.

Payments to Contractor shall be conditioned upon Contractor complying with all provisions of this Contract regarding scheduling and progress reports submissions and upon Contractor furnishing all other information and data necessary to ascertain actual progress. Metro's determination that Contractor has failed or refused to furnish the required information, data, schedules or other reports shall constitute a basis for withholding all payments until the required information, data, revised schedules and diagrams, if necessary, and other reports are furnished.

- 9.3.5. Payment Does Not Imply Acceptance of Work -- The granting of any progress payment, or the receipt thereof by Contractor, shall not constitute acceptance of the Work or any portion thereof, and shall in no way lessen the liability of Contractor to replace unsatisfactory work or material, though the unsatisfactory character of such work or material may or may not have been apparent or detected at the time such payment was made.
- 9.3.6. Offset of Sums Due Metro from Contractor -- In addition to any retention rights allowed Metro under this Contract, it is mutually understood and agreed that Metro may, upon prior written notice to Contractor, offset from any payment otherwise due Contractor, as much as may be necessary to protect and compensate Metro from any costs or expenses it may incur due to any breach of the Contract

by Contractor, including applicable liquidated damages. Any sums so offset shall become the property of Metro.

9.3.7. Time of the Essence --Time is of the essence for the performance of the Work under this Contract.

9.4. Substantial Completion -- When Contractor considers the Work to be substantially complete, Contractor shall submit to Metro a written notice that the Work is substantially complete and a punch list of items to be completed or corrected. Within a reasonable time after receipt of such notice, Metro and Architect/Engineer will review the Work, including a physical inspection, to determine the status of completion. Should the Architect/Engineer and Metro determine that the Work is not substantially complete:

9.4.1. Construction Manager will promptly notify Contractor in writing, giving the reasons therefor.

9.4.2. Contractor shall remedy the deficiencies in the Work, and thereafter send a second written notice of Substantial Completion to Metro.

The above-described procedure shall be followed until the Work is, in the opinion of Metro and Architect/Engineer, substantially complete. At that point:

9.4.2.1. The Architect/Engineer will prepare a Certification of Substantial Completion on AIA Document G704, accompanied by the approved punch list of items to be completed or corrected as verified and amended by the Architect/Engineer.

9.4.2.2. Metro shall submit the Certificate of Substantial Completion to Contractor for signature. Contractor shall complete the items on the approved punch list.

9.5. Final Completion and Acceptance -- When Contractor considers the Work to be finally complete, Contractor shall submit written certification to Metro that:

9.5.1. Contract Documents have been reviewed.

9.5.2. Work has been inspected for compliance with Contract Documents.

9.5.3. Work has been completed in accordance with Contract Documents to include submission of record documents.

9.5.4. Equipment systems have been tested in presence of Metro and are operational.

9.5.5. Work is ready for final inspection.

Architect/Engineer and Metro will promptly review the Work and include a physical inspection to verify the status of completion and shall inform Metro of the conclusions. Metro shall, within fifteen (15) days after receipt of Contractor's certification, either accept the Work or notify Contractor of the work yet to be performed on the Contract as outlined below.

Should the Architect/Engineer and Metro consider that the work is incomplete or defective:

9.5.5.1. Construction Manager will promptly notify Contractor in writing, listing the incomplete or defective work.

9.5.5.2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to Metro that the Work is complete. Metro will then advise the Architect/Engineer.

9.5.5.3. Architect/Engineer and Metro will review and reinspect the Work.

The above-described procedure shall be followed until the Work is, in the opinion of Metro and Architect/Engineer, finally complete. Contractor shall immediately thereafter prepare and submit Closeout Submittals as described below.

9.6. Closeout Submittals -- Contractor shall submit the following items, as applicable, with its request for Final Payment:

9.6.1. Evidence of Compliance with Requirements of Governing Authorities.

9.6.2. Project record documents in accordance with the Specifications.

9.6.3. Operation and maintenance data in accordance with the Specifications.

9.6.4. Warranties in accordance with requirements of various Specification sections and these General Conditions.

9.6.5. Extra stock and maintenance materials. Contractor shall submit receipts, signed by Metro, for the various specific items.

9.6.6. Evidence of payment and release of claims in accordance with the following section.

9.6.7. Consent of surety to Final Payment.

- 9.6.8. Certificates of insurance for products and completed operations in accordance with Article 11 of these General Conditions.
- 9.6.9. If Contractor is a "foreign contractor" as that term is defined in Subparagraph 14.3.6, complete documentation of Contractor's compliance with ORS 279.021.
- 9.7. Releases -- Contractor and each assignee under any assignment in effect at the time of Final Payment shall execute and deliver, at the time of application for Final Payment, as a condition precedent to Final Payment, a release in form and substance satisfactory to Metro, discharging and releasing Metro and the Architect/Engineer of and from all liabilities, obligations and claims arising under this Contract.
- In addition to the above-described release, Contractor shall:
- 9.7.1. Submit to Metro an affidavit certifying that Contractor has paid all federal, state and local taxes including excise, use, sales, and employee withholding taxes.
- 9.7.2. Deliver to Metro written releases of all rights to file claims against Metro or to file claims on any bonds in connection with the Contract, signed by each Subcontractor and Supplier who performed labor or furnished materials in connection with the work.
- 9.7.3. Deliver to Metro Contractor's written undertaking, with sureties acceptable to Metro:
- 9.7.3.1. To promptly pay and obtain a release of claims on any bonds which may in the future affect the premises; and
- 9.7.3.2. To defend, indemnify and save Metro harmless from any liability or expense because of any claim on any bond or any other claim related to the Contract or the Work.
- 9.8. Final Payment -- Upon application of Contractor and Contractor's completion of and compliance with all of the provisions of the above Paragraphs and settle of all claims arising from the agreement including claims that Metro may have against Contractor, Metro shall pay Contractor the balance of the Contract Amount subject to the availability of monies in the Construction Fund as described in Paragraph 9.1 and less any previous payments, offsets and withholdings allowed Metro under this Contract and Retainage which has been returned to Contractor.

Acceptance of Final Payment by Contractor shall constitute a waiver of all claims of whatever nature which Contractor may have or allege to have against Metro arising out of or related to Work described in the Contract Documents.

- 9.9. No Waiver of Rights -- Neither the final review by Metro, nor any order or certificate for the payment of money, nor any payment for, nor acceptance of the whole or any part of

the Work by Metro, nor any extension of time, nor any position taken by Metro shall operate as a waiver of any provision of this Contract or of any power herein reserved by Metro or any right to damage herein provided; nor shall any waiver of any breach of this Contract be held to be a waiver of any other or subsequent breach. All of Metro's remedies provided in this Contract shall be taken and construed as cumulative; that is, in addition to each and every other remedy herein provided; and Metro shall have any and all equitable and legal remedies which it would in any case have.

ARTICLE 10 SAFETY AND PROTECTION OF THE WORK

10.1. Safety Requirements

- 10.1.1. Safety Generally -- Contractor shall be solely and completely responsible for the safety of the Work and the Site, including, but not limited to, the safety of all persons and property involved in the Work at the Site at any time until Final Completion and Acceptance of the Work.

All Work shall be performed in full accordance with all applicable safety codes, laws, ordinances and requirements including, but not limited to, the Safety and Health Regulations for Construction, promulgated by the Secretary of Labor under Section 107 of the Contract Work Hours and Safety Standards Act as set forth in Title 29 of the Code of Federal Regulations, federal and state OSHA, Metro's insurance standards, and all other applicable safety codes. Where any of these are in conflict, the more stringent requirement shall be followed. Contractor's failure to thoroughly familiarize itself with the aforementioned safety provisions shall not relieve it from any requirements in the Contract Documents to comply with such safety provisions or from any penalties for failure to so comply.

Contractor shall inspect the Work and the Site daily and immediately correct any unsafe conditions. All job personnel shall be knowledgeable of and comply with the above safety requirements.

Contractor shall take all precautions to prevent the possibility of fire resulting from contract operations. Contractor shall provide properly maintained emergency fire extinguishing equipment of a readily available type and quantity as necessary to meet potential fire hazards.

- 10.1.2. Health and Safety Program -- Contractor shall develop, publish and implement the overall Health and Safety Program for the Project. Refer to Section 01500 of the Technical Specifications. This Program shall conform to all applicable codes. Contractor shall submit the written Health and Safety Program to Metro for review and comment within fourteen (14) days after the receipt of the written Notice To Proceed. The Program, as approved by Metro, shall subsequently be distributed to and implemented by Contractor's personnel as well as its Subcontractors and

Suppliers. Contractor shall fully implement and comply with the approved Safety Program.

10.1.3. Health and Safety Officer -- Prior to initiation of construction, Contractor shall designate in writing a Site Health and Safety Officer who shall be responsible for coordinating Contractor's Health and Safety Program. The individual so designated shall be the interface with the Construction Manager on matters relating to safety, and Contractor's compliance with the approved Safety Program. Metro reserves the right to accept or reject the Health and Safety Officer designated by Contractor.

10.2. First Aid -- Contractor shall maintain on the Site during work operations, a member of its work force who is qualified in administering first aid to its personnel and shall have available in its job office the first aid equipment as required to meet all applicable safety codes. The names and credentials of qualified personnel will be submitted to the Construction Manager.

Contractor shall require or provide adequate clothing and protective gear for all personnel working on the job site. This includes but is not limited to hard hats; substantial boots or shoes, shirts with sleeves at all times; eye and ear protection, gloves, face masks, welding hoods, safety belts as required for the type of work being done.

10.3. Protection of Work, Persons and Property Against Damages -- Contractor shall protect the Work from damage due to construction operations, the action of the elements, including erosion due to normal and extraordinary weather conditions, the carelessness of other contractors, vandalism, or any other cause whatever until Final Completion and Acceptance of the Work.

Contractor shall protect all public and private property insofar as it may be endangered by operations of Contractor including adjoining lands, air and waterways, and shall be fully responsible for taking proper precautions for the prevention of accidents to persons and/or damage to such property at, on or near the Site.

All federal, state and local safety and environmental protection laws, rules and orders including fire codes, applicable to the Work to be done under the Contract, shall be obeyed, complied with and enforced by Contractor.

Contractor shall provide and maintain such guards, fences, barriers, signs, regulatory and warning lights, and other traffic control and safety devices adjacent to and on the Site as may be necessary to prevent accidents to the public and damage to property. Contractor shall also provide, place and maintain such lights as may be necessary for illuminating the said signs, guards, fences, barriers and other traffic and safety control devices.

Upon Final Completion and Acceptance of the Work, Contractor shall remove all temporary signs, lights, barriers, etc., from the Site.

ARTICLE 11 INDEMNIFICATION AND INSURANCE

- 11.1. Indemnification -- Contractor agrees that for purposes of the Oregon Tort Claims Act (ORS 30.260 through 30.300), neither Contractor, its officers, agents and employees nor any Subcontractor or Supplier of Contractor of any tier, or its officers, agents or employees, are agents of Metro. Contractor for itself and its officers, agents, employees and its Subcontractors and Suppliers of any tier and their officers, agents and employees will make no claim whatsoever against Metro for indemnification pursuant to ORS 30.260 to 30.300 and Contractor agrees to hold Metro harmless and indemnify Metro from any such claims.

Contractor shall assume all responsibility for the Work and shall bear all losses and damages directly or indirectly resulting to Contractor, Metro, Architect/Engineer, their officers, agents and employees, or to others on account of the character or performance of the Work, or accidents, unless such cause is due to the sole negligence of Metro or Architect/Engineer.

Contractor shall assume the defense, if requested, indemnify and hold harmless Metro and Architect/Engineer from all claims, liability, loss, damage, consequential or otherwise, and injury of every kind, nature and description, directly or indirectly resulting from activities in the performance of the Contract, the ownership, maintenance or use of motor vehicles in connection therewith, or the acts, omissions, operations, or conduct of Contractor or any Subcontractor or Supplier under the Contract or in any way arising out of the Contract, irrespective of whether fault is the basis of the liability or claim.

Any specific duty or liability imposed or assumed by Contractor, as may be otherwise set forth in the Contract Documents, shall not be construed as a limitation or restriction of the general liability or duty imposed upon Contractor by this Paragraph.

Such liabilities and losses from which Contractor shall indemnify and hold harmless the above-described indemnities shall include, but not be limited to:

- 11.1.1. Special activities by Metro to verify and/or expedite delivery of materials and those losses incurred by Metro as a result of any delays to Other Metro Contractors resulting from acts of Contractor or its failure to act.
- 11.1.2. Acceleration payments to Other Metro Contractors on the project or related projects resulting from Contractor falling behind the Construction Schedule for causes not entitling it to an extension of time under any provisions of the Contract Documents which cause other Metro Contractors to fall behind the Construction Schedule and who must then accelerate the performance of the work, as directed by Metro, in order to maintain progress.

11.1.3. Violations of the ordinances or regulations of Metro, any federal, state, county or city laws or order of any properly constituted authority in any manner affecting this Contract, in addition to any laws or regulations which might affect this Contract.

11.1.4. Any and all suits, actions, damages or claims of every name and description to which the above indemnified may be subjected or put by reason of injury to persons or property arising out of, in connection with, or incident to the execution of the work or resulting from acts or omissions on the part of Contractor, its Subcontractors, officers, employees or agents and all attorney's fees and court costs incident thereto.

11.2. Insurance

11.2.1. Public Liability and Property Damage Insurance

Contractor shall purchase and maintain, at the Contractor's expense, the following types of insurance covering the Contractor, its employees and agents.

A. Broad form comprehensive general liability insurance covering bodily injury, property damage, and personal injury with automatic coverage for premises/completed operations and product liability. The policy must be endorsed with contractual liability coverage.

B. Automobile bodily injury and property damage liability insurance.

Insurance coverage shall be on an occurrence basis with an annual aggregate limit of \$1,000,000.

Metro, its elected officials, departments, employees and agents shall be named as an ADDITIONAL INSURED. Notice of any material change or policy cancellation shall be provided to Metro thirty (30) days prior to the change.

C. Subcontractor's Insurance -- Contractor shall require that all of its Subcontractors and Suppliers of any tier provide insurance coverage and conditions identical to Contractor's insurance coverage, except that the policy limits of all Subcontractors' insurance coverage shall be at least \$1,000,000 combined single limit for each occurrence and in the aggregate.

11.2.2. Workers' Compensation and Employer's Liability Insurance

The Contractor, its subcontractors, and all employers working under this contract are subject employers under the Oregon Workers' Compensation Law and shall comply with ORS 656.017, which requires them to provide workers' compensation coverage for all their subject workers. The Contractor shall

provide Metro with certification of workers' compensation insurance including employer's liability of \$1,000,000.

11.2.3. Forms of Policies and Other Insurance Requirements -- In addition to filing any other insurance certificates specified elsewhere in these Contract Documents, Contractor shall, within seven (7) days following Notice of Award of Contract, provide Metro two (2) certified copies of the policies of all insurance herein required to be obtained by Contractor except that Worker's Compensation Insurance may be evidenced by a Certificate of Insurance. At Metro's request, Contractor shall immediately deliver to Metro the receipts for payment of premiums on any or all such policies.

All policies of insurance and Certificates of Insurance shall be satisfactory to Metro. Approval of the insurance by Metro shall not relieve or decrease the extent to which Contractor or Contractor's Subcontractors and Suppliers of any tier may be held responsible for payment of any and all damages resulting from performance of the Work.

Each such policy or Certificate of Insurance shall bear an endorsement precluding its cancellation, expiration or any reduction in its coverage without giving to Metro at least sixty (60) days prior written notice. Contractor shall file with Metro two (2) certified copies of the required new or renewed policy or two (2) Certificates of Insurance for each such policy, as applicable, before the effective date of such cancellation, change or expiration.

If Contractor neglects to obtain or maintain in force any such insurance or to deliver such policy or policies, certificates and receipts to Metro, then Metro may, at its option, obtain and maintain such insurance. Contractor hereby appoints Metro its true and lawful attorney, to do all things necessary to obtain and maintain such insurance. All monies expended by Metro for such insurance shall be charged to Contractor and Metro may offset its costs in obtaining and/or maintaining such policies from sums due or to become due Contractor under the Contract or otherwise collect such sums from Contractor. Failure of Metro to obtain or maintain such insurance shall in no way relieve Contractor of any of its responsibilities under this Contract.

Contractor's failure to maintain any item of the required insurance shall be sufficient cause for termination or suspension of this Contract.

All insurance required shall be obtained through a company or companies having a policyholders surplus of at least ten (10) times the amount or limit of liability afforded by such insurance company on policies issued for this Contract. Such company shall be duly and legally licensed to transact business in the state of

Oregon and shall be acceptable to Metro. Said insurance shall be primary over any insurance or self-insurance of Metro.

11.3. Builder's All Risk Insurance

- 11.3.1. Contractor, for the life of this Contract, shall effect and maintain Builders All Risk Insurance and fire insurance with extended coverage and malicious mischief coverage upon the structures on which the work of this Contract is to be done to 100 percent (100%) of the insurable value thereof, protecting: 1) Owner's interest; 2) Contractor's interest; and 3) the subcontractor's interests in the work. Contractor's interest and the subcontractor's interests, as used herein, means their property interests and the property interests of others for which they are responsible in the Project, in all materials and supplies entering into or used or destined for use therein, and in all expendable items of equipment which are used in or are incidental to but which do not become a part of the finished Project, located at the job site at the time of loss or damage. Such insurance shall not exclude coverage for landslides, collapse, explosion or loss due to the result of faulty workmanship.
- 11.3.2. Contractor and all subcontractors shall be responsible for any loss or damage to their machinery and apparatus and nonexpendable items of their equipment.
- 11.3.3. Contractor shall provide adequate fire protection equipment and safeguards to protect Owner's and Contractor's interests in accordance with Owner's insurance carrier's requirements.

11.4. Labor and Materials and Performance Bond

- 11.4.1 Contractor shall provide continuous coverage of a separate Performance Bond and a Labor and Materials Bond for the duration of the Contract. The Bonds shall be in the forms provided in these Contract Documents.
- 11.4.2 As an alternative to providing either or both of the bonds specified in this section 11.03, Contractor may provide a Letter or Letters of Credit, issued by a sound financial institution satisfactory to Metro. Such Letter or Letters of Credit shall be in a form acceptable to Metro. The Letter or Letters of Credit shall be in an amount equivalent to the bonds required under this section.

ARTICLE 12 MINORITY BUSINESS PROGRAM PROGRAM

Contractor shall comply with all pertinent provisions of Metro's Minority Business Program which are contained in Metro Code 2.04 and which are by this reference expressly incorporated herein and made a part of this Contract.

Contractor shall not replace a minority or women-owned business enterprise Subcontractor with another Subcontractor, either before Contract award or during Contract performance, without prior written approval of Metro. In replacing a minority or women-owned business Subcontractor, Contractor shall replace such minority or women-owned business Subcontractor with another certified minority or women-owned business Subcontractor or make good faith efforts to do so. Failure to do so shall constitute Contractor's default of this Contract, and Metro, at its option, may terminate this Contract under the procedures set out in Article 15.

Metro reserves the right, at all times during the period of this Contract, to monitor Contractor's compliance with the terms of the Minority Business Program and enforce the program if Contractor should fail to so comply. Contractor shall be bound by any and all representations made concerning its compliance with the program prior to Contract award and any and all representations made by Contractor concerning the replacement of a minority or women-owned business Subcontractor during the performance of this Contract.

ARTICLE 13 EQUAL EMPLOYMENT OPPORTUNITY AFFIRMATIVE ACTION REQUIREMENT

Contractor shall be certified as Equal Employment Opportunity Affirmative Action Employers by the City of Portland, Oregon, for the entire term of the Contract. Contractor's Subcontractors and Suppliers shall be certified prior to commencement of any of their Work on the Project and shall remain certified for the entire duration of the Contract.

ARTICLE 14 MISCELLANEOUS STATUTORY RESPONSIBILITIES OF CONTRACTOR

- 14.1. Generally -- Contractor shall keep itself fully informed of and shall fully comply with all federal, state, regional and local laws, rules, regulations, ordinances and orders pertaining in any manner, to this Contract and those rules, regulations and orders of any agency or authority having jurisdiction over the work or those persons employed or engaged therein. Contractor shall pay all taxes, including federal, state, regional, county, city or taxes of any other governmental entity applicable to the work performed or materials provided under this Contract.
- 14.2. Environmental Laws -- Contractor shall fully comply with all federal, state and local laws, ordinances and regulations dealing with the prevention of environmental pollution and the preservation of natural resources and all amendments thereto. Contractor shall also fully comply with all rules, regulations and ordinances enacted or to be enacted by any federal, state or local agency dealing with the prevention of environmental pollution and the preservation of natural resources that affect the performance of the Contract. Such statutes, rules, regulations and ordinances shall include, but are not limited to those in 7 USCA Sections 136 to 136Y, 15 USCA Sections 2601 to 2629, 33 USCA Sections 1251 to 1376, 33 USCA Sections 1401 to 1445, 42 USCA Sections 300f to 300j-11, 42 USCA Sections 4321 to 4370a, 42

USCA Sections 4901 to 4918, 42 USCA Sections 6901 to 6991i, 42 USCA Sections 7401 to 7642, 42 USCA Sections 9601 to 9675, 29 USCA Sections 651 et seq., Oregon Administrative Rules Chapter 61, and Title 18 of the City of Portland Code.

Such agencies shall include, but not be limited to, the following:

FEDERAL AGENCIES

Agriculture, Department of Forest Service
Soil Conservation Service
Defense, Department of
Army Corps of Engineers
Energy, Department of
Environmental Protection Agency
Health and Human Services, Department of
Interior, Department of
Fish and Wildlife Service
Heritage Conservation and Recreation Service
Bureau of Land Management
Bureau of Indian Affairs
Water and Power Resource Service
Office of Surface Mining
Labor, Department of
Occupational Safety and Health Administration
Mine Safety and Health Administration
Transportation, Department of
Coast Guard
Federal Highway Administration

STATE AGENCIES

Agriculture, Department of
Energy, Department of
Environmental Quality, Department of
Fish and Wildlife, Department of
Forestry, Department of
Geology and Mineral Industries, Department of
Human Resources, Department of
Land Conservation and Development, Department of
Soil and Water Conservation Commission
State Engineer
State Land Board and Division of State Lands
Water Resources Board, Department of
Bureau of Labor and Industries

LOCAL AGENCIES

City of Portland
Multnomah County
Metro
Planning Commissions (as applicable)

14.3. Other Provisions of Oregon Law

- 14.3.1. Generally -- The provisions set out in Oregon Revised Statutes Chapters 187 and 279, as amended or superseded, including the latest additions and revisions, are incorporated by reference as part of these Contract Documents. Such sections include, but are not necessarily limited to, ORS 187.010, 187.020 279.021, 279.312, 279.314, 279.316, 279.318, 279.320, 279.334, 279.338, 279.348, 279.350, 279.352, 279.354, 279.355, 279.356, 279.359, 279.361, 279.365, and 279.400 through 279.435. Contractor shall fully comply with all applicable provisions of these statutes. The specific requirements of certain of these sections are set out below.
- 14.3.2. Payment to Subcontractors and Laborers -- Pursuant to ORS 279.312, Contractor shall make payment promptly, as due, to all persons supplying such Contractor labor or material for the projection of the Work provided in this Contract. Contractor shall pay all contributions or amounts due the Industrial Accident Fund (IAF) from such Contractor, Subcontractor or Supplier incurred in the performance of the Contract. Contractor shall not permit any lien or claim to be filed or prosecuted against Metro, the State, County, school district, municipality, municipal corporation, or subdivision thereof, on account of any labor or material furnished. Contractor shall pay to the Department of Revenue all sums withheld from employees pursuant to ORS 316.167.
- 14.3.3. Failure to Make Payment for Labor or Services -- Pursuant to ORS 279.314, if Contractor fails, neglects, or refuses to make prompt payment of any claim for labor or services furnished to Contractor or a Subcontractor by any person in connection with this Contract as such claim becomes due, Metro may pay such claim to the person furnishing the labor or services and charge the amount of the payment against funds due or to become due Contractor by reason of such Contract. Metro's payment of such a claim in the manner authorized by ORS 279.314 shall not relieve Contractor or Contractor's surety from obligation with respect to any unpaid claims.
- 14.3.4. Hours of Work -- Except as provided in ORS 279.334, no person shall be employed for more than eight (8) hours in any one day, or forty (40) hours in

any one week, except in cases of necessity, emergency, or where the public policy absolutely requires it, and in such cases the laborer shall be paid at least time and a half pay for all overtime in excess of eight (8) hours a day and for work performed on Saturday and on any legal holiday specified in ORS 279.334. Contractor shall furthermore comply with any applicable provisions of ORS 279.316, 279.334, 279.336 and 279.338.

14.3.5. Payment for Medical Care -- Pursuant to ORS 279.320, Contractor shall promptly, as due, make payment to any person, co-partnership, association or corporation, furnishing medical, surgical and hospital care or other needed care and attention, incident to sickness or injury, to the employees of Contractor, of all sums which Contractor agrees to pay for such services and all monies and sums which Contractor collected or deducted from the wages of employees pursuant to any law, contract or agreement for the purpose of providing or paying such service.

14.3.6. Requirements for Foreign Contractors -- Pursuant to ORS 279.021, any "foreign contractor" awarded a public contract with a price exceeding \$10,000, shall promptly report to the Department of Revenue, on forms to be provided by the Oregon Department of Revenue, the total contract price, terms of payment, length of contract and such other information as may be required before Final Payment can be received on the public contract. Final Payment shall not be made until this provisions has been complied with.

For purposes of this paragraph, a "foreign contractor" is one who is not domiciled in or registered to do business in the state of Oregon.

14.3.7. Prevailing Wage -- Except as limited by Oregon Revised Statutes, Contractor shall pay his/her workers and require his/her Subcontractors to pay its workers the prevailing rate of wage as required in ORS 279.350, and shall comply with all other requirements contained therein. The Appendix to this Contract contains a schedule of the existing prevailing rate of wage which may be paid to workers in each trade or occupation required to perform the Work, either by Contractor or its Subcontractors or any other person doing or contracting to do the whole or any part of the Work contemplated by this Contract, and such workers shall be paid not less than such specified minimum hourly rate of wage. The specifications for each subcontract shall include a copy of the prevailing wage schedule applicable to this project, and each subcontract shall include a clause regarding conformance to the schedule. In order to insure compliance of prevailing wage requirements, under Chapter 279, Metro will require that all payrolls be submitted on a schedule to be determined by Metro.

14.3.8. Sanitary Facilities -- Contractor shall be responsible for all costs that may be incurred in complying with ORS 654.150 and the rules adopted pursuant thereto including, but not limited to, securing exemption or partial exemption from the requirements of ORS 654.150, (sanitary facilities at construction projects; standards, exemptions).

14.3.9. Royalty Payments -- Contractor shall promptly pay when due, all royalties owed to the State of Oregon or other governmental entity under ORS Chapter 274 or other provision of law.

14.4. Work to Comply with Codes -- All Work shall be in full compliance with any and all codes specified in the Contract Documents and all federal, state and local laws, ordinances, rules, regulations and orders and all amendments to such codes, laws, ordinances, rules, regulations and orders. If Contractor observes or discovers that any portion or portions of the Contract Documents are at variance with any such requirements, Contractor shall promptly submit a written Request for Clarification to Metro pursuant to Paragraph 3.2 which shall fully describe the variance. If Contractor performs Work contrary to codes, laws, ordinances, rules, regulations or orders without submitting such Request to Metro, Contractor shall assume full responsibility for such Work and shall bear all costs attributable thereto.

Persons authorized by Metro or any governmental body having jurisdiction over the Project may at any time enter upon any part of the work to ascertain whether Contractor is complying with such laws, ordinances, regulations or orders.

14.5. No Additional Compensation Allowed for Compliance with Laws -- The Contract Amount includes full compensation for compliance with all applicable laws, rule, regulations, ordinances and orders and all amendments thereto and Contractor shall not make claim for nor be allowed any additional compensation for such compliance.

ARTICLE 15 TERMINATION OR SUSPENSION OF THE

15.1. For Default of Contractor -- If Contractor should be adjudged bankrupt, or if Contractor should make a general assignment for the benefit of its creditors, or if a receiver should be appointed on account of insolvency, or if Contractor should refuse to or fail to supply enough properly skilled workers or proper materials for the efficient prosecution of the Work, disregard laws, ordinances or the instructions of Metro, or otherwise be in violation of any provision of the Contract, Metro may, without prejudice to any other right or remedy and after giving Contractor and Contractor's surety on the Performance Bond prior written notice, terminate the Contract or any portion of the Contract, which termination shall be effective ten (10) days after service of such notice. Such notice shall contain the reasons for the termination and shall state that unless, within ten (10) calendar days of service of the termination notice on Contractor, Contractor or its surety on the Performance Bond shall have cured or shall have made, in Metro's opinion, appropriate

arrangements for prompt cure of all of the cause(s) for termination cited in the notice of termination, the Contract shall terminate.

Upon termination, Metro may take possession of the premises and of all materials, tools and appliances thereon as well as all other materials whether on the premises or not, for which Contractor has received partial payment, and finish the Work or the portion terminated by whatever method it may deem expedient.

In the event action as above indicated is taken by Metro, Contractor, or Contractor's surety, shall provide Metro with immediate and peaceful possession of all of the materials, tools and appliances located on the premises as well as all other materials whether on the premises or not, for which Contractor has received any progress payment. Upon termination, in the event that the surety does not complete the Contract, at the election of Metro, Contractor shall assign any and all subcontracts and material contracts to Metro or Metro's designee. Further, Contractor shall not be entitled to receive any further payment until the Work is completed. On completion of the Work, determination shall be made by Metro of the total amount Contractor would have been entitled to receive for the Work, under the terms of the Contract, had Contractor completed the Work. If the difference between said total amount and the sum of all amounts previously paid to Contractor, which difference will hereinafter be called the "unpaid balance," exceeds the expense incurred by Metro in completing the Work, including expense for additional managerial and administrative service, and all other costs, damages and expenses incurred by Metro due to Contractor's failure to complete the Contract, such excess will be paid to Contractor, with the consent of the surety. If, instead, the described expenses incurred by Metro exceed the unpaid balance, the amount of the excess shall be paid to Metro by Contractor or his/her surety. If only a portion of the Contract is terminated, this paragraph shall be deemed to apply to that portion of the Work only.

In addition to the above-mentioned right, Metro shall have the right, at its option, to suspend all or part of Contractor's performance under the Contract should any of the events occur which give Metro the right to terminate the Contract as above-described. In such event Metro shall give Contractor and Contractor's surety prior written notice of such suspension and Contractor shall stop or cause to stop all such work under the Contract immediately on receipt of such notice and shall not commence such work under the Contract again unless and until Contractor shall receive written notice from Metro to proceed. Metro shall not be responsible or liable to Contractor or others for any costs or expenses of whatever nature related to Contractor's failure to stop work as directed by Metro.

After receipt of a notice of termination or suspension, and except as otherwise directed by Metro, Contractor shall as regards those portions of the Contract terminated or suspended:

- 15.1.1. Stop work under the Contract on the date and to the extent specified in the notice of termination or suspension.
- 15.1.2. Place no further orders or subcontracts, or suspend the same, as applicable, for materials, services or facilities except as necessary to complete the portion of the work under the Contract which is not terminated or suspended.
- 15.1.3. Terminate or suspend, as applicable, all orders and subcontracts to the extent that they relate to the performance of such work terminated or suspended.

Metro may, at its discretion, avail itself of any or all of the above rights or remedies and its invoking of any one of the above rights or remedies will not prejudice or preclude Metro from subsequently invoking any other right or remedy set forth above or elsewhere in the Contract.

None of the foregoing provisions shall be construed to require Metro to complete the Work, nor to waive or in any way limit or modify the provisions of the Contract relating to the fixed and liquidated damages suffered by Metro on account of failure to complete the Project within the time prescribed.

- 15.2 Termination in the Public Interest -- It is hereby agreed that Metro has the right to terminate the Contract in whole or in part when Metro considers it to be in the public interest.

In the event the Contract is terminated as being in the public interest, Contractor shall be entitled to a reasonable amount of compensation for preparatory work and for all reasonable costs and expenses arising out of the termination, excluding lost profits.

In the event of termination under this Paragraph, the amount to be paid to Contractor shall be determined on the basis of the Schedule of Values in the case of any fully completed separate item or portion of the Work for which there is a separate or unit contract price and in respect to any other work under the Contract, Contractor will be paid a percent of the Contract price equal to the percentage of the work completed.

* * * END OF SECTION * * *

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SUPPLEMENTARY CONDITIONS
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**SECTION 00800
SUPPLEMENTARY CONDITIONS**

PART 1 - GENERAL

CONDITIONS:

All conditions as set forth in the General Conditions and Division 1 which are applicable to all contractors shall apply to such extent that they are not in conflict with these Supplementary Conditions. In the event of such conflict, these Supplementary Conditions shall take precedence.

TIME OF COMPLETION:

Time is a basic consideration of this Contract. Work under this Contract shall commence within five (5) calendar days after issuance of written Notice to Proceed from Metro and shall be Substantially Completed in One Hundred Fifty (150) calendar days after receipt of such written Notice which is proposed in the official proposal form and indicated in the official form of agreement (executed between Owner and Contractor). Completion within this time period is contingent on immediate availability of the site to the Contractor.

SEQUENCING AND SCHEDULING OF CONSTRUCTION:

General Provisions:

The following are general statements for guidance of the contractor as to requirements for sequencing and scheduling of the work:

Sequencing:

1. The contractor shall not interfere with station operations without approval of Metro and its on site contractors.
2. The Contractor may have to perform work during hours of station closure to prevent disruption to station operations. Contractor must get Metro's approval to work swing and graveyard shifts.

Scheduling:

1. General: Contractor shall schedule various phases of the Work as necessary to expedite Contract. Scheduling of the Work is critical to complete various phases of the Work on or before stipulated dates, in order that Owner may have opportunity and access to finish those items not under Contract and make the facility ready for their use.

2. See Section 01310 for specific requirements on scheduling with bar charts and CPM schedule.

ENGINEER/ARCHITECT'S REPRESENTATIVE:

Shall be defined in Section 00700 GENERAL CONDITIONS.

APPROVALS FOR SUBSTITUTIONS OF MATERIALS:

Specified under the Instruction to Bidders Section.

LAYOUT OF WORK:

Provide and maintain grades, lines, levels, bench marks, monuments, and reference points and be responsible for same. Written approval required for removal of any such indicators. Replace any reference points disturbed by these operations.

Verify grades, lines, levels, and dimensions as shown; report any errors or inconsistencies before commencing Work.

The Contractor shall make available at all times and until completion of rock work, a surveyor, who shall establish and maintain base or reference lines and elevations from which all crafts shall layout their respective work and from which all work may be checked for accuracy in event of conflict or error.

EXPLANATION OF SPECIFICATIONS:

COMPLIANCE WITH STANDARD AND INDUSTRY SPECIFICATIONS:

Any material or operation specified by reference to published specifications of a manufacturer or published specifications of American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), Federal Specifications (FS), industry association, applicable building code, or the like shall, unless otherwise indicated, comply with requirements of the current specification or standard listed (in effect at time of bid opening). In case of a conflict between referenced specification or standard and Project Specifications, Project Specifications shall govern. In case of a conflict between referenced specifications or standards, the one having the more stringent requirements shall govern.

COPIES OF CODES AND STANDARDS:

CODES AND STANDARDS:

Provide at Contractor's field office throughout construction period, maintained in good order and available to Architect and Owner's representative, one (1) copy each of following applicable codes and specified standards, all in latest edition.

Applicable building, Life Safety (NFPA No. 101), Structural Specialty, Plumbing, and Electrical Codes.

NBFU Code.

AWS Code for Arc and Gas Welding Building Construction and AWS Welding Inspection (handbook).

Referenced ACI, AISC, AITC, ANSI, APWA, ASHRAE and NEMA Standards.

ASTM Standards in Building Codes.

OSHA Standards (U.S. Dept. of Labor's User's Guide for Applying Safety and Health Standards, 29 CFR 1910).

Oregon State Workmen's Compensation Board Safety Codes for Construction Work.

Other referenced standards and codes shall be required at such location only when specifically directed.

MANUFACTURER'S DIRECTIONS:

All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in strict accordance with manufacturer's printed directions, unless otherwise specified. Furnish four bound copies of manufacturer's printed specifications for installation, application, use and maintenance to Owner.

EQUIPMENT MANUALS:

Upon completion of Work, Contractor shall deliver to Owner four (4) complete sets (1 bound copy of each manual per set) of equipment installation, maintenance, and operating instruction manuals related to Work under the Contract. Include a complete parts list and applicable warranties and certifications with same, as well as name and address for source of material (for reorder or service order purposes). Include all such items in each set in vinyl three-ring binder, complete with indexing and tabbing. Deliver stated manuals at completion of the Work.

CONTRACTOR'S AND ENGINEER/ARCHITECT'S MEETINGS: (Also see Section 01040)

Contractor shall call and conduct regularly scheduled weekly meetings with his concerned subcontractors and major suppliers to discuss overall and detailed progress of Work.

In addition, if/when so requested by Engineer/Architect, Contractor shall attend and cause his concerned subcontractors and major suppliers to attend any/all meetings called by Architect for similar purposes.

SERVING UTILITIES:

Consult with Owner and other private and public utility companies, departments or districts as required for locations, extent, and disposition of all required services related to same. The Owner will assist with locating utilities, however the contractor is responsible for locating light and power poles, sewer, gas, and water piping, and gas and water "shut off" boxes and covers. Notify all known potentially affected utility companies, departments of districts at least 48 hours in advance of intended excavation in the approximate locations of underground active utilities. Carefully probe and/or hand dig when excavations approach approximate locations of such utilities. Arrange for and pay cost of disconnecting, removing, relocating, capping, replacing or abandoning all public and private utilities impeding construction operations, all per servicing utilities' regulations and governing Codes. Cap abandoned utilities. Provide maintenance of all on-site active above-grade and below-grade services to others than Owner. Any damaged utilities shall be repaired immediately to Owner's satisfaction.

SAFETY AND HEALTH PRECAUTION:

Provide warning signs, flagger(s), and other safety and health precautions which may become necessary or required for protection of work already in place or for protection of the public, Owner's personnel, and construction personnel, including Owner's and Architect's Representatives engaged on the Project. State of Oregon Workmen's Compensation Board Safety Codes for Construction Work and Federal Occupational Safety and Health Standards of the Occupational Safety and Health Act of 1970 (OSHA), all as applicable, form a part of these Specifications. See Construction Facilities and Temporary Controls Section 01500.

FIRE PROTECTION:

Take all precautions to prevent the possibility of fire resulting from construction operations. Particularly avoid hazardous accumulations of rubbish and unsecured flammable sheeting used in and around the Project site when so specifically required by Fire Marshal having jurisdiction. Provide emergency fire extinguishing equipment of adequate type and quantity, readily available, and properly maintained. Do not store paint cans on the site except where specifically approved by Fire Marshal.

SPECIAL PRECAUTIONS:

The gas collection and distribution on the St. Johns Landfill present a possible fire hazard. For this reason, no smoking or open flame will be permitted north of the landfill bridge.

The site for the Maintenance Building is south of the landfill bridge on property commonly known as Parcel A. Parcel A has also been used in the past as a landfill. The refuse is older and reasonably inert. However, care should be taken in the event it becomes necessary to excavate refuse for the installation of utilities or tanks. Whenever refuse is uninterred, contractor will be required to execute the provisions of Section 01100 Health and Safety Program regarding hazardous waste operations. In addition, the excavated refuse will, in most cases, not be suitable for backfilling the excavation and should be removed to a sanitary landfill.

OWNER'S OCCUPANCY OF PREMISES:

Owner reserves the right to occupy portions of Project Site and to have work done by other contractors before Substantial Completion of the Work. Such use shall not negate any provisions of Section 00700 General Conditions, Article 10, PAYMENTS AND COMPLETION. Contractor shall furnish without additional charge from permanent systems of the Project any heat, ventilation, water, light, power, and sanitary facilities the Owner and his other contractors or vendors will require for their work.

LIMITS OF SITE OCCUPANCY:

Limits of Project site occupancy defining storage, work, and access areas under the Contract shall be as indicated by the Owner and shall be respected by all trades engaged in the Work. See drawings showing contract limits and staging area.

FINAL CLEANING UP:

Immediately prior to Owner's inspection for Substantial Completion of the Work, provide thorough "broom cleaning" of all exterior flatwork surfaces and thorough vacuum cleaning of interior flatwork surfaces.

In addition at such time, clean all interior and exterior surfaces, including all labels, marks and fingerprints; leave free from grease, dust, dirt, stains, soiling and defacement of any kind.

ANCHORING DEVICES:

The following requirements pertain to securement of various items to concrete construction by various trades under the work who are affected by such job conditions.

Unless otherwise indicated, anchors for attachment of structural work to concrete or masonry surfaces shall be of following types: expansion anchor type in concrete equal to Phillips Wedge Anchors; flush type anchors in masonry equal to Rawl H/S Drop-In Masonry anchors. Provide anchors corrosion-resistant surfaces, including machine bolts for masonry anchors, at locations where such items exposed to moisture from any source whatsoever.

In general and unless otherwise required by specific job conditions, anchors for attachment of non-structural work to concrete or masonry surface shall be of following types: Flush, self-drilling or non-drilling types of anchors in concrete equal to Phillips Red Head or Multi-Set; non-flush type anchors in concrete equal to Rawl H/S Drop-In Masonry Anchors; and non-flush type anchors in masonry equal to Phillips sleeve Anchors. Provide such anchors, including machine bolts, with corrosion-resistant surfaces at locations where such items exposed to moisture from any source whatsoever.

Power-driven studs and pins may be used only where load is acting in shear on anchor (parallel with surfaces), where no possibility of anchor's withdrawal, and where stability or strength not impaired. Generally not permitted on structural items.

Where vibration of any kind is a possibility, use vibration-proof anchors. Design anchors to resist leverage and shock where such possible.

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SECTION 01010 SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section describes the project and the work to be performed under this Contract. Detailed requirements and extent of work are stated in applicable Specification sections and shown on the Drawings.

1.2 ORGANIZATION AND INTERPRETATION OF CONTRACT DOCUMENTS

- A. Specifications and Drawings included in these Contract Documents establish the performance, quality requirements, location and general arrangement of materials and equipment, and establish the minimum standards for quality of workmanship and appearance.
- B. Specification sections have not been divided into groups for work of subcontractors or various trades. Should there be questions concerning the applicability or interpretation of a particular section or part of a section or Drawing, direct questions to the Engineer.
- C. A part of the work that is necessary or required to make each installation satisfactory and operable for its intended purpose, even though it is not specifically included in the Specifications or on the Drawings, shall be performed as incidental work as if it were described in the Specifications and shown on the Drawings.

1.3 DESCRIPTION OF PROJECT

A. General

- 1. The work covers construction work specifically shown on the Contract Drawings and described herein.
- 2. This contract is for the design and construction of a pre-engineered steel building, including foundations, for a maintenance building at the St. Johns Landfill. The building will be located south of the landfill bridge on a property known as Parcel "A". Site utilities consisting of water, sanitary sewer, site drainage and treatment will be included in this work. The interior of the building will include concrete slab on grade, office and conference room spaces, bathrooms and shower facilities, a laboratory, two maintenance bays, one overload crane, a shop, and equipment storage.
- 3. The Contractor shall, except as otherwise specifically stated in applicable parts of these Contract Documents, provide and pay for labor, materials, equipment, tools, construction equipment, facilities, and services necessary for proper execution, testing, and completion of the work.

1.4 PERMITS AND LICENSES

- A. Metro has applied for the general permits for the project. Permits should be available by date of Notice to Proceed.
- B. Contractor shall acquire and pay for all specialty permits such as electrical permits, mechanical permits, sewer and water connection permits, transportation permits, street closure permits, wage and hour regulations permits, and all other permits of a temporary nature relating to the construction of the project.

1.5 USE OF PREMISES

- A. Contractor shall schedule his work so as to maintain accessibility. See Supplementary Conditions for further clarification.

* * * END OF SECTION * * *

**SECTION 01025
MEASUREMENT AND PAYMENT**

PART 1 GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Bid Form: Section 00300
- B. Payments: Article 9 General Conditions
- C. Construction Schedules: Section 01310
- D. Supplementary Conditions
- E. Technical Specifications

1.2 MEASUREMENT OF QUANTITIES

- A. Payments will be made based on measurements of completed work in accordance with the United States Standard Measures, and as set forth in the applicable divisions of the Specifications, unless otherwise noted.
- B. Volume of materials measured in the vehicles by which they are transported will require computing of the volume of the vehicles to the nearest 0.1 cubic yard for its capacity. Pay quantities will be determined by vehicle measurement at point of delivery, with no allowance for settlement of material during transit. Loads shall be level and uniform. Payment will not be made for material in excess of the approved capacity of the vehicle, and deductions will be made for loads below approved capacity.
- C. Volume of concrete and masonry in structures will be measured according to neat lines as shown on the Plans or as altered on order by the Architect or Metro.
- D. Volume of earthwork, particularly excavation, and embankment will be computed by the average end area method of material in place or by other methods of equivalent accuracy.
- E. Contractor shall make all interim measurements, and determine all interim quantities and amounts of completed work done under the Contract. At the time measurements are made for quantity determination, the Engineer or Metro shall be present to verify such measurements. From quantity figures so ascertained, it will be Contractor's responsibility to prepare a monthly periodical estimate of the work accomplished to date. This estimate and application for payment shall be submitted to Metro each month for review not later than the date established at the pre-construction conference. The Engineer and/or Metro will take measurements and determine the final quantities for payment with Contractor present to verify such measurements.

1.3 SCOPE OF PAYMENT

- A. Quantities listed in the Bid do not govern final payment. Payments to the Contractor will be made only for actual quantities of Contract Items performed in accordance with terms of the Contract and for items of work actually performed under Change Order. Bid Item quantities are estimates only, being given only as the basis for comparison of Bids and Metro does not warrant, expressly or by implication, that the actual amount of work will correspond therewith. The right to increase or decrease the amount of any class or portion of the work, or to make changes in the work required as may be deemed necessary is reserved by Metro as provided elsewhere in the specifications. All prospective bidders should note that certain bid items may be included in the Bid Form to establish a unit price should use of those items become necessary during construction. Allowance will not be made for loss of anticipated profits or additional compensation should the use of these items be deemed unnecessary.
- B. The Contractor shall accept the compensation, as herein provided, in full payment for furnishing all materials, labor, tools and equipment 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 final acceptance by the Owner.

1.4 INITIAL APPLICATION FOR PAYMENT:

Prior to the submittal of the first Application for Payment, the contractor shall submit:

- A. Quality Control and Safety Plans
- B. List of subcontractors
- C. List of suppliers
- D. Schedule of Values
- E. Contractor's Construction Schedule
- F. Submittal Schedule
- G. List of Contractor's staff assignments
- H. Copies of building permits required to be procured by the Contractor
- I. Copies of licenses from governing authorities
- J. Certificates of insurance and insurance policies
- K. Performance and payment bonds

1.5 SCHEDULE OF VALUES:

Refer to General Conditions Article 9.

A. Contractor shall prepare the Schedule of Values as follows:

1. Prepare Line Item Breakdown for lump sum bid items.

Break Contract lump sum bid item amounts down in line items corresponding to each Division Specification Section and in enough detail to facilitate evaluation of Applications for Payment. Break subcontract amounts down into several line items. Round amounts off to the nearest hundred dollars; the total shall equal the Contract Amount.

Breakdown shall be balanced so that progress payments will not create a condition where sufficient funds are not available to complete the work. Contractor shall provide documentation substantiating the cost allocation if the Architect or Metro believes that the costs are unbalanced.

2. Arrange the Schedule of Values in a tabular form with columns to indicate the following for each line item:
 - a. Description
 - b. Related specification section
 - c. Name of subcontractor
 - d. Name of manufacturer or fabricator
 - e. Name of supplier
 - f. Change Orders (numbers) that have affected value
 - g. Dollar value
 - h. Percentage of Contract sum to the nearest percent, adjusted to total 100 percent
3. Include the following on the Schedule of Values:
 - a. Project name and location
 - b. Name of the Architect
 - c. Contractor's name and address

B. The Schedule of Values shall be consistent with:

1. Contractor's Construction Schedule
2. Application for Payment form
3. List of subcontractors
4. List of products
5. Schedule of submittals

- C. Submit the Schedule of Values to Metro for review and approval within thirty (30) days after issuance of Notice to Proceed, but no later than fifteen (15) days before the date scheduled for submittal to the initial Application for Payment. Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives change the Contract Sum.
- D. Upon acceptance of the Schedule of Values by Metro, it shall be used as a basis for all requests for partial payment.

1.6 APPLICATION FOR PAYMENT

A. Application for Payment Format

Use the AIA Document G702 and Continuation Sheets G703 as the form for the application. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made. Include amounts of Change Orders and Force Account Work issued prior to the last day of the period covered by the application. Show items in accord with Article 8 of the General Conditions. Each item in the Schedule of Values and Applications for Payment shall be complete including total cost and share of overhead and profit.

- B. For each item where an Application of Payment includes products purchased or fabricated and stored, but not installed, provide separate line items for initial cost and installed value.
- C. Temporary facilities and items that are not a direct cost of Work-in-place may be shown either as separate line items or distributed as general overhead expense.
- D. Where Maintenance Manuals are required, no more than 50% of the applicable portion of the lump sum bid shall be paid prior to receipt of a rough draft of the Maintenance Manual and no more than 90% of the final payment shall be made before receipt of the Maintenance Manual complete.

1.7 WAIVERS OF LIEN

With each application, submit waivers of lien from every entity who may file a lien arising out of the Contract and related to the Work covered by the payment. Submit partial waivers on each item for the amount requested, prior to deduction for retainage. When an application shows completion of an item, submit final or full waivers.

1.8 FINAL PAYMENT APPLICATION

Prior to submitting the application, the contractor shall submit:

- A. Written certification of Final Completion approved by Metro
- B. Completion of Project Close-out requirements as outlined in the General Conditions
- C. Completion of items specified for completion after Substantial Completion
- D. Transmittal of required Project construction records to Owner
- E. Occupancy permits
- F. Warranties and maintenance agreements
- G Maintenance instructions
- I. Meter Readings
- J. Final cleaning
- K. Application for reduction of retainage and consent of surety
- L. Punchlist of work remaining and corrections required

1.9 CHANGE ORDER AND FORCE WORK PROCEDURES

Refer to Article 8 in Section 00700 General Conditions.

*** * * END OF SECTION * * ***

SECTION 01040
COORDINATION AND SITE CONDITIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for coordinating and sequencing the work under the Contract and requirements regarding existing site conditions.
- B. Requirements for cutting and patching of new and existing work.

1.2 JOB SITE COORDINATION

- A. The Contractor is responsible for overall coordination of the project.
- B. The project work shall be coordinated with the operation of the St. Johns Landfill so as to minimize interruption to station operations and other problems during operations. Utility location and connections shall be coordinated with the proper utility companies. Replacement of any damaged material, including labor and materials, will be the responsibility of the Contractor.
- C. The site will be available seven days per week between the hours of 6:30 a.m. and 6:30 p.m. All materials, equipment and debris shall be removed and stored in designated areas during operation of the facility. Contractor will take all safety precautions that are standard to the industry and meet or exceed all OSHA standards, i.e., signage, barricades, fall protection, etc. It is the contractor's responsibility to train and ensure compliance with the above policies for any and all of their personnel and/or subcontractors.

1.3 SITE CONDITIONS

A. Information On Site Conditions

- 1. General: Information obtained by the Owner regarding site conditions, topography, subsurface information, ground water elevations, existing construction of site facilities as applicable, and similar data will be available for inspection at the Metro Regional Center, Regional Environmental Management Department upon request. Such information is offered as supplementary information only. Neither the Engineer nor the Owner assumes any responsibility for its accuracy or completeness or for the Contractor's interpretation of such information.

Where measurement of quantities depends on elevation of existing ground, elevations obtained in the field will be compared with those shown on the Drawings. Variations of 1 foot or less will be ignored, and the profiles shown on the Drawings will be used. Variations greater than 1 foot will be compensated for by holding the shape of the drawn profile but shifting each end vertically upward or downward by the amount of the variation.

2. Control Points: Contractor shall establish vertical and horizontal survey control points on structures and improvements located in the vicinity of the work prior to beginning work, and shall check the points for movements when directed by the Engineer. Furnish Architect with copies of survey notes for each survey and a copy of the layout of survey control points.
3. Contractor will provide all field engineering services and record changes in the location, or layout, of permanent structures on the Project Record Documents.

B. Existing Utilities.

1. Location
 - a. Known utilities and facilities adjacent to or within the work area are shown on the Drawings. The locations shown are taken from existing records and the best information available from existing utility plans; however, it is expected that there may be some discrepancies and omissions in the locations and quantities shown. Those shown are for the convenience of the Contractor only, and no responsibility is assumed by either the Owner or the Architect for their accuracy or completeness. Contractor's request for additional compensation or Contract time resulting from encountering utilities not shown will be considered as set forth in the General Conditions.
 - b. Contractor shall exercise reasonable care to verify locations of utilities and facilities shown on the Drawings and to determine the presence of those not shown. Immediate and adjacent areas where excavations are to be made shall be thoroughly checked by visual examination for indications of underground facilities, and also checked with electronic metal and pipe detection equipment.
2. Contractor's Responsibilities
 - a. Where Contractor's operations could cause damage or inconvenience to railway, telegraph, telephone, television, power, oil, gas, water, sewer, or irrigation systems, the Contractor shall make arrangements necessary for the protection of these utilities and services. Replace existing utilities removed or damaged during construction, unless otherwise provided for in these Contract Documents.
 - b. Notify utility offices that are affected by construction operations at least 48 hours in advance. Under no circumstances expose any utility without first obtaining permission from the appropriate agency. Once permission has been granted, locate, expose, and provide temporary support for the utilities.
 - c. Contractor shall be solely and directly responsible to owner and operator of such properties for damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of injuries or damage which may result from construction operations under this Contract.
 - d. Neither Owner nor its officers or agents shall be responsible to Contractor for damages as a result of Contractor's failure to protect utilities encountered in the work.

- e. In event of interruption to domestic water, sewer, storm drain, or other utility services as a result of accidental damage due to construction operations, promptly notify the proper authority. Cooperate with said authority in restoration as promptly as possible and pay for repair. Prevent interruption of utility service unless granted by the utility owner.
- f. In the event Contractor encounters water service lines that interfere with trenching, obtain prior approval of the water utility, cut the service, dig through, and restore service to previous conditions using equal materials.

C. Interfering Structures

- 1. Take necessary precautions to prevent damage to existing structures whether on the surface, aboveground, or underground. An attempt has been made to show major structures on the Drawings. While the information has been compiled from the best available sources, its completeness and accuracy cannot be guaranteed.
- 2. Protect existing structures from damage, whether or not they lie within limits of easements obtained by the Owner. Where existing fences, gates, buildings, or other structures must be removed to properly carry out work, or are damaged during work, restore them to original condition and to the satisfaction of property owner.
- 3. Contractor may remove and replace in equal or better than original condition, small structures such as fences, that interfere with Contractor's operations.

D. Field Relocation

- 1. During construction, it is expected that minor relocations of proposed facilities will be necessary. Make such relocations only by direction of the Engineer or Owner. If existing structures are encountered that prevent construction as shown, notify the Engineer or Owner before continuing with work so that Engineer or Owner may make necessary field revisions.
- 2. Where shown or directed by and acceptable to the Engineer or Owner, provide relocation of existing facilities to include piping, utilities, equipment, structures, electrical conduit wiring, electrical duct bank, and other miscellaneous items. Use only new materials for relocation of existing facilities. Match materials of existing facilities, unless otherwise shown or specified. Perform relocation to minimize downtime of existing facilities. Install new portions of existing facilities in their relocated position prior to removing existing facilities, unless otherwise accepted by Engineer or Owner. Comply with cutting and patching requirements in this section.

E. Easements

- 1. It is anticipated that required easements and permits will be obtained before construction is started. However, should the procurement of any easement or permit be delayed, schedule work so that operations are confined to areas where easements or permits have been obtained or are not required, until such time as easements and permits have been secured.

2. Before final payment will be authorized, Contractor shall furnish the Owner written releases from property owners or public agencies where side agreements or special easements have been made, or where Contractor's operations have not been kept within the Owner's property.
3. In the event that Contractor is unable to secure written releases, inform the Owner of the reasons.
 - a. Owner or its representatives will examine the site, and Owner will direct Contractor to complete work that may be necessary to satisfy terms of the easement.
 - b. Should Contractor refuse to do this work, Owner reserves the right to have it done by separate contract and deduct the cost of same from the Contract amount, or require the Contractor to furnish a satisfactory bond in a sum to cover legal claims for damages.
 - c. When Owner is satisfied that work has been completed in agreement with the Contract Documents and terms of easements, the right is reserved to waive the requirement for written release if:
 - 1) Contractor's failure to obtain such statement is due to the grantor's refusal to sign, and this refusal is not based upon any legitimate claims that Contractor has failed to fulfill the terms of the easement, or
 - 2) Contractor is unable to contact or has had undue hardship in contacting the grantor.
- F. Salvage of Materials. Contractor shall salvage materials for Contractor's use where shown on Drawings.
- G. Connecting to Existing Facilities. Unless otherwise shown or specified, determine methods of connecting new work to existing facilities, and obtain Architect's review and acceptance of connections.
 1. Determine location, elevation, nature, materials, dimensions, and configurations of existing facilities where necessary for connecting new work.
 2. Inspect existing record drawings and shop drawings, conduct exploratory excavations and field inspections, and conduct similar activities as needed.
 3. Shutdown of Owner's existing facility prior to connection, if necessary, shall be by Owner or as specified.

1.5 PROJECT MEETINGS

- A. Pre-construction Conference. Within five (5) days following execution of Contract but before start of work at the site, Contractor shall meet with Owner and Architect for discussion of scheduling requirements, procedures for handling shop drawings and other submittals, processing application for payment, and establishing a working understanding among the parties. The conference shall be attended by:
1. Contractor's office representative.
 2. Contractor's general superintendent.
 3. Subcontractors' representatives whom Contractor may desire or Architect may request to attend.
 4. Architect's representatives.
 5. Owner's representatives.
- B. Progress Meetings: Contractor will schedule regular progress meetings to be held once every week to review work progress, schedules, and other matters needing discussion and resolution. **Contractor will keep detailed minutes of these meetings and distribute them to all parties within three days of each meeting.**

1.6 SEQUENCE OF WORK

- A. Operation and Shutdown of Existing Facilities
1. Continuous operation of St. Johns Landfill maintenance operations is of critical importance
 - a. Schedule and conduct activities to minimize disruption operations and to enable existing facilities to operate, unless otherwise specified.
 - b. Conduct work outside normal working hours as may be necessary to meet project schedule and avoid undesirable conditions.
- B. Modifications to Existing Facilities. Where existing facilities are to be modified during the course of work, obtain Engineer's and Owner's review and acceptance of submittals for temporary shutdown, demolition, modification, corrections between new and existing work, and other related work. Conform to other sections as applicable.
- C. Milestone Completion Dates for Portions of Work. Refer to the Proposal for completion dates and Section 1310 Construction Schedule for detailed scheduling requirements.
- D. Time of Work
1. No work shall be done between 6:30 p.m. to 6:30 a.m. without the written permission of the Owner. However, maintenance or emergency work during these hours may be done without prior permission.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

A. General

1. Execute cutting (including excavating), fitting, or patching of work, required to:
 - a. Make the several parts fit properly.
 - b. Uncover work to provide for installation of specified work.
 - c. Remove and replace defective work or work not conforming to requirements of Contract Documents.
 - d. Remove samples of installed materials as specified for testing.
 - e. Install specified work in existing construction.
2. Perform the following upon written instruction of Engineer:
 - a. Uncover work to provide for Engineer's observation of covered work.
 - b. Remove samples of installed materials for testing.
 - c. Remove work to provide for alteration of existing work.
3. Contractor shall not, without written consent of Engineer or Owner:
 - a. Cut or alter work of another contractor.
 - b. Cut structural or reinforcing steel.
 - c. Endanger existing or new structures or facilities.
 - d. Shut down or disrupt existing operations.
4. Materials for replacement of work removed shall comply with applicable sections of these Specifications for corresponding type of work to be done.
5. Provide all tools and equipment required to accomplish cutting and patching.

B. Inspection and Preparation

1. Inspect existing conditions of work, including elements subject to movement or damage during cutting, patching, excavating, and backfilling.
2. After uncovering work, inspect conditions affecting installation of new products.

C. Procedures

1. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances and finishes.
2. Execute demolition as specified in Section DEMOLITION.
3. Execute excavating and backfilling as specified in Section EARTHWORK.

4. Restore work which has been cut or removed; install new products to provide completed work in accordance with specified requirements.
5. Refinish entire surfaces as necessary to provide an even finish.
 - a. Refinish continuous surfaces to nearest intersection.
 - b. Refinish entire assemblies.
6. Restore structures and surfaces damaged that are to remain in the completed work, including concrete-embedded piping, conduit, and other utilities.
7. Make restorations with new materials and appropriate methods as specified for new work of similar nature; if not specified, use best recommended practice of manufacturer or appropriate trade association.
8. Restore damaged work so there is a secure and intimate bond or fastening between new and old work. Finish restored surfaces to such planes, shapes, and textures that no transition between new and old work is evident in finished surfaces.

PART 4 PAYMENT

4.1 LUMP SUM BID AND UNIT PRICES

Payment for work in this section will be included as part of the lump sum bid or the unit price bid amounts stated in the Proposal.

* * * END OF SECTION * * *

SECTION 01092
REFERENCE STANDARDS

PART 1 GENERAL

1.1 SUMMARY

- A. These specifications and the Contract Drawings list many of the construction industry organizations, professional and technical associations, societies and institutes, and government agencies issuing, promoting, or enforcing standards to which references may be made in the Contract Document, along with the abbreviations commonly used for those references. Also included are certain general requirements for the use of industry standards specified, and for application of the standards in quality control.

1.2 USE OF REFERENCE STANDARDS

- A. Work specified by reference to the published standard or specification of a government agency, technical association, trade association, professional society or institute, testing agency, or other organization shall conform to or surpass the minimum standards of quality for materials and workmanship established by the designated standard or specification.
- B. Where so specified, products or workmanship shall also conform to the additional prescriptive or performance requirements included within the Contract Document to establish a higher or more stringent standard of quality than that required by the referenced standard.
- C. Where the specific date or issue of the standard is not included with the reference to the standard, the edition, including all amendments published and available on the first published date of the Invitation to Bid, shall apply.
- D. Where two or more standards are specified to establish quality, the product and workmanship shall conform to or surpass the requirements of both.
- E. In case of conflict between referenced standards, the more stringent shall apply.
- F. Where both a standard and a brand name are specified for a product in the Contract Document, the proprietary product named shall conform to or surpass the requirements of the specified reference standard. The listing of a trade name in a Contract Document shall not be construed as warranting that such product conforms to the respective reference standard.
- G. Copies of standards:
 - 1. Copies of applicable referenced standards have not been bound in this Contract Document.

2. Where copies of standards are needed by the Contractor for superintendence and quality control of the work, obtain a copy or copies directly from the publication source and maintain in an orderly manner at the job site, available to the Contractor's personnel, subcontractors, Owner, and Architect.
3. Submittals: Submit for approval the requests to use products conforming to printed standards or publications with a different publication date from that effective under the Contract. Clearly indicate the changes in product or workmanship quality involved in the proposed change, if any, and reasons for the request.

* * * END OF SECTION * * *

**SECTION 01100
HEALTH AND SAFETY PROGRAM**

PART 1 GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. General Conditions - Article 10, Safety and Protection of the Work
- B. Section 01500 Construction Facilities and Temporary Controls
- C. Section 02222 Excavating, Backfilling and Compacting for Utilities
- D. Section 02150 Shoring
- E. OSHA Regulations and Applicable Oregon Occupational Safety and Health Codes

1.2 SUBMITTALS

- A. Contractor will submit to Metro a written Health and Safety Plan no later than 14 days after Notice to Proceed. The Plan must be approved before Contractor begins work. Please refer to the special requirements for hazardous waste operations in paragraphs 1.8 through 1.9.
- B. Contractor will submit the name and qualifications of the proposed Site Health and Safety Officer as soon as possible but no later than 14 days after Notice to Proceed. This individual must be approved by Metro and appointed before Contractor begins work.
- C. Contractor will submit the names and qualifications of first aid trained personnel who will be available for administering first aid on each shift prior to beginning work. Include a list of first aid equipment available. Coordinate with and provide contact information for local health and safety agencies as follows:
 - 1. Emergency Medical Treatment and Evacuation
 - 2. Hospital
 - 3. Fire Department
 - 4. Law Enforcement
- D. Contractor will develop a detailed activity hazard analysis on each new phase of work prior to the start of work on that phase. This is in addition to the more preliminary hazard analysis included in the Health and Safety Plan. These hazard analyses will be reviewed with Metro and upon approval become a part of the Health and Safety Plan.

- E. Furnish reports of weekly job site safety meetings to Metro. Items reviewed, persons attending, person directing meeting and other issues discussed shall be documented in each report.

1.3 HEALTH AND SAFETY LAWS AND REGULATIONS, AND REQUIREMENTS FOR HAZARDOUS WASTE OPERATIONS

- A. The St. Johns Landfill is classified as a sanitary landfill. The site of the maintenance building is located on Parcel "A," which was also used in the past as a landfill. Most of the work involved in the project falls under OSHA and Oregon OSHA rules pertaining to ordinary construction, and Contractor shall conform to such rules when completing ordinary construction tasks. Some of the tasks involve the possibility of exposure to known and unknown materials that may be considered hazardous substances. These tasks include, but are not limited to,

1. Intentional excavation and work in refuse such as excavation for utilities, drainage structures and tanks.
2. Minor excavation of refuse during grading operations

For this type of work, Contractor shall ensure compliance with all requirements of the Federal Occupational Health and Safety Act of 1970 (OSHA), as amended including, OSHA 29 CFR Part 1910 Hazardous Waste Operations and Emergency response, Final rule, Oregon Administrative Rules (OAR) 437-02-100 et. seq. and with any other applicable Oregon Industrial Health and Safety provisions as they apply to health and safety provisions for hazardous waste operations, and all other applicable federal, state, county, and local laws, ordinances, codes, the requirements set forth herein, and any regulations that may be specified in other parts of this Contract. If any of these requirements are in conflict, the more stringent requirements shall apply. Contractor's failure to thoroughly familiarize himself with the aforementioned health and safety provisions shall not relieve Contractor of responsibility for full compliance with the obligations and requirements set forth therein. Where "Hazardous Waste Operations" is mentioned in the regulations listed above, it shall be interpreted in this Specification to include any person potentially exposed to hazards including, but not limited to, landfill gas, landfill gas condensate, asbestos or leachate at the St. Johns Landfill. Contractor is cautioned that the aforementioned OSHA and other referenced regulations require, among other items, the following:

1. A site specific Health and Safety Plan. (Note: This plan is to be written in sufficient detail to satisfy all requirements of OSHA 29 CFR Part 1910.120, and must be submitted for review by Metro prior to start of work on this site.)

2. A Site Health and Safety Officer as described in paragraph 1.5 these Specifications.
 3. A provision for Personal Protective Equipment, Level "B" which shall include, at a minimum:
 - Positive pressure, full-facepiece SCBA or positive pressure supplied-air respirator with escape SCBA.
 - Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one or two-piece chemical splash suit; disposable chemical-resistant one-piece suit).
 - Inner and outer chemical-resistant gloves.
 - Chemical-resistant safety boots/shoes.
 - Hard hat.
 - Two-way radio.
 4. Medical surveillance exams as described in OSHA 29 CFR Part 1910.120, Paragraph (f).
 5. Hazardous Waste Operator Training as described in OSHA 29 CFR Part 1910.120, Paragraph (e).
- B. The provisions mentioned above are considered minimum requirements for this project.

1.4 PRESENT SITE CHARACTERIZATION

The possibility exists of encountering gases, leachates, asbestos and/or other substances that may be potentially hazardous to the health and safety of personnel during work at the St. Johns Landfill. Tables of known substances and gases at the maximum concentration levels found at the landfill site are included in the Appendix and should be considered in preparing the Health and Safety Program. The information in the Appendix represents only the substances and gases identified to date. Since other substances and gases may be present and may be found during work pursuant to the Contract, Contractor should consider the possibility of encountering other substances or gases in preparing the Health and Safety Program. Contractor is solely and completely responsible for meeting all applicable laws, regulations and requirements of Paragraph 1.3 above for employee health and safety during the work performed under this Contract. Contractor shall

provide all personnel working on the project with required orientation and training on the potential hazards anticipated and the appropriate use of safety equipment.

1.5 CONTRACTOR'S RESPONSIBILITY FOR HEALTH AND SAFETY FOR HAZARDOUS WASTE OPERATIONS

- A. Contractor shall have sole responsibility for the safety, efficiency, and adequacy of Contractor's plant, appliances, and methods, and for any damage or injury resulting from their failure, or improper maintenance, use, or operation. Contractor shall be solely and completely responsible for the conditions at the site including health and safety for the authorized persons and property in performance of the Work. This requirement shall be continuous, and shall not be limited to normal working hours. The required or implied duty of Metro to review or approve Contractor's performance or any submittal of Contractor shall not be construed as relieving Contractor of full responsibility for worker safety and compliance with applicable laws, regulations and requirements.
- B. Contractor shall observe and comply with all applicable laws, regulations and requirements of Paragraph 1.3, above. Such information, interpretation, or representation of laws, regulations, or ordinances referenced in the Contract Documents shall not take precedence over the law, regulation, or ordinance itself, nor relieve Contractor of responsibility for determining the true current construction and content of such laws, regulations, and ordinances.
- C. Contractor shall appoint a Site Health and Safety Officer who has experience in industrial hygiene, such as an Industrial Hygienist certified by the American Industrial Hygiene Association or approved equal and who is qualified by experience and training in hazardous waste operations in accordance with the applicable laws, regulations, and requirements of Paragraph 1.3, above. The Site Health and Safety Officer shall be qualified and authorized to monitor, supervise and enforce compliance with the site Health and Safety Program.
- D. Contractor, through his Health and Safety Officer, shall be solely responsible for the detection of gases contaminated, soils, refuse or harmful liquids. Contractor shall provide for the protection and the health and safety of all workers and other authorized persons at the job-site from exposure to potentially hazardous substances.
- E. Contractor shall be responsible for ensuring that all necessary monitoring equipment, protective clothing, and other supplies and equipment up to the appropriate level of protection as defined by the applicable laws, regulations, and requirements of Paragraph 1.3 above are available to implement the plan. No work shall take place in areas where hazardous substances may potentially be present unless the Site Health and Safety Officer is present and monitoring of the site conditions is accomplished.

- F. Contractor, through the Site Health and Safety Officer, shall not permit any employee, in the performance of the Contract, to work under conditions which are hazardous to the employee. Should violations of the health and safety requirements be called to the Site Health and Safety Officer's attention by Metro or any authorized representative of a regulatory agency, Contractor shall immediately correct the identified conditions.
- G. In the event Contractor fails or refuses to promptly comply with any compliance directive, Metro may issue an order to stop all or any part of the work. When compliance with the directive is accomplished an order to resume work will be issued. Contractor shall not be entitled to any extension of time or any claim for damage or to any additional compensation for either the directive or the work suspension order. Failure of Metro to order discontinuance of any or all of Contractor's operations shall not relieve Contractor of responsibility for safety.
- H. Contractor shall maintain in a manner acceptable to Metro an accurate record of, and shall report to Metro all cases of death, occupational diseases, or traumatic injury to employees or the public incident to the performance of work under this Contract. Records to be kept by the Site Health and Safety Officer shall include as a minimum: daily log; all gas analyses; reports of variances in conditions; report of any illnesses, disease, injury, pulmonary disorder or death to any person on the site.
- I. The Site Health and Safety Officer shall immediately notify Metro of any emergencies as soon as possible following an incident. The site specific Health and Safety plan must also describe the emergency reporting procedures and actions to be taken in the event of an emergency.

1.6 HEALTH AND SAFETY PLAN FOR HAZARDOUS WASTE AND CONVENTIONAL OPERATIONS

- A. Contractor shall develop and implement for the duration of the work on or around the existing landfill a Site Health and Safety Plan for hazardous waste and conventional operations for its employees that is in compliance with the laws, regulations and requirements of Paragraph 1.3 above. The plan shall incorporate the requirements of the applicable laws, regulations and requirements as well as the following items for its employees involved in hazardous waste operations. The items include, as a minimum:
- Site Characterization and Health Risk and Hazard Analysis
 - Site Control Measures
 - Training
 - Medical Surveillance

- Engineering controls, work practices and personal protective equipment
 - Monitoring Program
 - Informational Program/Hazard Communication Program
 - Material Handling
 - Decontamination Procedures
 - Emergency Response
 - Illumination
 - Sanitation
 - Site Excavation
 - Contractors and Sub-Contractors
 - Standard operating procedures for health and safety
 - Names of key personnel and alternatives responsible for site health and safety
 - Personal protective equipment program
 - Confined space entry procedures
 - Spill containment program
- B. In the event the Health and Safety Program implemented for the duration of the work on or around the existing landfill is determined by Metro or a regulatory agency to be inadequate to protect the employees and the public, then such plan shall be promptly modified to meet the requirements of Metro or those regulatory agencies.

1.7 MONITORING FOR HAZARDOUS WASTE OPERATIONS

- A. As a part of the Health and Safety Program, Contractor shall perform monitoring so that employees are not exposed to levels which exceed established Permissible Exposure Limits or published exposure levels for hazardous substances.
- B. Identification of areas of potentially hazardous substances shall be made through observations and through a continuous ongoing monitoring program designed to detect contaminated air, soil, and surface water. Contractor shall develop a monitoring program in accordance with the requirements outlined in these Contract specifications that will provide Metro with certain information, as specified herein, that is needed to identify these potentially contaminated areas, as well as to provide information necessary to comply with relevant worker health and safety regulations. Contractor shall require all workers to report any observations of potentially hazardous substances or odors. Such observations will be reported to Contractor's On-Site Monitor who shall be qualified and

responsible for conducting a regular monitoring program and to the site Health and Safety Officer.

- C. Contractor shall develop as part of the Site Health and Safety Plan a monitoring program that will provide for detection of the presence of potentially hazardous substances during excavation operations. The program shall include, at a minimum, the following elements:
- Instruction of workers in observing and reporting potentially hazardous substances such as refuse, oily sheen or color on soils, or water, and oily or chemical odors.
 - Monitoring of excavated soils using a portable continuous analyzer, such as an HNU photo-ionization detector (PID), or an approved equivalent to detect the presence of non-methane organic vapors which could indicate chemical contamination. Monitoring devices shall be capable of detecting 0.1 ppm benzene and shall be calibrated daily by qualified personnel.
 - Periodic monitoring with a combustible gas indicator such as an MSA Model 361, or an approved equivalent with both audible and visual alarms during operations where the soil surface is being disturbed or when work is being performed below ground level. Calibrate the instrument in accordance with manufacturer's instructions prior to use. Set audible alarm at 10 percent LEL (lower explosive limit).
 - Development of action levels for worker safety when potential contamination is detected by monitoring equipment.
 - Development of an emergency medical care and treatment plan.
 - Submittal of copies of all monitoring records to the Engineer on a weekly basis.
- D. During construction, Contractor's soil and gas monitoring shall consist of inspection for visual abnormalities, odors and gases using a photo-ionization detector (PID) and a combustible gas meter. The visual and odor inspection will be an ongoing responsibility of all Contractor's employees. In addition, the air quality will be monitored continuously for all trench excavations, suspect soils, and area identified as known refuse soils. The meters shall be calibrated in accordance with manufacturer's instructions.
- E. In addition to the minimal requirements outlined herein, Contractor shall fully comply with the laws, regulations, and requirements of Paragraph 1.3 above relating to worker health and safety and the potential presence of contaminated air, soil, refuse and/or water.

1.8 NOTIFICATION AND SUSPENSION

- A. In the event Contractor's monitoring program detects the presence of a potentially hazardous substance at concentrations at or above established Permissible Exposure Limits or published exposure levels, Contractor shall immediately notify Metro. Following such notifications by Contractor, Metro may notify the various governmental and regulatory agencies concerned with the presence of potentially hazardous substances. Depending upon the type of the problem identified, Metro may further suspend the work in the vicinity of the material discovery.
- B. Following completion of any further testing necessary to determine the nature of the material, Metro will decide the manner in which the substance will be handled or disposed of and the actual procedures to be used in resuming the work.
- C. Although the actual procedures used in resuming the work shall depend upon the nature and extent of the potentially hazardous substance, Metro foresees the following alternatives operation as possible:
- Contractor to resume work as before suspension.
 - Contractor to move work operations to another portion of the site until measures to eliminate any hazardous conditions can be affected.
 - Metro will direct Contractor to dispose of the excavated refuse material at locations determined by Metro or at other appropriate and approved sites.
- D. If suspect air, soils and/or liquid is identified by the monitoring program and construction activity is terminated at the suspect location by Metro and Contractor cannot move his operation to another portion of the work, Contractor shall be compensated for idle time of all equipment in actual use at the time of the potentially hazardous substance identification at the potentially hazardous substance location. Contractor shall be compensated for those hours or days the equipment is idled until a determination of the condition is made. Labor that is idled and cannot be diverted to other work will be paid through the one-half shift of the day during which the work is suspended. No compensation will be made for overhead, profit and/or any other general expenses. Contractor shall maintain records in such a manner as to provide Metro with a daily report sheet itemizing the equipment (size, type and identification number) idled and the charges for equipment rental. Said daily report sheets shall be signed by Contractor or an authorized agent of Contractor. The charges for equipment rental shall not exceed the rates allowed under Force Account Work set forth in the General Conditions.

1.9 CORRECTIVE ACTIONS

Appropriate corrective actions are dependent upon the nature and extent to the contamination identified, and will be determined on a case-by-case basis by Contractor, Metro and the regulatory agency having jurisdiction.

* * * END

SECTION 01310 CONSTRUCTION SCHEDULES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Summary of Work: Section 01010
- B. Coordination and Site Conditions: Section 01040
- C. Shop Drawings, Project Data and Samples: Section 01340
- D. Schedule of Values: Section 01025

1.2 PRELIMINARY SCHEDULE

- A. The Contractor shall submit within five (5) days after Notice to Proceed, a preliminary project schedule in graphic form (e.g. bar chart) showing proposed schedule of anticipated progress to include all major operations and items and time of anticipated completion of major portions of the work.
- B. The preliminary schedule shall be accompanied by a narrative work plan which will include the following information:
 - 1. Manpower levels planned to achieve duration's shown in the preliminary schedule.
 - 2. Equipment utilization planned for each activity taking place on site.
 - 3. Identification of work planned for overtime or additional shifts.
 - 4. Plans for wet weather work.
 - 5. Identification of critical work or supply activities.
- C. The preliminary schedule will be reviewed within seven (7) days by the Architect and Metro. Comments will be forwarded to Contractor for his consideration and action where appropriate. A revised preliminary schedule shall be resubmitted by the Contractor three (3) days after receiving Architect and Metro comments, if so required.

1.3 CONSTRUCTION SCHEDULE

- A. The Contractor shall submit within 25 days of Notice to Proceed an overall project schedule in both graphic and tabular form.
- B. The schedule shall utilize an approved standard Critical Path Method (CPM) computer program using either the Arrow Diagram Method (ADM) or Precedence Diagram Method (PDM) which will furnish a mathematical analysis and identification of the critical path.

C. Reports to be furnished with the CPM schedule will include:

1. Work Item Number in ascending order
2. Total Float/Early Start in ascending order
3. Early Start in ascending order
4. Late start in ascending order
5. Predecessor report
6. Successor report

D. The graphic schedule will be of a format suitable for use by the Contractor and acceptable to Metro.

E. The work activities in the CPM will provide a complete sequence of construction, as well as submittal and delivery activity.

F. Information shown for each activity on the CPM will include description, responsibility, duration, float, early and late start dates, early and late finish dates, preceding and succeeding activities and relationships, percentage complete or remaining duration.

G. The Construction Schedule will be accompanied by a narrative similar in format provided in the Preliminary Schedule reflecting any refinements or changes to the planning process.

H. The Architect and Metro will review the Construction Schedule and provide comments to the Contractor for appropriate action potentially including revision and resubmittal. Once schedule is determined acceptable by Metro, this schedule will be designated the initial or zero progress schedule.

I. Contractor will update the CPM and submit two copies to Metro on a monthly basis. CPM will be accompanied by a narrative report which will include:

1. Description of work completed during the past month.
2. Discussion of problem areas including current and anticipated delay factors.
3. Description of schedule revisions made for this months update.
4. Actions planned to mitigate delays or to facilitate construction progress.

J. Contractor will provide electronic copy on computer diskette of the approved progress schedule and each monthly update which will function with approved CPM software program to allow Metro to analyze impacts on the schedule as required.

1.4 CONTRACTOR TO SCHEDULE WORK

Contractor shall keep the Engineer/Architect informed sufficiently in advance of the time and places at which he intends to work in order that the necessary measurements for record and payment may be made with the minimum of inconvenience and delay to both the Architect and the Contractor.

1.5 TWO-WEEK SCHEDULE

Provide to Metro, on a weekly basis, a two-week schedule using bar chart format in sufficient detail to plan and properly coordinate upcoming work.

1.6 SUBMITTALS BY CONTRACTOR

- A. Submit Preliminary Schedule prior to starting work.
 - 1. Engineer/Architect and Metro will review overall schedule and may return reviewed copy with suggested revisions within seven (7) days after receipt.
 - 2. If required by the Engineer/Architect, contractor shall resubmit a revised preliminary schedule within three (3) days after return of reviewed copy.
- B. Submit initial CPM Construction Schedule within 25 days after Notice to Proceed. Include a cash flow summary based on a monthly estimate of revenue with the initial project schedule.
- C. Submit monthly updated CPM Construction Schedule by the seventh day of each month. Updated schedule shall reflect actual progress of the project to within five (5) working days prior to submittal.
- D. Submit a Two-Week Schedule every week. Deliver to Metro at the weekly Progress Meeting.
- E. Submit two copies of schedules to Metro, both initial submittals and revised or updated schedules.

1.7 DISTRIBUTION BY CONTRACTOR

- A. Distribute copies of reviewed schedules to:
 - 1. Job site file
 - 2. Other contractors
 - 3. Subcontractors
 - 4. Other concerned parties

*** * * END OF SECTION * * ***

SECTION 01340
SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Coordination and Site Conditions: Section 01040
- B. Construction Schedules: Section 01310
- C. Contractor's Quality Control: Section 01400
- D. Project Record Documents: Section 01720

1.2 SUBMITTAL REGISTER AND SCHEDULE

- A. Contractor will review the Contract Documents and identify all requirements for submittal of information to the Engineer and Metro. Contractor will arrange the listing of these submittals in order by section and paragraph beginning with the General Conditions, Supplementary Conditions and finally, the Technical Specifications in numerical order by section and paragraph. This document will be identified as the Submittal Schedule and will include the following information about each required submittal.
 - 1. Specification Section and Paragraph
 - 2. Transmittal Number (leave blank until submittal is made)
 - 3. Description
 - 4. Responsibility (Contractor, Sub or Supplier)
 - 5. Schedule Date - Date on which Contractor plans to submit
 - 6. Approval Required - Date approval is required to deliver the material by required date.
 - 7. Material Required - Date material is needed on-site.
 - 8. Submittal Date - Leave blank until submittal is actually made.
 - 9. Review Status - No Exceptions Taken, Make Corrections Noted, Rejected, Revise and Resubmit, Submit Specified Item.
 - 10. Action Date - Date on which Metro actually returned the reviewed submittal to Contractor.
 - 11. Comment - Cross reference on notes as required.
- B. The Submittal Schedule will be submitted no later than 10 days after Notice to Proceed and should be coordinated with the information presented in the Construction Schedule.
- C. Sufficient lead time should be allowed for review and approval by Metro. Allow 21 days for review and approval. Specifically identify those submittals which will require an expedited review process.
- D. The Submittal Schedule upon acceptance by Metro will form the basis for the Submittal Register. Contractor will keep track of submittals as submitted by sequential number. Contractor will update his submittal Schedule with information from the Submittal Register on a monthly basis and furnish a copy to Metro.

1.3 SUBMITTALS

- A. All submittals including shop drawings, data and samples shall be submitted attached to a form approved by the Engineer/Architect. Location by drawing number and paragraph of specification shall be shown on the form for the product or material being submitted. Each transmittal shall be assigned a unique number in sequential order.
- B. Shop drawings shall be submitted and reviewed in the following manner:
1. Contractor shall review, stamp with his approval and submit postpaid with such promptness as to cause no delay in his work or in that of any other contractor, the required number of copies of all shop drawings, schedules, data, and samples required for the work of the various trades determined necessary by the Engineer/Architect, required in the General Conditions and/or described elsewhere in the Project Specifications.
 2. Shop drawings shall establish the actual detail of all manufactured or fabricated items. All shall be drawn to scale and be completely dimensioned.
 3. Sheet sizes of shop drawings shall be in multiples of 8 1/2 by 11 inches, preferably not exceeding 22 by 34 inches unless there is a special requirement for larger size sheets.
 4. Provide on each drawing a clear space for the Engineer/Architect's review and approval stamps and comments.
 5. Four (4) copies of shop drawings, manufacturer's literature, brochures, catalog cuts, and other pertinent printed matter or data shall be submitted in addition to the number of copies Contractor wishes returned to him.
 6. Contractor shall obtain and provide such number of prints or copies of drawings as is required for his field distribution.
 7. Shop drawings may be submitted to the Engineer in the form of a reproducible transparency, along with one blackline or blue-line print. Mylars are preferred.
 8. The Engineer shall review the shop drawings with reasonable promptness and will affix the Shop Drawing Review Stamp with notations thereon indicating "No Exceptions Taken", "Make Corrections Noted", "Revise and Resubmit", "Rejected" or "Submit Specified Item".
 9. When shop drawings and/or other submittals are required to be revised or corrected and resubmitted, Contractor shall make such revisions and/or corrections and resubmit the drawings or other material in the same manner as specified above.
 10. It shall be Contractor's responsibility to clearly note on the shop drawings, and in writing specifically call to the Engineer's attention, any changes and deviations that vary from the Contract Drawings and Specifications. No review of the shop drawings by the Engineer shall relieve Contractor of full responsibility and at his own cost and expense to comply with the Contract Documents.

11. If corrections are required, Contractor shall make the corrections required by the Engineer and file with him the same number of corrected copies as indicated above. Contractor shall direct specific attention in writing or, on resubmitted Shop Drawings to revisions other than the corrections requested on previous submissions. The Engineer will return to Contractor copies of drawings in the same manner and number as before.
 12. Shop Drawings shall give complete information necessary for the fabrication and installation of all component parts of the equipment, structure, facility, etc. In the case of structural drawings, they shall include the location, type, and size and extent of all welds, if any are necessary. Manufacturer's standard details, catalogues, advertising literature, etc., shall not necessarily constitute all of the shop drawings required for any unit or facility. Additional shop details designed for the particular project shall be furnished when required by the Engineer. Shop drawings of electrical equipment shall include complete diagrams of electrical circuitry.
 13. The Engineer's review of and placement of shop drawing review stamp on any shop drawing is understood to be an acceptance of the character of the details and not a check of any dimension or quantity and will not relieve Contractor from responsibility for errors of any sort in shop drawings data or schedules, whether or not such errors are found by the Architect in his review of such details.
 14. No changes will be made in any shop drawing after it has been reviewed except by the consent or direction of the Engineer/Architect in writing.
- C. Samples shall be submitted in the same manner as shop drawings.
1. Samples to be physical examples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged.
 - a. Office samples of sufficient size and quantity to clearly illustrate
 - (1) Functional characteristics of product or material, with integrally related parts and attachment devices.
 - (2) Full range of color samples.

After review the Engineer/Architect will retain two samples and return the remainder to Contractor.
 - b. Field samples and mockups
 - (1) Erect at project site location acceptable to Architect.
 - (2) Construct each required sample or mock-up complete, including work of all trades required in finished work.
 - (3) Coordinate sampling of natural materials with Field Engineer.

2. If any test sample fails to meet the specification requirement, all previous approvals will be withdrawn and such materials or equipment, which fail the testing, shall be subject to removal and replacement by Contractor with materials or equipment meeting the specification requirement.
3. Affected finish work shall not be commenced until the Engineer has given written approval for the field samples.

1.4 CONTRACTOR RESPONSIBILITY

- A. All submittals shall be attached to a "Shop Drawing Transmittal" form approved by the Engineer.
- B. Contractor shall review and approve shop drawings before submittal. Submittal directly from Subcontractor or Suppliers will not be accepted.
- C. By approving and submitting Shop Drawings and Samples, Contractor thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data, or will do so, and that he has checked and coordinated each Shop Drawing with the requirements of the Work and of the Contract Documents and that there is no conflict with other submittals that may affect the work of another contractor of Metro.
- D. A copy of each approved shop drawing and each approved sample shall be kept in good order by Contractor at the job site and shall be available to the Engineer.

1.5 LIMITATION

Two submittals (initial and revised) of each item requiring samples and/or shop drawings will be reviewed by the Engineer in the regular course of the Contract. However, all subsequent reviews of the same item over two will be reviewed at the expense of Contractor unless the right to an additional review without charge was previously approved in writing by the Engineer. Contractor will be billed by Metro at the Engineer's current established rates.

1.6 GENERAL PRODUCT REQUIREMENTS

- A. Unless otherwise specifically provided, all workmanship, equipment, and materials incorporated in the work covered by the Contract are to be new and of the best available grade of their respective kinds.
- B. For products specified only by reference standards, select any product meeting standards, by any manufacturer.
- C. For products specified by naming one or more products, but indicating the option of selecting equivalent products by stating "or equivalent" after specified product, Contractor must submit request, as required for substitution, for any product not specifically named.

1.7 SUBSTITUTIONS REVIEW AND APPROVAL PROCEDURE

- A. Engineer/Architect will consider formal requests from Contractor for substitution of products in place of those specified. Provide complete list of all products which are proposed for installation as substitutions or product options. Tabulate list by each specification section. The Contractor shall pay any engineering expenses associated with review of substitution requests.
- B. Submit detail request for substitution in accordance with requirements for submittal of shop drawings and the following additional requirements.
 - 1. For construction methods
 - a. Detailed description of proposed method.
 - b. Drawings illustrating methods.
 - 2. Itemized comparison of proposed substitution with product or method specified.
 - 3. Data relating to changes in construction schedule.
 - 4. Accurate cost data on proposed substitution in comparison with product or method specified.
- C. In making request for substitution, Contractor shall specifically represent:
 - 1. He has personally investigated proposed product or method, and determined that it is equivalent or superior in all respects to that specified.
 - 2. He will provide the same guarantee for substitution as for product or method specified.
 - 3. He will coordinate installation of accepted substitution into work, making such changes as may be required for work to be complete in all respects.
 - 4. He waives all claims for additional costs related to substitution which consequently becomes apparent.
 - 5. Cost data is complete and includes all related costs under his Contract.
- D. Substitutions will not be considered if:
 - 1. They are indicated or implied on shop drawings or project data submittals without formal request submitted in accord with Section 01340.
 - 2. Acceptance will require substantial revision of Contract Documents or redesign by the Engineer/Architect, without substantial benefit to Metro.

- E. The above shall not be construed to mean that any substitution for materials and equipment will be allowed. The Engineer reserves the right to reject and disapprove any request he deems irregular or not in compliance with the Specifications.

*** * * END OF SECTION * * ***

SECTION 01400
CONTRACTOR'S QUALITY CONTROL

PART 1 GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. General Conditions - Article 7 Control and Quality of work and Material.
- B. Technical Specifications pertaining to the work.

1.2 RESPONSIBILITIES

- A. Contractor is primarily responsible for quality control and will provide for sufficient supervision and control measures on a daily basis to ensure that the Work is completed in accordance with the Contract Documents.
- B. Metro and the Engineer are responsible for quality assurance. Their activities in no way relieve Contractor of his quality control responsibilities.

1.3 REQUIREMENTS

- A. Quality Control Plan - Contractor will prepare and submit a plan of action to establish and maintain a Quality Control Program. The program as a minimum will contain:
 - 1. The quality control organization chart beginning with the responsible corporate officer.
 - 2. The names and qualifications of personnel selected to implement the program on-site.
 - 3. Authority and responsibility of the quality control staff.
 - 4. A breakdown of the schedule of work which includes proposed inspections, tests or other means of controlling the quality of work for each phase.
 - 5. Provides controls for each phase of work by establishing a system of inspections as follows:
 - a. Preparatory Inspection - This inspection will be conducted by Contractor prior to starting any new phase of work. Contractor's Quality Control Manager will review the contract documents to ensure that required materials, equipment and procedures have been submitted and approved, are on-site and checked, that a reasonable, coordinated work plan has been prepared, that all previous work has been completed, inspected and tested as required. Contractor will schedule a preparatory conference with the Engineer to discuss the findings and to develop a material understanding on execution of the work and the quality standards which will be used. The inspection results and minutes of the conference will be documented by Contractor and a copy furnished to the Engineer. Subsequent to the conference, but prior to start of work, all involved working personnel and inspectors will be briefed on the work plan and the quality standards expected.

- b. Initial Inspection - This joint inspection by Contractor and the Engineer/Metro Construction Manager will be made as soon as a representative portion of the work has been accomplished. This inspection will be repeated if new crew member(s) are assigned to the work or if acceptable standards of workmanship are not being met. Contractor will, as a minimum, document this inspection in the daily Quality Control Report.
 - c. Follow-up Inspections - Contractor will perform daily inspections of the work until completion.
6. Establish a system of Quality Control Deficiency Reports to report deficiencies in the work or materials to determine appropriate correction and to track the execution of the correction.

B. Documentation

- 1. Daily Quality Control Report - This report will be furnished by Contractor in a suitable format on a daily basis over the signature of the Quality Control Manager or on-site Quality Control Representative. It shall be delivered to the on-site Metro Representative and/or Engineer/Architect by 10:00 a.m. on the following work day, and will contain as a minimum:
 - a. Weather
 - b. Manpower (listed by craft for Contractor and total for each Subcontractor)
 - c. Equipment used
 - d. A summary of activity for each shift and evaluation of the workmanship
 - e. A record of any inspections which were made
 - f. Results of tests
 - g. Identification of deficiencies or rejections
 - h. Proposed remedial sections
 - i. Corrective actions taken
 - j. Safety related issues
 - k. Permanent materials deliveries and inspections
- 2. Preparatory Inspection Meeting Record - This record will be delivered to the on-site Metro Representative and/or Engineer/Architect prior to the start of each phase of work but not later than three work days after the meeting. The hazard analysis separately described in Section 01100 can be delivered at the same time.
- 3. Test Reports - A record of all tests shall be kept by Contractor on the job site. A copy of all test reports done by Contractor shall be provided to the Architect and/or Metro.
- 4. Quality Control Deficiency Reports - Contractor will prepare a deficiency report on all deficiencies in the work or in the quality of materials. The report will be logged and numbered and submitted to the Engineer and/or Metro along with the recommended remedy. Contractor will track the action through to completion, submitting a final report of inspection on the work in question.

C. Duties and responsibilities of the Quality Control Manager or a designated representative includes:

1. Have the authority to stop or reject work.
2. Be on-site during normal working hours and will be assigned full time to the project.
3. Establish the Quality Control Plan and execute the Quality Control Program.
4. Review all submittals, including shop drawings and materials submittals. Reject those submittals not in accordance with the Contract Documents, approve and submit those which are in accordance. Maintain a job site submittal file.
5. Ensure that line, grade, depth and compaction, density and composition of materials are in accordance with the Contract Documents.
6. Ensure that all work to be inspected includes an opportunity for Metro to check work prior to covering the work.
7. Coordinate required tests and inspections with the Architect and Metro's Construction Manager.
8. Inspect the work of Contractor and all Subcontractors.
9. Submit all required quality control documentation and maintain records.
10. Verify that all permanent materials delivered to the job site are in accordance with the Contract Documents. Submit certifications and test reports as required.
11. Accompany the Architect and/or Metro Construction Manager on job site inspections as required.
12. Prepare and submit the project punch lists prior to job completion and acceptance.
13. Furnish representative samples for testing as required by the Contract Documents or Metro.

1.4 INSPECTION

- A. Contractor will provide continuous inspection over his daily operations, including overtime and additional shifts.
- B. The Engineer and other regulatory agencies may also inspect as required by law and custom. The inspection by any of the above does not relieve Contractor of the requirement to inspect and to produce work in accordance with the plans and specifications. Contractor shall at all times provide safe access and assistance to the Engineer, and other authorized inspectors for inspection of the work.

1.5 TESTING

- A. Contractor will be responsible for all testing which may be required. Contractor will submit the qualifications of an independent test laboratory to provide testing services as required.
- B. The Engineer may conduct additional testing to check on the quality of work, materials or testing.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

The planning, execution and results of Contractor's Quality Control Program are considered incidental to the payment for the work as indicated by the bid items. Failure to comply with the Quality Control Program may result in withholding of all or a portion of the monthly progress payments by Metro at its discretion and Metro may use these withheld funds to contract or pay for this work outside of this Contract.

* * * END OF SECTION * * *

SECTION 01500
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary utilities required during construction.
- B. Temporary construction facilities, including field offices and project signs.
- C. Requirements for security and protection of facilities and property.
- D. Requirements for traffic regulation and access to the work.
- E. Temporary controls for protection of environment.

1.2 SUBMITTALS

A. Temporary Utility Submittals

- 1. Electric power supply and distribution plans.
- 2. Water supply and distribution plans, including metering device.
- 3. Wastewater routing plans including piping, ditches, culverts, etc.

B. Temporary Construction Submittals

- 1. Access roads and parking area plans.
- 2. Storage yard and storage building plans, including gravel surfaced area.
- 3. Fencing and protective barrier locations and details.
- 4. Engineer's field office plans and equipment list.
- 5. Staging area plan and notification of any obstructions encountered during mobilization.

C. Temporary Control Submittals

- 1. Copies of permits or approvals for construction from governing environmental protection agencies.
- 2. Plan for disposal of waste materials.

D. Safety and Protection Submittals

- 1. Copies of permits or approvals for construction activities from governing safety authorities.
- 2. Copies of survey notes taken to establish control points for structures affected by the work, and layout of survey control points.

E. Traffic Routing Submittal

1.3 MOBILIZATION

- A. Use area designated for Contractor's temporary facilities as determined by Metro.
- B. Notify Owner of obstructions not shown or not readily apparent by visual inspection of the staging area. If such obstructions adversely affect Contractor's operations, proper adjustment to Contract will be considered. Do not remove obstructions without Owner's prior consent.

1.4 TEMPORARY UTILITIES

- A. Permits Obtained by Owner. Copies of permits or approvals for temporary utilities to be obtained by Owner will be made available to Contractor at the pre-construction conference.
- B. Costs After Substantial Completion. Upon acceptance of the work or a portion of the work defined and certified as substantially complete by Architect, and Owner commences full-time successful operation of the facility or portion thereof, the Owner will bear the cost for utilities used for Owner's operation. Contractor shall continue to pay for utilities used until final acceptance of the work, except as provided herein.
- C. Electric Power
 - 1. Locate and determine the type and amount of electric power available and make arrangements for obtaining temporary electric power service, metering equipment, and pay all costs for the electric power used during the Contract period, except as specifically provided for utilities used by the Owner on portions of the work designated in writing by the Architect as substantially complete.
 - 2. Temporary electric power installations shall meet construction safety requirements of OSHA, state, and other governing agencies.
 - 3. Cost of electric power used in performance and acceptance testing shall be borne by Contractor.
- D. Water. The contractor will provide temporary facilities and piping required to bring water to the point of use, and remove them when no longer needed. Install an acceptable metering device and pay for water used at the Owner's current rate.
- E. Sewage. Provide and maintain sanitary facilities for Contractor's employees and subcontractors' employees that comply with regulations of local and state health departments.
- F. Telephone. Arrange for on-site telephone service for Contractor's use during construction. Costs of installation and monthly bills for Contractor's telephone service shall be borne by the Contractor.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 TEMPORARY CONSTRUCTION

- A. Access Roads and Parking. Contractor and Contractor employees shall provide for their own parking.
- B. Storage Yards and Buildings.Storage Yards and Buildings
 - 1. Construct temporary storage yards for the storage of products that are not subject to damage by weather conditions. Materials such as pipe, reinforcing and structural steel, shall be stored on pallets or racks, off the ground, and in a manner to allow ready access for inspection and inventory. Temporary gravel surfacing of storage yards must be approved by the Engineer.
 - 2. Erect or provide temporary storage buildings of various sizes needed to protect mechanical and electrical equipment and other materials, as recommended by manufacturers of such equipment and materials.
 - a. Provide environmental control systems that meet recommendations of manufacturers of equipment and materials stored in the buildings.
 - b. Buildings shall be of sufficient size.
 - c. Arrange or partition buildings to provide security for their contents and ready access for inspection and inventory.
 - d. At or near completion of the work, temporary storage buildings shall be dismantled, removed from the site, and remain the property of the Contractor.
- C. Fencing and Barricades
 - 1. Security Fence: The Contractor shall erect a temporary security fence with gates around the construction site as shown on the drawings.
 - 2. Barricades: Provide barricades as necessary to prevent unauthorized entry to construction areas, both inside and outside of fenced area. Also provide barricades to protect existing facilities and adjacent properties from potential damage. Locate barriers to enable access by facility operators and property owners.

3.2 SAFETY AND PROTECTION

- A. Examination of Existing Facilities
 - 1. After the Contract is awarded and before the commencement of work, Contractor and Engineer shall make a thorough examination of all existing buildings, structures, and other improvements in the vicinity of the work, as applicable, which might be damaged by construction operations.

2. Periodic examinations of existing buildings, structures, and other improvements in the vicinity of the work shall be made jointly by authorized representatives of the Contractor and the Owner. The scope of the examination shall include cracks in structures, settlement, leakage, and similar conditions.
3. Records in triplicate of all observations shall be prepared by the Contractor and each copy of every document shall be signed by the authorized representative of the Owner and of the Contractor. Photographs, as requested by the Owner, shall be made by the Contractor and signed in the manner specified above. One signed copy of every document and photograph will be kept on file in the office of the Owner.
4. These records and photographs are intended for use as indisputable evidence in ascertaining whether and to what extent damage occurred as a result of the Contractor's operations, and are for the protection of the adjacent property owners, the Contractor, and the Owner.

B. Safety Requirements

1. Contractor shall do whatever work is necessary for safety and be solely and completely responsible for conditions of the job site, including safety of all persons (including employees) and property during the Contract period. This requirement shall apply continuously and not be limited to normal working hours.
2. Safety provisions shall conform to Federal and State Departments of Labor Occupational Safety and Health Act (OSHA), and other applicable federal, state, county, and local laws, ordinances, codes, requirements set forth herein, and regulations that may be specified in other parts of these Contract Documents. Where these are in conflict, the more stringent requirement shall be followed. Contractor shall become thoroughly familiar with governing safety provisions and shall comply with the obligations set forth therein.
3. Contractor shall develop and maintain for the duration of the Contract, a safety program that will effectively incorporate and implement required safety provisions. Contractor shall appoint a qualified employee who is authorized to supervise and enforce compliance with the safety program.
4. Engineer's duty to conduct construction review of the Contractor's performance is not intended to include a review or approval of the adequacy of Contractor's safety supervisor, safety program, or safety measures taken in, on, or near the construction site.
5. As part of safety program, Contractor shall maintain at its office or other well-known place at the job site, safety equipment applicable to the work as prescribed by the governing safety authorities, and articles necessary for giving first-aid to the injured. Establish procedures for the immediate removal to a hospital or a doctor's care of persons who may be injured on the job site.

6. Contractor shall do all work necessary to protect the general public from hazards, including, but not limited to, surface irregularities or unramped grade changes in pedestrian sidewalk or walkway, and trenches or excavations in roadway. Barricades, lanterns, and proper signs shall be furnished in sufficient amount to safeguard the public and the work.
7. Construct and maintain satisfactory and substantial temporary chain link fencing, solid fencing, railing, barricades or steel plates, as applicable, at all openings, obstructions, or other hazards in streets, sidewalks, floors, roofs, and walkways. Such barriers shall have adequate warning lights as necessary or required for safety.
8. Comply with Owner's safety rules while on Owner's property.
9. If death or serious injuries or damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner and Engineer. In addition, Contractor shall promptly report in writing all accidents whatsoever arising out of, or in connection with, the performance of the work whether on or adjacent to the site, giving full details and statements of witnesses.
10. If claim is made by anyone against Contractor or any subcontractor on account of accident, Contractor shall promptly report the facts in writing, giving full details of the claim.
11. Furnish reports of weekly tool box safety training meetings as completed.

C. Traffic Safety and Access

1. Comply with rules and regulations of the city, state, and county authorities regarding closing or restricting the use of public streets or highways. No public or private road shall be closed, except by written permission of the proper authority. Assure the least possible obstruction to traffic and normal commercial pursuits.
2. Where traffic will pass over backfilled trenches before they are paved, maintain top of trench to allow normal vehicular traffic to pass over. Provide temporary access driveways where required. Cleanup operations shall follow immediately behind backfilling.
3. When flagmen and guards are required by regulation or when deemed necessary for safety, furnish them with approved orange wearing apparel and other regulation traffic control devices.
4. Traffic control procedures and devices used on all local, county, and state rights-of-way shall meet the requirements of the applicable current laws and regulations for traffic control. (See 3.3, TRAFFIC REGULATION, below.)
5. Provide snow removal to facilitate normal vehicular traffic on public or private roads affected by construction. Perform snow removal promptly and efficiently by means of suitable equipment whenever necessary for safety, and as may be directed by proper authority.

6. Contractor shall leave its night emergency telephone number or numbers with the police department, so that contact may be made easily at all times in case of barricade and flare trouble or other emergencies.
- D. Fire Prevention. Perform all work in a fire-safe manner. Furnish and maintain on the site adequate fire fighting equipment capable of extinguishing incipient fires. Comply with applicable federal, local, and state fire prevention regulations. Where these regulations do not apply, follow applicable parts of the National Fire Prevention Standard for Safeguarding Building Construction Operations (NFPA No. 241).
- E. Protection of Work and Property
 1. General
 - a. Contractor shall employ such means and methods necessary to adequately protect public property and property of the Owner against damage. In the event of damage to such property, immediately restore the property to a condition equal to its original condition and to the satisfaction of the Engineer and the owner of said property, and bear all costs thereof.
 - b. Protect stored materials and other items located adjacent to the proposed work.
 2. Finished Construction
 - a. Contractor shall assume the responsibility for protection of finished construction and shall repair and restore any and all damage to finished work to its original or better condition.
 - b. Where responsibility can be fixed, costs for replacement or repair of damaged work shall be charged to the party responsible. If responsibility cannot be fixed, costs shall be prorated among all parties in proportion to their activities at the time the damage was done.
 - c. Prevent wheeling of loads over finished floors, either with or without plank protection, except in rubber-tired wheelbarrows, buggies, or dollies. Protect finished floors and concrete floors exposed as well as those covered with composition tile or other applied surfacing.
 - d. At such time temporary facilities and utilities are no longer required for the work, notify Engineer/Architect of intent and schedule for their removal. Remove temporary facilities and utilities from the site as Contractor's property and leave the site in such condition as specified, as shown on the Drawings or as directed by the Engineer.
 - e. In unfinished areas, leave the site evenly graded, seeded, or planted as necessary, in a condition that will restore original drainage, and with an appearance equal to or better than original.

3.3 TRAFFIC REGULATION

A. Traffic Routing (Refer to Supplemental Conditions for further information.)

1. Prior to starting work at project site, Contractor shall submit traffic routing plans to the Engineer/Architect for review and approval showing:
 - a. Sequences of construction affecting the use of roadways.
 - b. Time required for each phase of the work.
 - c. Provisions for decking over excavations or phasing of operations, or a combination of these two methods, to provide necessary access.
2. This provision shall not be construed as preventing the Contractor from proceeding with mobilization of plant and equipment, and from placing orders for materials upon receipt of Notice to Proceed. Contractor shall not be entitled to delays due to "DISAPPROVED" traffic routing plans.

B. Signs and Equipment. Furnish at the site, or convenient to and immediately available to the site, the following signs and equipment:

1. Barricades, as required by the Vehicle Code, in sufficient quantity to safeguard the public and the work.
2. Portable "TOW-AWAY- NO STOPPING" signs, placed where approved by police department and owner.
3. Traffic cones, to delineate traffic lanes to guide and separate traffic movements.

3.4 ENVIRONMENTAL CONTROLS

A. General

1. The Contractor in executing the work shall maintain affected areas within and outside project boundaries free from environmental pollution that would be in violation of federal, state, or local regulations.
2. Do not impair operation of existing sewer systems. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures. Maintain original site drainage wherever possible.

B. Water Pollution Control

1. Comply with laws, rules, and regulations of the State of Oregon and agencies of the United States Government prohibiting the pollution of lakes, wetlands, streams, or river waters from the dumping of refuse, rubbish, or debris.

2. Divert sewage and waste flow, including stormwater flow, interfering with construction and requiring diversion to sewers leading to a wastewater treatment plant. Do not cause or permit action to occur which would cause an overflow to an existing waterway. Prior to commencing excavation and construction, obtain Architect's agreement with detailed plans showing procedures intended to handle and dispose of sewage, groundwater, and stormwater flow, including dewatering pump discharges.
3. Contractor shall comply with the procedures outlined in the U.S. Environmental Protection Agency manuals entitled "Guidelines for Erosion and Sedimentation Control Planning and Implementation", "Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity".

C. Dewatering Procedures

1. The Contractor shall construct, maintain, and operate cofferdams, channels, flume drains, sumps, pumps, or other temporary diversion and protection works. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally-safe removal and disposal of water from the various parts of the work. Maintain the foundations and parts of the work free from water.
2. Where an excavation extends below the water table, dewater in a manner that will prevent loss of fines from the foundation. Maintain stability of slopes and bottom of the excavation, and perform construction operations in the dry. Use screened wells or equivalent methods for dewatering. Control seepage along the bottom of excavations, which may require ditches and pipe drains leading to sumps from which the water shall be pumped and properly discharged.

D. Waste Material Disposal

1. Excess excavated material not required or suitable for backfill, and other waste material, must be disposed of in accordance with existing regulations.
2. Unacceptable disposal sites include, but are not limited to, sites within a wetland or critical habitat and sites where disposal will have a detrimental effect on surface water or groundwater quality.
3. Contractor shall make his own arrangements for disposal subject to submission of proof that the owner(s) of the proposed site(s) has a valid fill permit issued by the appropriate governmental agency. Submit intended haul route plan, including a map of the proposed route(s). Provide watertight conveyance for liquids, semi-liquids, or saturated solids that tend to bleed during transport.
4. Maintain areas covered by the Contract and affected public properties free from accumulations of waste, debris, and rubbish caused by construction operations. Remove excavated materials from the site.

5. Cleaning and disposal shall comply with local ordinances and pollution control laws. Do not burn or bury rubbish or waste materials on the project site. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.

E. Air Pollution Control

1. Minimize air pollution likely to occur from construction operations by wetting down bare soils during windy periods, requiring proper combustion emission control devices on construction vehicles and equipment, and by shutdown of motorized equipment not in use. Trash burning will not be permitted on the construction site.
2. If temporary heating devices are necessary for protection of the work, they shall be an approved type as specified under Article TEMPORARY UTILITIES.
3. Operations of dumping rock and of carrying rock away in trucks shall be conducted to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in the construction area a dust-preventive treatment, or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.

- F. Noise Control. Minimize noise by executing work using appropriate construction methods and equipment. Provide acoustical barriers so noise emanating from tools or equipment will not exceed legal noise levels.

G. Pest and Rodent Control

1. Comply with local health requirements for pest and rodent control. Cooperate with agencies and companies authorized to spray or provide other treatments to prevent insect outbreaks.
2. Maintain closures of means of entry into finished buildings by rodents. Inspect for rodents during cleaning, remove debris, and treat infested areas to Owner's satisfaction.

PART 4 PAYMENT

4.1 LUMP SUM AND UNIT PRICE BIDS

- A. Payment for work in this section will be included as part of the lump sum and unit price bid amounts stated in the Proposal.

* * * END OF SECTION * * *

SECTION 01600
PRODUCT SHIPMENT, HANDLING, STORAGE, AND PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements and procedures for work necessary for shipment, handling, storage, and protection of material and equipment products.

1.2 SUBMITTALS

- A. Contractor shall submit the following:
 - 1. Assembly instructions for parts shipped unassembled.
 - 2. Manufacturer's instructions for unloading, handling, storage, and protection prior to installation, with each shipment of each product type.
 - 3. Copy of manufacturer's notice of shipment for products critical to project schedule.
 - 4. Documentation of products in storage, submitted with each progress payment request.

1.3 PREPARATION FOR SHIPMENT

- A. When practical, products shall be factory assembled.
 - 1. Furnish assembly instructions for parts and assemblies that are shipped unassembled.
 - 2. Mark or tag the separate parts and assemblies for field assembly.
 - 3. Cover machined and unpainted parts that may be damaged by the elements with a strippable protective coating.
- B. Package or crate products to provide protection from damage during shipping, handling, and storage.

Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, name of project and Contractor, equipment number, and approximate weight.
- C. Mark spare parts and special tools to identify the associated products by name, equipment, and part number. Package parts for protection against damage from the elements during shipping, handling, and storage. Ship in boxes or containers marked to indicate the contents and as stated above. Deliver spare parts and special tools before the associated equipment is scheduled for the initial test run.

- D. Contractor shall request a minimum seven (7) day advance notice of shipment from manufacturers.
- E. Where specified for specific product, factory test results shall be reviewed and accepted before such product is shipped.

1.4 RECEIVING, INSPECTION, AND UNLOADING

- A. Contractor shall record the receipt of products at the job site.
- B. Upon receipt of products at the job site, Contractor shall inspect for completeness and evidence of damage during shipment.
 - 1. Engineer/Architect may be present for inspection.
 - 2. Should there appear to be damage, notify the Architect immediately and inform the manufacturers and the transportation company.
 - 3. Expedite replacement of damaged, incomplete, or lost items.
- C. After completion of inspection, unload products in accordance with manufacturer's instructions for unloading, or as specified. Do not unload damaged or incomplete products to be returned to manufacturer for replacement, except as necessary to expedite return shipment.

1.5 HANDLING, STORAGE, AND MAINTENANCE

- A. Handle products in accordance with the manufacturer's written recommendations, and in a manner to prevent damage.
- B. Store products prior to installation as recommended by the manufacturer.
 - 1. Store products such as pipe and reinforcing steel off the ground in approved storage yards.
 - 2. Store items subject to damage by the elements, vandalism, or theft in secure buildings.
 - 3. Provide environmentally controlled storage facilities for items requiring environmental control for protection.
 - 4. Storage yards and storage buildings shall conform to requirements of Section 1500 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.
- C. Provide manufacturer's recommended maintenance during storage, installation, and until products are accepted for use by Owner.
- D. Store products to provide access for inspection and inventory control. Contractor shall document products in storage to facilitate inspection and to estimate progress payments for products delivered but not installed in the work.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

PART 4 PAYMENT

4.1 LUMP SUM AND UNIT PRICE BID

Payment for work in this section will be included as part of the lump sum and unit price bid amounts stated in the Proposal.

*** * * END OF SECTION * * ***

SECTION 01650
TESTING, STARTUP AND OPERATION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Construction Facilities and Temporary Controls: Section 01500
- B. Contract Close-out: Section 01700
- C. Operation and Maintenance Data: Section 01730
- D. Equipment: Division 11
- E. Mechanical: Division 15
- F. Electrical: Division 16

1.2 RESPONSIBILITY

- A. Testing, startup and operation shall not be cause for claims for delay by the Contract and all expenses accruing therefrom, shall be deemed to be incidental to the Contract.
- B. The Contractor shall provide all materials, supplies and labor necessary to efficiently complete the testing, startup and operation.
- C. All power and utilities needed or used by the Contractor shall be paid by the Contractor up to and including the day of final acceptance of the Contract by Metro. If not paid, these charges shall be treated as claims against the Contractor.
- D. If Metro chooses to commence operations prior to final acceptance, Metro will assume payment of all power and utility charges effective the day that operation is assumed by Metro and notice is given in writing.

1.3 SCHEDULE

- A. Placing all applicable phases of the project in service shall consist of three parts: testing, start up and operations.
- B. Not less than thirty (30) days before anticipated time for beginning the testing, the Contractor will submit to the Engineer/Architect for approval, a complete plan for:
 - 1. Schedules for tests.
 - 2. Detail schedules of procedures for startup.
 - 3. Complete schedule of events to be accomplished during startup.
 - 4. Schedule operator training as specified.
 - 5. An outline of work remaining under the Contract that will be carried out concurrently with the operation phases.

1.4 TESTING

- A. Testing shall consist of individual tests and checks made on equipment intended to provide proof of performance of units and proper operation of unit controls together with such necessary tests whether or not described elsewhere in these Specifications to assure proper alignment, size, condition, capability, strength, proper adjust, lubrication,

pressure, hydraulic tests, leakage tests and all other checks deemed necessary by the Architect to determine that all materials and equipment are of specified quality, properly situated, anchored and in all respects ready for use.

- B. All gravity pipe and pressure piping shall be tested as required by these specifications and applicable codes.
- C. Tests on individual items of equipment, pipelines, vessels, structures, tanks, controls and other items shall be as described in various sections describing such items.
- D. Testing will be done by the Contractor in the presence of an Inspector designated by the Engineer/Architect. Records of all official tests will be made by the Inspector.
- E. During tests, the Contractor shall correct any defective work discovered or that is not in first class operating condition.

1.5 STARTUP

- A. Startup shall consist of testing by a simulated operation, all operational equipment and controls. The purpose of these tests shall be to check that all equipment will function under operating conditions, that all interlocking controls and sequences are properly set and that the facility will function as an operating unit.
- B. Checks for leakage of tanks, ponds, piping, valves, gates and all other hydraulic systems and structures will be made.
- C. Factory representatives of all major units shall be present for the startup phase. The test shall continue until it is demonstrated that all dysfunction of controls and machinery are corrected.
- D. The startup shall not begin until all tests required by these Specifications have been completed and approved by the Engineer.

1.6 OPERATION

- A. Operation of the facility shall be immediately started after completion of testing and startup and after satisfactory repairs and adjustments have been made and providing supply and disposal facilities furnished by others are available. If these facilities are not available, the plant will be closed down and no further testing or operation by the Contractor will be required. The Contractor, however, will be responsible that all details required by the Contract shall remain in good order until final acceptance of the whole Contract.
- B. The facility will be operated by personnel placed on the project by Metro South Transfer Station who will perform all duties and operate all equipment.
- C. Taking possession and use of the facility shall not be deemed an acceptance of any work not completed in accordance with the Contract Documents.
- D. If such prior use increases or causes refinishing of completed work, the Contractor shall be entitled to such extra compensation or extension of time or both, as the Engineer/Architect may determine.

***** END OF SECTION *****

**SECTION 01700
CONTRACT CLOSE-OUT**

PART 1 GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Adjusted Payments for Delay: Article 3 General Conditions
- B. Payments: Article 9 General Conditions
- C. Certification and Final Payment: Article 9 General Condition
- D. Coordination and Site Conditions: Section 01040
- E. Project Record Documents: Section 01720
- F. Operation and Maintenance Data: Section 01730

1.2 SUBSTANTIAL COMPLETION

A. Contractor

1. After testing and startup, submit written certification to Architect that Project or designated portion of Project is substantially complete.
2. Submit punch list of items to be completed or corrected.

B. Engineer will make an inspection after receipt of Contractor's certification, together with Metro's representative.

C. If it appears to the Engineer and Metro that work is substantially complete:

1. The Engineer may request, and Contractor shall prepare and submit to the Engineer, a list of items to be completed or corrected as determined by the inspection.
2. If the Engineer then considers the work to be substantially complete, the Engineer may, with Metro's approval, issue a Certificate of Substantial Completion, with appropriate conditions, accompanied by a list of the items to be completed and corrected, as verified and amended by Engineer. Omission of any item from the list shall not relieve Contractor from responsibility to complete all the work in accordance with the Contract.
3. Metro occupancy of Project or designated portion of Project:

Metro may use all or part of the work within the time designated in the Certificate of Substantial Completion, upon notice to the insurance company or companies as provided in Article 9 of the General Conditions.
4. Contractor shall complete all the work within the time designated in the Certificate, or if not so designated within a reasonable time.

D. Should the Engineer and Metro consider that work is not substantially complete:

1. Engineer shall notify Contractor, in writing stating reasons and list of items.
2. Contractor shall complete work and send second written notice to Engineer and Metro certifying that Project or designated portion of Project is substantially complete.

E. Warranties: Under Article 7 of the General Conditions, guarantee and warranty periods begin with the date of final acceptance. However, in connection with any specific equipment certified by the Engineer as completed and its use or operation thereof for its intended purpose is assumed by Metro, the warranty period for such equipment shall begin with the beginning date of such use or operation.

1.3 FINAL INSPECTION

A. Contractor shall submit written certification that:

1. Contract Documents have been reviewed.
2. Work has been completed in accordance with Contract Documents.
3. Equipment and systems have been tested in presence of Metro's representative and are operational.
4. Project is completed, and ready for final inspection.

B. Engineer will make final inspection within a reasonable time after receipt of certification.

C. Should Engineer consider that work is complete in accordance with requirements of Contract Documents, Engineer shall request Contractor to make project close-out submittals.

D. Should Engineer and Metro consider that work is not complete:

1. Engineer shall notify Contractor, in writing, stating reasons.
2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to Architect certifying that work is complete.
3. Engineer will re-inspect work.

1.4 RE-INSPECTION COSTS

In addition to any overtime inspection due under Article 9 of the General Conditions, should Engineer be required to perform second inspections because of failure of work to comply with original certifications of Contractor, Metro will compensate Engineer for additional services as stated in said article and charge Contractor for such fees at the Engineer's currently established billing rate.

1.5 CLOSE-OUT SUBMITTALS

- A. Project Record Documents: To requirements of Section 01720.
- B. Guarantees and bonds required by these specifications: See Article 7 of General Conditions and specific equipment or material specifications.
- C. Easement Release: (where applicable).
- D. At the close of the Contract Contractor shall:
 - 1. Pay all utility bills.
 - 2. Remove all electrical, sanitary, gas, telephone, water, offices and any other temporary service equipment that may remain.
 - 3. Arrange for transfer of electrical, water and other applicable utility accounts to Metro's name.
- E. Deliver evidence of compliance with requirements of governing authorities (where applicable).

1.6 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit final statement of accounting to Architect.
- B. Statement shall reflect all uncompleted adjustments
 - 1. Additions and deductions resulting from:
 - a. Previous Change Orders.
 - b. Cash Allowances.
 - c. Unit Prices.
 - d. Other Adjustments.
 - e. Deductions for Liquidated Damages.
 - 2. Unadjusted sum remaining due.

1.7 FINAL APPLICATION FOR PAYMENT

Contractor shall submit final application for payment in accordance with requirements of General Conditions and shall reflect the final adjustment of accounts in Paragraph 1.6.

1.8 FINAL CERTIFICATE FOR PAYMENT

- A. Engineer will issue Final Certificate in accordance with provisions of General Conditions.
- B. Should final completion be materially delayed through no fault of Contractor, Engineer may issue a Final Certificate for Payment, in accordance with provisions of General Conditions and existing laws.

1.9 POST-CONSTRUCTION INSPECTION

- A. Prior to expiration of one year from Date of Substantial Completion or Final Acceptance, Architect may make visual inspection of Project in company with Metro and Contractor to determine whether correction of work is required, in accordance with warranty/guarantee provisions of General Conditions.
- B. For guarantees beyond one year, Engineer/Architect will make inspections at request of Metro, after notification to Contractor.
- C. Metro will promptly notify Contractor, in writing, of any observed deficiencies.

*** * * END OF SECTION * * ***

**SECTION 01720
PROJECT RECORD DOCUMENTS**

PART 1 GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Close-out Submittals: Article 9 General Conditions Section 01700.
- B. Coordination and Site Conditions: Section 01040
- C. Shop Drawings, Project Data, and Samples: Section 01340
- D. Operation and Maintenance Data: Section 01730

1.2 MAINTENANCE OF RECORD DOCUMENTS

- A. Contractor shall maintain at job site, one record copy of:
 - 1. Contract Drawings.
 - 2. Project Specifications.
 - 3. Addenda.
 - 4. Reviewed Shop Drawings.
 - 5. Change Orders.
 - 6. Other Modifications to Contract.
 - 7. Field Test Records.
 - 8. Operational and Maintenance Data Delivered with Mechanical and Electrical Equipment.
 - 9. Certified Weight Tickets
- B. Store record documents apart from working documents used for construction.
- C. Provide files and shelves for storage of record documents.
- D. Maintain record documents in clean, dry, legible condition.
- E. Do not use record documents for daily construction purposes.
- F. Make record documents available at all times for inspection by Architect and Metro

1.3 RECORDING

- A. Do not permanently conceal any work until required information has been recorded.
- B. Keep record documents current.
- C. Contract Drawings: Legibly mark to record actual construction:
 - 1. Horizontal and vertical location of underground utilities and appurtenances and references to permanent surface improvements.
 - 2. Field changes of dimension and detail.
 - 3. Changes made by Change Order.
 - 4. Details not on original Contract Drawings.
- D. Specifications and Addenda: Legibly mark up each Section to record:
 - 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 - 2. Changes made by Change Order.

3. Other matters not originally specified.

E. Shop Drawings: Maintain as record documents; legibly annotate drawings to record changes made after review.

1.4 SUBMITTAL

A. At completion of project, deliver complete set of all record documents to Engineer.

B. Accompany submittal with transmittal letter signed by Contractor or his authorized site representative.

*** * * END OF SECTION * * ***

**SECTION 01730
OPERATION AND MAINTENANCE DATA**

PART 1 GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Testing, Startup and Operation: Section 01650
- B. Shop Drawings, Product Data and Samples: Section 01340
- C. Contract Close-out: Section 01700
- D. Material and Equipment Specified: All Divisions

1.2 REQUIREMENTS

- A. The Contractor shall submit to Engineer two copies of draft operations and maintenance manuals for each major piece of equipment and system component at least 30 days prior to scheduled testing and at least 30 days prior to submitting written notice of substantial completion.
- B. Engineer and Metro will review and return one copy with comments. If corrections are required, the Contractor will make corrections and resubmit one corrected copy plus corrected pages for the copy in Metro's possession.
- C. Upon approval, the Contractor will furnish six (6) copies of the Operations and Maintenance Manuals. Complete approval of all required manuals will be a condition for final completion and payment.
- D. The Operations and Maintenance Manuals will include as a minimum the following:
 - 1. Table of Contents.
 - 2. System Description and Functions of Individual Items of Equipment.
 - 3. As Built Layout. Include locations of all elements and wiring diagram of control circuits.
 - 4. Operations and Maintenance Instructions for each major item of equipment. These instructions will clearly identify the equipment actually provided and information pertaining to other models or variations will be lined out. The instructions will include information on:
 - a. Operating conditions
 - b. Installation instructions
 - c. Startup procedures
 - d. Shut down procedures

- e. Maintenance instructions
 - f. Trouble shooting procedures.
5. Maintenance Schedules - Cross reference these schedules to specific paragraphs in the O&M Instructions.
6. Spare Parts and lubricants lists
7. Warranties
- E. Specific requirements for the Electrical Operations and Maintenance Manual are included in Division 16.

1.3 MANUAL ASSEMBLY

- A. Data shall be bound in first quality, heavy, permanent 3-ring type binders.
- B. Manuals shall be assembled and indexed so that information on any piece of equipment can be readily found.

1.4 MAINTENANCE SCHEDULE

Maintenance schedules for each item of equipment will include a "summary of maintenance" substantially in the format as attached:

(Typical Maintenance Summary Form attached)

*** * * END OF SECTION * * ***

TYPICAL MAINTENANCE SUMMARY FORM

1. EQUIPMENT ITEM
2. MANUFACTURER
3. EQUIPMENT IDENTIFICATION NUMBER(S)
4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS)
5. NAMEPLATE DATA (hp, voltage, speed, etc.)
6. MANUFACTURER'S LOCAL REPRESENTATIVE

Name _____ Telephone No. _____

Address _____

7. MAINTENANCE REQUIREMENTS

Maintenance Operation	Frequency	Lubricant (If Applicable)	Comments
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable.	List required frequency of each maintenance operation.	Refer by symbol to lubricant list required.	

8. LUBRICANT LIST

Reference Symbol	Shell	Standard Oil	Gulf	Arco	Or Equal
List symbols used in Item 7. above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

9. SPARE PARTS. Include your recommendations regarding what spare parts, if any, should be kept on the job.

* * * END OF SECTION * * *

DIVISION 2 - SITEWORK

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SECTION 02010

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- D. Shoring: Section 02150

1.2 SOILS REPORTS

- A. Any data on soil and/or subsurface conditions shown in the Plans or Specifications is not to be taken as a representation, but is based on limited information and is at best only an opinion; consequently, such data cannot be considered precise or complete and there is no guarantee as to its completeness, accuracy, or precision.
- B. A copy of any available reports may be inspected at the office of the Engineer if so stated in section "Information Available to Bidders."
- C. These reports were obtained only for use by the Engineer in design and are not a part of the Contract Documents.
- D. Additional Investigation:
 - 1. Contractor should visit the site and acquaint himself with site conditions before submitting a bid and the submission of a bid will be prima facie evidence that he has done so.
 - 2. Prior to bidding, Contractor may make his own subsurface investigations to satisfy himself with site and subsurface conditions.

1.3 QUALITY ASSURANCE

- A. The Contractor shall readjust work performed that does not meet technical or design requirements.
- B. The Contractor shall make no deviations from the Contract Documents without specific and written approval of the Owner.
- C. The Contractor shall be responsible for obtaining approval from responsible agency or property owner before performing any exploratory excavations.

* * * END OF SECTION * * *

SECTION 02050

DEMOLITION

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Site Clearing: Section 02110
- B. Grading: Section 02210
- C. Excavating, Backfilling and Compacting for Utilities: Section 02222
- D. Pavement Repair and Resurfacing: Section 02575

1.2 PROTECTION

- A. Roads, adjacent property and other work to remain shall be protected throughout the work.
- B. Pavement may be cut only where authorized and only to the extent specified.
- C. Any material damaged by Contractor's operations shall be replaced with new material by the Contractor.

1.3 CUTTING PAVEMENT AND CURBS

- A. Unless specified otherwise by the authority having control over the pavement, curbs and walks, cutting and replacement shall be as specified in Section 02575.

1.4 ROADS, DRAINS, UTILITY LINES AND MISCELLANEOUS

- A. Pipe laying operations in certain areas may necessitate temporary removal of drains, service lines, conduits, etc. to facilitate construction. In the event that the Contractor finds it necessary to remove the above mentioned items, it is to be understood that it will be his responsibility to restore these items in a manner equal to their original condition. The Contractor shall maintain adequate temporary provisions for domestic deliveries and utilities service and access to fire fighting equipment.
- B. The cost of the above described work shall be included in the price bid for pipe and no additional compensation shall be made to the Contractor.
- C. The Contractor shall make every effort to prevent blocking driveways for more than a reasonable time and shall make such driveways immediately accessible on order of Metro.

1.5 REMOVAL OF OBSTRUCTIONS

- A. The Contractor shall raze, remove, and dispose of curbing, asphalt pavement, irrigation lines, existing fences and other obstructions that will affect the new construction area as described and indicated on Dwgs. G-03 and G-04.
- B. When salvageable material is to remain Metro's property, the Contractor shall remove it and deliver it to site designated by the Engineer or project documents. Any material not designated as Metro's property will belong to the Contractor. The Contractor shall store or dispose of such material at suitable disposal site or at his storage yard.

*** END OF SECTION ***

SECTION 02110

SITE CLEARING

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Subsurface Conditions: Section 02010
- B. Dewatering: Section 02140
- C. Shoring: Section 02150
- D. Excavating, Backfilling and Compacting for Structures: Section 02221
- E. Excavating, backfilling and Compacting for Structures: Section 02222
- F. Sedimentation Control: Section 02275

1.2 PROTECTION

- A. Streets, roads, adjacent property and other work to remain shall be protected throughout the work.

1.3 MEASUREMENT AND PAYMENT

- A. All work included in this section shall be incidental to other portions of the work.

2. PRODUCTS

2.1 MATERIALS

- A. Materials shall be at the Contractor's option.

3. EXECUTION

3.1 SURVEY STAKING IN UNCLEARED EASEMENTS

- A. Centerlines of utility lines shall be flagged prior to clearing and it shall be the Contractor's responsibility to set his own offsets for clearing limits.
- B. When the clearing is done, the survey for construction shall be accomplished as per Section 01050.
- C. If the controls or stakes are damaged or destroyed, the cost of replacement shall be at the expense of the Contractor.

3.2 CLEARING

- A. Clearing work shall be performed within the confines of the area indicated on the Drawings, or in the Specifications.
- B. Debris resulting from said clearing shall be disposed of by the Contractor and the right-of-way cleaned up in a neat and workmanlike manner.
- C. No logs, stumps, rocks, etc., shall be left lying in the right-of-way or on adjacent property without specified written approval by the Owner.
- D. All trees to be felled within the area to be cleared shall be close cut parallel to the ground, removed and disposed of at the expense of the Contractor.

3.3 GRUBBING

- A. All trees or stumps within the area to be cleared shall be removed.
- B. Grubbing will be performed where designated on the drawings or as specified herein and shall include removal from the ground of all stumps, roots, buried logs and other vegetation not otherwise provided for and the removal and disposal of the refuse.

3.4 DAMAGED VEGETATION

- A. Neatly trim torn limbs and trunk and severed roots.
- B. Apply wound paint to above-ground wounds.
- C. Remove and replace in kind all vegetation damaged extensively.

3.5 DISPOSAL

- A. Contractor may sell any saleable material.
- B. Material not sold shall be hauled to a disposal site secured by the Contractor at his expense.

*** END OF SECTION ***

SECTION 02140

DEWATERING

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Subsurface Investigations: Section 02010
- B. Excavating, Backfilling and Compaction for Utilities: Section 02222

1.2 QUALITY CONTROL

- A. It shall be the sole responsibility of the Contractor to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.
- B. The Contractor shall employ an independent qualified Professional Engineer with experience in similar dewatering problems to review and approve the Contractor's proposed method of dewatering and to at least weekly, inspect the Contractor's operations and provide a report to the Engineer.
- C. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the Contractor.
- D. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points should be established and observed at frequent intervals to detect any settlement which may develop. Should significant settlement be observed, recharge wells could be placed between the structure and the trench and water pumped under pressure back into the soil.
- E. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the Contractor. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor.

2. PRODUCTS

2.1 EQUIPMENT

- A. Before operations begin, the Contractor shall have available on the site of work sufficient pumping equipment and/or other machinery to assure that the operation of the dewatering system can be maintained.

3. EXECUTION

3.1 METHODS

- A. Dewatering shall be done by such method as the Contractor may elect.
- B. Dewatering, sufficient to maintain the groundwater level at or below the surface of trench bottom, base of the bedding course or foundation, shall be accomplished prior to pipe laying and jointing, if not prior to excavation and placing of the bedding as called for in other sections of the Specifications. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench.
- C. The normal water table shall be restored to its natural level in such a manner as to not disturb the pipe and its foundation.
- D. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check by the Contractor shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

- E. Dewatering of the trench shall be considered as incidental to the construction and all costs thereof shall be included in various unit contract prices in the Bid Form.
- F. Dispose of water so as not to cause injury to public or private property or to cause a nuisance or menace to the public and in accordance with the requirements of regulatory agencies.
- G. Construction of temporary facilities to dispose of water shall be incidental to the construction.
- H. Permanent piping systems shall not be incorporated in the dewatering system.

* * * END OF SECTION * * *

SECTION 02150

SHORING

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Excavating, Backfilling and Compacting for Structures: Section 02221
- B. Excavating, Backfilling and Compacting for Utilities: Section 02222

1.2 QUALITY ASSURANCE

- A. Contractor's sheeting and shoring plans shall be designed by a structural engineer with experience in the work.

2. PRODUCTS

2.1 TRENCHES

- A. Materials used shall be at the Contractor's option.

3. EXECUTION

3.1 SAFETY REQUIREMENTS

- A. Shoring shall be placed in accordance with federal, state and local safety requirements.

3.2 CRIBBING AND SHEETING

- A. Unless otherwise provided, the Contractor shall provide all cribbing and sheeting needed to protect the work, adjacent property and improvements, utilities, pavement, etc., and to provide safe working conditions in the trench.
- B. Removal of any or all cribbing and sheeting from the trench shall be accomplished in such a manner as to fulfill all of the above requirements and shall also be accomplished in such a manner as to prevent any damage to the work.
- C. Damages resulting from improper cribbing or from failure to crib shall be the sole responsibility of the Contractor.
- D. Cribbing will not be a pay item and the cost thereof shall be included in the contract price for each of the various items of work included in the project unless otherwise provided.
- E. Whether cribbing and sheeting shall be left in place or removed shall be at the option of the Contractor, provided that removal of any and all sheet piling, sheeting or cribbing used in trench or structure excavation shall be accomplished in the manner as to prevent the settlement of the pipes or other work and to prevent increased backfill loading which might overload the pipe or walls of the structure.
- F. Should the Owner order that any sheeting or cribbing be left in place, the Contractor shall not remove the same but will receive payment for the materials left in place on a unit price basis if such be in the Contract or at the market value thereof if there be no such unit price.

3.3 SPECIAL REQUIREMENT FOR FLEXIBLE PIPE

- A. Shoring to be removed, or moveable trench shields or boxes, shall be located at least 2-1/2 pipe diameters away from the pipe if the bottom of the shoring, shield or box extends below the top of flexible

- pipe, unless a satisfactory means of reconsolidating the bedding or side support material disturbed by shoring removal can be demonstrated.
- B. Damages resulting from improper shoring or failure to shore shall be the sole responsibility of the Contractor.

* * * END OF SECTION * * *

SECTION 02210

GRADING

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Subsurface Conditions: Section 02010
- B. Site Clearing: Section 02110
- C. Excavating, Backfilling, and Compacting for Utilities: Section 02222
- D. Riprap: Section 02274

1.2 QUALITY CONTROL ASSURANCE

- A. Soils and Backfill: Moisture density standard ASTM D1557 or AASHTO T-180 method unless otherwise specifically approved.
- B. In-place Density Determination: Sandcone method ASTM D1556 or Nuclear method ASTM D2922.
- C. Classification of Soils ASTM D2487.
- D. Quality control monitoring of subgrade backfill and embankment materials and construction by certified independent laboratory approved by Engineer, secured and paid for by the Contractor.

1.3 SUBMITTALS

- A. Import backfill gradation and moisture density compaction curve test reports.
- B. Embankment and native backfill materials gradations and moisture density standards curve test reports.
- C. Certification of gradation and compliance with referenced standards, and moisture density standards test reports.
- D. Density test results in approved format.

2. PRODUCTS

2.1 NATIVE MATERIAL FOR EMBANKMENT

- A. Selected soil free from roots or other organic material, debris, or frozen material.
- B. Maximum size to 6 inches with no stone larger than 4 inches in upper 6 inches of fill.
- C. Free of excess moisture.
- D. Processed to uniform moisture and texture necessary to obtain specified density.

2.2 IMPORT MATERIAL FOR EMBANKMENT

- A. Conform to Section 02222 for Backfill Gravel.

2.3 WASTE MATERIAL

- A. Foreign materials, buried rubble, abandoned pipes and native soil materials that cannot be processed to uniform moisture and texture necessary to achieve specified densities shall be disposed of by the Contractor at the appropriate waste site.
- B. Waste site shall be provided by the Contractor.

3. EXECUTION

3.1 WORK SEQUENCE

- A. Notify Engineer of any discrepancies between contractual requirements and site conditions prior to start of work.
- B. Maintain backfill embankment and subgrade zones or lifts open until approval of testing is secured from the Engineer. Any work covered up prior to approval shall be excavated and reconstructed at Contractor's expense.
- C. Prior to pipe installation construct embankments a minimum of 12 inches above pipe crowns and trench for all pipelines. Mounding over pipelines will not be permitted.
- D. Work in inclement wet weather at Contractor's risk.
- E. Any materials which become unstable as the result of improper selection of techniques, equipment, or operations during inclement wet weather shall be replaced at Contractor's expense with imported material for embankment.
- F. Excavations and embankment shall be accomplished in such a manner that drainage is maintained at all times.

3.2 STOCKPILING NATIVE MATERIALS FOR REUSE

- A. Material suitable for topsoil shall be deposited in protected, maintained piles separate from other materials and readily available.
- B. Upon completion, all material storage areas shall be restored to substantially their original condition.

3.3 EXCAVATION

- A. Remove all materials required regardless of type or character.
- B. Excavate to lines and grades shown on the drawing.
- C. Transport all materials to embankment areas or to waste as required.

3.4 PREPARATION OF GROUND SURFACE FOR FILL

- A. All vegetation, such as roots, brush, heavy sods, heavy growth of grass, and all decayed vegetable matter, rubbish, and other unsuitable materials within the area upon which fill is to be placed, shall be stripped or otherwise removed before the fill is started.
- B. Sloped ground surfaces steeper than one vertical to four horizontal on which fill is to be placed, shall be plowed, stepped (benched), or broken up in such manner that the fill material will bond with the existing surface.
- C. The original ground surface shall be plowed or scarified to a depth of at least six (6) inches and compacted as specified herein.
- D. Soft, wet soils shall be excavated and replaced or allowed to dry before placing fill.

3.5 EMBANKMENT

- A. Construct of materials specified, conditioned to proper moisture and texture necessary to assure specified densities.
- B. Loose thickness lifts not to exceed 8 inches.
- C. Maintain drainage at all times.
- D. Construct to grades shown on the Drawings.

3.6 COMPACTION

- A. Refer to Sections 02221 and 02222 for compaction requirements.

3.7 FINISH ELEVATIONS

- A. Contours illustrated are intended as a general guide to achieve proper aesthetics and drainage control.
- B. Control grid and spot elevations to be established by Contractor.
- C. Vary control grid spacing to accurately define slope, rounding of mounds and depressions.
- D. Field staking of certain intermediate grid points at locations where slopes are uniform may, at Engineer's discretion, be eliminated.
- E. Finished surface shall be smooth, compacted and free from irregular surface change so as to drain readily.
- F. The degree of finish shall be that ordinarily obtainable from blade grader operations, except as otherwise specified. The finished surfaces not to be paved shall be not more than 0.15 feet above or below the established grade or approved cross section. All areas to be paved shall be finished as required for pavement subgrade.

3.8 DENSITY TEST RECORD DOCUMENTATION

- A. Location of horizontal and vertical grid and datum.
- B. Density and percent of referenced standard computation.
- C. Material description and appropriate compaction control standard.

3.9 DENSITY TEST FREQUENCY

- A. Foundation embankment under structures and pipelines, top two feet of road subgrade, and 10 foot wide backfill zone around structures for each one foot of vertical embankment or backfill height, conduct one test for every 300 square feet.
- B. Other embankment same as above, except substitute 600 for 300.
- C. Additional tests as required by the Engineer, if tests indicate compaction deficiency.

*** END OF SECTION ***

SECTION 02221

EXCAVATING, BACKFILLING AND COMPACTING FOR STRUCTURES

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Subsurface Investigation: Section 02010
- B. Dewatering: Section 02140
- C. Shoring: Section 02150
- D. Grading: Section 02210
- E. Excavation, Backfilling, and Compacting for Utilities: Section 02222
- F. Sedimentation Control: Section 02275

1.2 GENERAL REQUIREMENTS

- A. The Contractor shall provide, complete, all excavation, removal, stockpiling, disposal and backfilling of whatsoever nature necessary for construction of all structures.
- B. The Contractor shall provide all construction and subsequent removal of all shoring, cribs and cofferdams that may be necessary for protection of existing structures, excavation, removal, construction of structures, placement and compaction of backfill.
- C. Excavation for manholes, catch basins, and other similar utility structures is specified in Section 02222.

1.3 CLASSIFICATION

- A. All excavation is unclassified unless separate bid item is included in bid form.
- B. The terms earthwork or excavation include all materials excavated or removed regardless of material characteristics.
- C. The Contractor shall make his own estimate of the kind and extent of materials which will be encountered in the excavation.

1.4 QUALITY CONTROL ASSURANCE

- A. Soils and Backfill: Moisture density standard ASTM D1557 or AASHTO T-180 method unless otherwise specifically approved.
- B. In-place Density Determination: Sandcone method ASTM D1556 or Nuclear method ASTM D2922.
- C. Classification of Soils: ASTM D2487.
- D. Quality control monitoring of subgrade backfill and embankment materials and construction by certified independent laboratory approved by Engineer and, secured and paid for by the Contractor.

1.5 SUBMITTALS

- A. Import backfill gradation and moisture density compaction curve test reports.
- B. Embankment and native backfill materials gradations and moisture density standards curve test reports.
- C. Certification of gradation and compliance with referenced standards, and moisture density standards test reports.
- D. Density test results in approved format.
- E. At any time the Contractor shall change the source and/or stockpile from which materials are obtained, certificates of gradation for these new sources will also be required. The Contractor shall include expenses incurred in having this certification in his bid price. No additional compensation will be allowed.

- F. During construction, the Owner may elect to have further gradation testing completed on the materials being furnished by the Contractor. This testing will be at the expense of the Owner, however, the Contractor shall provide material samples as may be necessary to complete this testing and these material samples will be furnished from material available on the job site or from the Contractor's source and/or supplier.

2. PRODUCTS

2.1 BACKFILL GRAVEL

- A. All gravel backfill shall be clean and free from vegetable matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and compaction to form a firm stable base.
- B. The backfill material shall conform to Class 2 Aggregate sub-bases as specified in the Standard Specifications.

2.2 NATIVE MATERIAL

- A. Native material removed from excavation that is suitable for backfill may be stockpiled on site.
- B. Stockpiled material shall be protected with plastic sheeting or by some other method from contamination and weather damage.
- C. Material that becomes too wet or contaminated in the stockpile shall be hauled to a disposal site and replaced with suitable imported material at the Contractor's expense.
- D. Material to be reused shall be such gradations and moisture content that it can be handled and compacted to meet the requirements as specified herein.
- E. Maximum size 6 inches with no stone larger than 4 inches in upper 6 inches of backfill.

2.3 FOUNDATION GRAVEL

- A. Crushed surfacing as specified in Standard Specifications or gravel material as specified in these specifications.
- B. Material shall be a clean gravel-sand mixture free from organic.

3. EXECUTION

3.1 GENERAL EXCAVATION REQUIREMENTS

- A. The Contractor shall exercise care and caution in performing the work so as not to cause any slide or slip beyond the limits of the structure excavation.
- B. He shall be responsible for damages to abutting improvements and properties resulting from any slide or slip, whatever the cause.
- C. He shall also at his own expense, remove the loose material and backfill or repair the slide or slip area with granular material, lean concrete, or by other method or means with the approval of the Owner.
- D. All excavated material unsuitable or surplus for backfill and embankment shall be removed from the project site to a dump site by the Contractor.
- E. Excavated material suitable for Backfill and Embankment shall be stockpiled.
- F. The excavation shall be dewatered as described in Section 02140 during excavation, construction of structures and placement and compaction of backfill.
- G. Excavation, sloped back sufficiently to prevent sliding of shoring, shall be provided. Design of shoring is responsibility of the Contractor.
- H. Excavations shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, installation of services, and for inspection, except where concrete is specified to be placed directly against excavated surfaces.

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

3.2 FOUNDATION PREPARATION

- A. Should the excavation be carried below the lines and grades specified on the drawings or should the bottom of the excavation be disturbed because of the Contractor's operations and require overexcavation and backfill, the Contractor shall refill such excavated space to the proper elevation with foundation gravel.
- B. Foundation shall be dug to final grade so that subgrade is not disturbed.
- C. The foundation and slab subgrade bearing areas shall be protected from disturbance with a 6-inch minimum layer of foundation gravel compacted to a minimum density of 95% modified Proctor.

3.3 INSPECTION

- A. During the course of excavation, the Engineer may stop the work and make bearing tests or test borings, and the Contractor shall give any assistance the Engineer may need in making such tests and shall receive no extra compensation for such stoppages. Materials and labor furnished by the Contractor for such tests will be considered as incidental to the work.
- B. When the foundation excavation is completed, the Contractor shall notify the Engineer who will make an inspection and approve the work before any additional work or structure is placed thereon.
- C. Contractor shall additionally notify the Engineer on completion of placement of foundation material. The Engineer will then make an inspection, make compaction tests, and the Engineer shall approve the work before any additional work or structure is placed thereon.

3.4 BACKFILLING

- A. The Contractor shall provide and place all backfill necessary to bring the site to the grades shown on the plans.
- B. Structure backfill shall not be placed until the subgrade portions of the structure have been inspected by the Engineer.
- C. No backfill material shall be deposited against concrete structures until the concrete has developed a strength of not less than 3000 pounds per square inch in compression, or until the concrete has been in place for 28 days, whichever occurs first.
- D. Backfill material shall be placed in uniform layers and shall be brought up uniformly on all sides of the structure.
- E. Backfill material shall be compacted to 90% of the modified Proctor Maximum Dry Density test procedure (AASHTO T-180).
- F. Mechanical or power tampers may be used in compacting the backfill material; however, no equipment or tamper may be used which by its weight or movement will damage, move or tilt out of alignment any part of the structure above or below the ground surface.
- G. Contractor shall be responsible for any such damages and shall make necessary corrections and repairs at his own expense.
- H. Unless otherwise specified, backfill around and above pipelines within the excavation line of any structure shall be the same as that specified for structures.

3.5 DENSITY TEST RECORD DOCUMENTATION

- A. Location of horizontal and vertical grid and datum.
- B. Density and percent of referenced standard computation.
- C. Material description and appropriate compaction control standard.

3.6 DENSITY TEST FREQUENCY

- A. Backfill zone around structures for each one foot of vertical embankment or backfill height, conduct one test for every 300 square feet.
- B. Additional tests as required by the Engineer, if tests indicate compaction deficiency.

* * * END OF SECTION * * *

SECTION 02222

EXCAVATING, BACKFILLING AND COMPACTING FOR UTILITIES

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Subsurface Investigation: Section 02010
- B. Grading: Section 02210
- C. Excavating, Backfilling and Compacting for Structures: Section 02221
- D. Sedimentation Control: Section 02275

1.2 CLASSIFICATION

- A. All excavation is unclassified unless separate bid item is included in bid form.
- B. The terms earthwork or excavation include all materials excavated or removed regardless of material characteristics.
- C. The Contractor shall make his own estimate of the kind and extent of materials which will be encountered in the excavation.

1.3 QUALITY CONTROL ASSURANCE

- A. Soils and Backfill: Moisture density standard ASTM D1557 or AASHTO T-180 method unless otherwise specifically approved.
- B. In-place Density Determination: Sandcone method ASTM D1556 or Nuclear method ASTM D2922.
- C. Classification of Soils: ASTM D2487.
- D. Quality control monitoring of subgrade backfill and embankment materials and construction by certified independent laboratory approved by Engineer and secured and paid for by the Contractor.

1.4 SUBMITTALS

- A. Import backfill gradation and moisture density compaction curve test reports.
- B. Embankment and native backfill materials gradations and moisture density standards curve test reports.
- C. Certification of gradation and compliance with referenced standards and moisture density standards test reports.
- D. Density test results in approved format.
- E. At any time the Contractor shall change the source and/or stockpile from which materials are obtained, certificates of gradation for these new sources will also be required. The Contractor shall make allowances in his unit prices bid for these items to cover expenses incurred in having this certification made and no additional compensation will be allowed.
- F. During construction, the Owner may elect to have further gradation testing completed on the materials being furnished by the Contractor. This testing will be at the expense of the Owner, however, the Contractor shall provide material samples as may be necessary to complete this testing and these material samples will be furnished from material available on the job site or from the Contractor's source and/or supplier.

2. PRODUCTS

2.1 BACKFILL MATERIALS

- A. These materials shall be native materials and as described in this section.

2.2 GRAVEL BEDDING MATERIAL

- A. Bedding for Rigid Conduits: Bedding material shall consist of clean, granular, well graded screened or crushed sand and gravel material conforming to the following gradation when tested in accordance with ASTM D422:

Sieve Size <u>Square Opening</u>	Percent Passing <u>By Weight</u>
3/4 inch	100
3/8 inch	95 - 100
No. 8	0 - 10
No. 200	0 - 3

- B. Bedding for Flexible Conduits: Bedding material shall be a clean screened or crushed sand/ gravel mixture free from organic matter and conforming to the following gradation when tested in accordance with ASTM D422:

Sieve Size <u>Square Opening</u>	Percent Passing <u>By Weight</u>
3/4 inch	100
3/8 inch	70 - 100
No. 4	55 - 100
No. 10	35 - 95
No. 20	20 - 80
No. 40	10 - 55
No. 100	0 - 10
No. 200	0 - 3

- C. Minimum sand equivalent shall be 35 in accordance with ASTM D2419.

2.3 BACKFILL GRAVEL

- A. All backfill gravel to be furnished under this Contract shall consist of naturally occurring screened or crushed gravel.
- B. Be essentially free from wood waste or other extraneous or objectionable materials.
- C. Shall have such characteristics of size and shape that it will compact readily and shall meet the following test requirements:

Stabilometer "R" Value	72 min.
Swell Pressure	0.3 psi max.
Maximum Particle Size	3 in.
Passing 1/4" Sq. Opening	25% min.
Passing No. 200 Sieve	10% max.
All percentages are by weight	
Dust Ratio: $\frac{\% \text{ Passing No. 200 Sieve}}{\% \text{ Passing No. 40 Sieve}}$	2/3 max.
Sand Equivalent (ASTM D2419)	30 min.

- D. Backfill gravel material retained on a 1/4-inch square sieve shall contain not more than 0.20% by weight of wood waste.
- E. The Contractor shall provide the Engineer with a certificate of gradation or sieve analysis from a qualified testing laboratory for backfill gravel furnished under this contract.
- F. Tallying for pay quantities shall be as established by the Contractor and Engineer prior to construction.

2.4 FOUNDATION GRAVEL

- A. At least two basic trench-bottom conditions commonly cause problems: (1) where silty soils or fine sandy soils are encountered, they will usually flow in the presence of a stream of water, and (2) where clays, peats, or other soft materials are encountered, they may become saturated with water, but do not usually break down into fine particles and flow as do the silts or sands mentioned above.
- B. Contractor's attention is called to conditions for use of the material as outlined in Article 3.5 of this section.
- C. Condition (1) Material: Where Condition (1) is encountered, the following foundation gravel has been found by experience usually to be adequate. Foundation gravel shall consist of clean bank run sand and gravel, free from dirt, roots, topsoil, and debris and contain not less than 35% retained on a 1/4-inch sieve and with all stones larger than two (2) inches removed. Such gravel must only be used in a dry-trench bottom, free from quicksand or running sand.
- D. Condition (2) Material: Where Condition (2) is encountered, Class A or Class B foundation gravel listed below, has been found by experience usually to be adequate. Other material may, however, be found more desirable by the Contractor:

Sieve Size	Class A	Class B
<u>Square Opening</u>	<u>% Passing</u>	<u>% Passing</u>
2-1/2"	98 - 100	95 - 100
2"	92 - 100	75 - 100
1-1/2"	72 - 87	30 - 60
1-1/4"	58 - 75	0 - 15
3/4"	27 - 47	0 - 1
3/8"	3 - 14	-----
No. 4	0 - 1	-----

- E. Foundation gravel shall contain no pieces larger than five (5) inches, measured along the line of greatest dimension.

2.5 RIGID INSULATION

- A. Insulation shall be closed-cell, extruded polystyrene foam.
- B. The insulation shall have a typical five year aged thermal conductivity, k factor of 0.2 Btu/hr/sq.ft./°F/in when tested at 75° F mean temperature in accordance with ASTM C518.
- C. Minimum compressive strength of 25 psi when tested in the vertical direction in accordance with ASTM D1621.
- D. Maximum water absorption of 0.3% by volume when tested in accordance with ASTM C272.

3. EXECUTION

3.1 TRENCHING

- A. Material shall be excavated from trenches and piled adjacent to the trench and maintained so that the toe of the slope of the spoil material is at least two (2) feet from the edge of the trench.
- B. Material shall be piled in such a manner that will cause a minimum of inconvenience to public travel.
- C. Free access shall be provided to all fire hydrants, water valves and meters, and clearance shall be left to enable the free flow of storm water in all gutters, conduits, and natural watercourses.
- D. Ledge rock, boulders, or stones shall be removed to provide a minimum clearance of six (6) inches under and around the pipe.
- E. Contractor shall keep excavations free of water in accordance with Section 02140.
- F. Contractor is responsible for shoring in accordance with Section 02150.

3.2 TRENCHING FOR WATER LINES

- A. Trenches shall be dug to true and smooth bottom grades and in accordance with the lines given by the Engineer.
- B. Trench widths shall not exceed 30 inches maximum or 1.5 times outside diameter of the pipe plus 18 inches whichever is greater.
- C. Standard excavation equipment shall be adjusted so as to excavate the narrowest ditch possible.
- D. Depth of trenching for water mains shall be such as to give a minimum cover of 36 inches over the top of the pipe unless otherwise specified.
- E. Deeper excavation may be required due to localized breaks in grade, or to install the new main under existing culverts or other utilities where necessary.
- F. Where profile of pipeline and ground surface is shown on the Plans, pipeline shall be laid to elevation shown regardless of depth.
- G. Excavation shall be to such depth that the minimum cover over the valve nuts shall be one foot.
- H. The length of trench excavated in advance of pipe laying shall be kept to a minimum and in no case shall length of open trench exceed 400 feet unless specifically authorized by the Engineer
- I. Trenches shall be overexcavated below the specified grade to provide for bedding material specified.

3.3 TRENCHING FOR SEWERS AND DRAINS

- A. Trenches must be of sufficient width to permit proper jointing of the pipe and backfilling of material along the sides of the pipe.
- B. Trench width at the surface of the ground shall be kept to the minimum amount necessary to install the pipe in a safe manner, ordinarily accomplished by sloping the trench sides to the angle of repose of the material encountered.
- C. Trenches wider than the maximum specified may result in a greater load of overburden than the pipe is designed for, and consequently, if the maximum trench width is exceeded by the Contractor, the Contractor shall at his own expense, provide pipe of higher strength classification, or provide a higher class of bedding where necessary to assure that the pipe will not be overloaded.
- D. The normal maximum permissible trench width, at the bottom of the trench and up to a point at the crown of the pipe, shall be 1.5 times the inside diameter plus 18 inches or 40 inches, whichever is greater.
- E. Excavation for manholes and other structures shall be sufficient to provide a minimum of 12 inches between their outside surfaces and the sides of the excavation.
- F. The length of trench excavated in advance of the pipe laying shall be kept to a minimum, and in no case shall it exceed 150 feet unless specifically authorized by the Engineer.
- G. Trenches shall be excavated below the barrel of the pipe a sufficient distance to provide for bedding material specified.

3.4 PIPE FOUNDATIONS

- A. Where the trench bottom is in a material which is unsuitable for foundation or which will make it difficult to obtain uniform bearing for the pipe, such material shall be removed and a stable foundation provided in accordance with Standard Detail entitled "Foundation Gravel and Backfill".
- B. Proper preparation of foundation and placement of foundation material where required, shall precede the installation of all pipe. This shall include the necessary preparation of the native trench bottom and/or the top of the foundation material to a uniform grade so that the entire length of pipe rests firmly on a suitable properly compacted material.
- C. Gravel to be used for foundation purposes shall be of a type and gradation to provide a solid compact bedding in the trench. Since trench conditions vary, foundation gravel requirements will change.
- D. Neither approval or disapproval of the foundation material proposed by the Contractor shall relieve him of his responsibility for providing adequate pipe foundation and guaranteeing his work as elsewhere required by the Contract.
- E. Unsuitable material for foundation purposes below the depth required for the specified bedding shall be removed and replaced with suitable foundation gravel.

- F. Excavated materials shall be disposed of at an approved waste site and all costs involved in the excavating and wasting of this material shall be considered as incidental to the foundation item, except that excavation more than two (2) feet below the pipe invert shall be classified as extra excavation and paid for at the Extra Excavation unit bid price.

3.5 PIPE BEDDING

- A. Placement of bedding material in the pipe zone shall be as specified in the section regarding the pipeline being constructed.

3.6 BACKFILLING

- A. Pipe bedding and backfill to 6 inches over the top of the pipe shall be completed before backfilling operations are started.
- B. The Contractor shall take all necessary precautions to protect the pipe from any damage, movement or shifting. In general, backfilling shall be performed by pushing the material from the end of the trench into, along and directly over the pipe so that the material will be applied in the form of a rolling slope rather than by side filling which may damage the pipe. Backfilling from the sides of the trench will be permitted after sufficient material has first been carefully placed over the pipe to such a depth as to protect the pipe.
- C. Compaction equipment used above the pipe zone shall be of a type that does not injure the pipe.
- D. Provide for the proper maintenance of traffic flow and accessibility as may be necessary.
- E. Make adequate provisions for the safety of property and persons.
- F. Temporary cribbing, sheeting, or other timbering shall be removed unless specifically authorized in writing.
- G. Dewatering shall be continued until the trench is completely backfilled.
- H. Brush, stumps, logs, planking, disconnected drains, boulders, etc., shall be removed from the material to be used for backfilling the trench.
- I. Where original excavated material is unsuitable for trench backfill, backfill gravel shall be placed. The unsuitable material shall be removed to a disposal area. Backfill gravel shall be used for backfill only where original material is unsuitable and upon approval by the Engineer.
- J. Where it is required that a blanket of select material or bank run gravel be placed on top of the native backfill, the backfill shall be placed to the elevations shown on the Plans, or to the elevation the Engineer may direct, and shall be leveled to provide for a uniform thickness of the selected material. Compaction of the native material shall be as required by the Owner and shall be performed prior to placing the select material except where the backfill is settled by the jetting method. In this case, the bank run material shall be placed before jetting. The top layer of material shall be then loosened by scarifying or other method and recompacted. Surface material shall be loosened to whatever depth is required to prevent bridging of the top layer, but shall in no case be less than 18 inches.
- K. Backfill Gravel: Wherever a trench is excavated in a paved roadway, sidewalk or other area where minor settlements would be detrimental and where the native excavated material is not suitable for compaction as backfill, the trench shall be backfilled to such depth as the Engineer may direct with Backfill Gravel.

3.7 GENERAL COMPACTION REQUIREMENTS

- A. Requirements of this section shall apply unless more stringent requirements are established by the local agency involved.
- B. When working in an existing traveled roadway, restoration and compaction must be achieved as the trench is backfilled so as to maintain traffic.
- C. Trench backfill under roadway shall be mechanically compacted to 95% of maximum density except for trenches over 8 feet in depth.
- D. When working in areas outside of proposed traveled roadway or on easements, backfill compaction may be achieved throughout the entire depth of the trench either by mechanical compaction or by water

settling. In any case where the fill cannot be brought to a visibly dry, firm, stabilized condition by water settling, all affected backfill shall be removed and replaced by backfill gravel mechanically compacted to 95% density.

3.8 MECHANICAL COMPACTION

- A. Method of compaction shall be at Contractor's option.
- B. The Contractor shall be responsible to provide the proper size and type of compaction equipment and select the proper method of utilizing said equipment to attain the required compaction density.
- C. In place compaction tests may be made. Contractor shall remove and recompact material that does not meet specified requirements.

3.9 ADJUSTING MANHOLES TO GRADE

- A. The Contractor shall adjust manhole castings to final grade by adding brick and/or mortar under the casting and patching with asphalt concrete. Paving adjusting rings will not be allowed.
- B. All manholes shall be adjusted to grade after the asphaltic concrete surfacing has been placed. Disturbed area around cover shall be patched and sealed to Standard Specification requirements.
- C. The Contractor shall take care not to extend the manholes above finished grade.
- D. The Contractor shall exercise extreme care in preventing foreign material from entering the manhole.

*** END OF SECTION ***

SECTION 02260

FINISH GRADING

1. GENERAL

1.1 WORK INCLUDED

- A. Finish grade in all planted areas to those elevations shown on the Drawings. Contractor to receive site rough graded to 8-in. below finish grade in all planter areas.
- B. Supply topsoil to meet finish grade conditions from rough grading of site.

1.2 RELATED WORK

- A. SECTION 02486 - LANDSCAPE INSTALLATION

1.3 PROTECTION

- A. Prevent damage to existing bench marks, pavement, utility lines. Correct damage at no cost to Owner.

2. PRODUCTS

2.1 MATERIALS

- A. Imported topsoil shall be a 50/50 compost mixture obtained from source approved by the Owner.

3. EXECUTION

3.1 SUBSOIL PREPARATION

- A. Rough grade subsoil systematically to allow for a maximum amount of natural settlement and compaction. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, etc. In excess of 6 inches in size. Remove subsoil which has been contaminated with petroleum products.
- B. Bring subsoil to required levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- C. Slope grade away from building minimum 2-1/2 inches in 10 feet (2%) unless indicated otherwise on Drawings.
- D. Rip subgrade to a depth of 6 inches where soil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading soil, has compacted subsoil.
- E. Compact subsoil to the following
 - 1. 85% relative compaction where topsoil is to be placed

3.2 PLACING TOPSOIL

- A. Place topsoil in all planter area prior to planting.
- B. Use topsoil in relatively dry state. Place during dry weather.
- C. Fine grade topsoil, eliminating rough and low areas to insure positive drainage. Maintain levels, profiles and contours of subgrades.
- D. Remove stones, roots, grass, weeds, debris and other foreign material while spreading, in excess of one (1) inch in diameter.
- E. Manually spread topsoil around any existing trees, plants, and building to prevent damage which may be caused by grading equipment.
- F. Lightly compact placed topsoil.

3.3 SURPLUS MATERIALS

- A. Remove surplus subsoil and topsoil from site.
- B. Leave stockpile areas and entire job site clean and raked, ready to receive landscaping.

* * * END OF SECTION * * *

SECTION 02275

SEDIMENTATION CONTROL

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Clearing and Grubbing: Section 02102
- B. Grading: Section 02210
- C. Excavating, Backfilling and Compacting for Structures: Section 02221
- D. Excavating, Backfilling and Compacting for Utilities: Section 02222

1.2 QUALITY CONTROL

- A. Conform to regulatory requirements.
- B. Sedimentation control systems depicted on drawings are intended to be minimum requirements to meet anticipated site conditions.
- C. When no sedimentation control system is shown on the drawing, the Contractor shall provide and design system to prevent siltation of adjacent property or streams.

1.3 SCHEDULE

- A. Required sedimentation control facilities must be constructed and in operation prior to land clearing and/or other construction to ensure that sediment laden water does not enter the natural drainage system.
- B. Sediment facilities shall be maintained in a satisfactory condition until such time that clearing and/or construction is completed and potential for on-site erosion has passed.
- C. The implementation, maintenance, replacement and additions to erosion/sedimentation control systems shall be the responsibility of the Contractor.

2. PRODUCTS

2.1 STRAW

- A. Be in an air dried condition free of noxious weeds, weed seeds, and other materials detrimental to plant life.
- B. Be seasoned before baling or loading and shall be acceptable to the Engineer.

2.2 JUTE MATTING

- A. Be of a uniform open plain weave of unbleached, single jute yarn treated with a fire retardant chemical.
- B. The yarn shall be of a loosely twisted construction and shall not vary in thickness by more than 1/2 of its normal diameter.
- C. Furnished in rolled strips 48 inches wide by approximately 50 yards long.
- D. Average weight of 0.92 pounds per square yard with an allowable tolerance of plus or minus 1 inch in width and 5% in weight.

2.3 FILTER FABRIC

- A. Filter fabric for the erosion protection barriers shall be Mirafi 140, or equivalent.

2.4 WIRE

- A. Wire for the erosion protection barriers shall be 2 x 2 mesh, 14 gauge galvanized wire.

2.5 SUPPORT POSTS

- A. Support posts for the erosion protection barriers shall be 2-inch by 4-inch, Doug-FR No. 1 or better wood posts or 1-1/2-inch by 4/8-inch medium weight steel fence posts.

2.6 CLEAR PLASTIC COVERING

- A. Clear plastic covering for protection of slopes and cuts shall meet the requirements of the NBS Voluntary Product Standard, PS 17 for Polyethylene sheeting having a minimum thickness of 6 mil.

3. EXECUTION

3.1 EROSION CONTROL

- A. Erosion control provisions shall meet or exceed the requirements of the local agency having jurisdiction.
- B. When provisions are specified and shown on the Drawings, they are the minimum requirements.
- C. Contractor shall not permit sediment laden waters to enter drainage facilities.
- D. As construction progresses and seasonal conditions dictate, more siltation control facilities may be required. It shall be the responsibility of the Contractor to address new conditions that may be created and to provide additional facilities over and above minimum requirements as may be required.

3.2 SILTATION/SEDIMENTATION PONDS

- A. Siltation/sedimentation ponds shall be installed on site to desilt all stormwater or water pumped from excavations.
- B. If additional siltation control is required, check dams or silt fences may be placed in streams or ditches receiving stormwater from areas disturbed by construction.
- C. Siltation/sedimentation ponds shall be constructed in accordance with the requirements of the agencies having jurisdiction over facilities to receive discharge from siltation/sedimentation ponds.

3.3 FILTER FABRIC FENCES

- A. Filter fabric fence shall consist of filter fabric fastened to wire fabric with staples or wire rings.
- B. Wire shall be fastened to posts set at 4-foot centers.
- C. Fabric shall be buried into ground approximately 8 inches to prevent silt from washing under fabric.
- D. Fence shall be located to catch silt and prevent discharge to drainage courses.

3.4 STRAW BALE FILTER

- A. Installed in drainage way to catch silt.
- B. Dig bales into ground approximately 6 inches and stake in place with 2 wooden stakes in each bale.
- C. Bales to extend above anticipated surface of stream.

3.5 PLACING JUTE MATTING

- A. Seed and fertilizer shall be placed prior to placing of matting.
- B. Jute matting shall be unrolled parallel to the flow of water. Where more than 1 strip of jute matting is required to cover the given area, it shall overlap the adjacent mat a minimum of 4 inches. The ends of matting shall overlap at least 6 inches with the upgrade section on top.
- C. The up-slope end of each strip of matting shall be staked and buried in a 6-inch deep trench with the soil firmly tamped against the mat. Three stakes per width of matting (1 stake at each overlap) shall be driven below the finish ground line prior to backfilling of the trench.

- D. The Engineer may require that any other edge exposed to more than normal flow of water or strong prevailing winds be staked and buried in a similar manner.
- E. Check-slots shall be placed between the ends of strips by placing a tight fold of the matting at least 6 inches vertically into the soil. These shall be tamped and stapled the same as upslope ends. Check-slots must be spaced so that one check-slot or one end occurs within each 50 feet of slope.
- F. Edges of matting shall be buried around the edges of catch basins and other structures as herein described. Matting must be spread evenly and smoothly and in contact with the soil at all points.
- G. Matting shall be held in place by approved wire staples, pins, spikes or wooden stakes driven vertically into the soil. Matting shall be fastened at intervals not more than 3 feet apart in 3 rows for each strip of matting, with 1 row along each edge and 1 row alternately spaced in the middle. All ends of the matting and check slots shall be fastened at 6-inch intervals across their width. Length of fastening devices shall be sufficient to securely anchor matting against the soil and driven flush with the finished grade.

3.6 PLACING CLEAR PLASTIC COVERING

- A. Clear plastic covering shall be installed on erodible embankment slopes as shown in the plans or as designated by the Engineer.
- B. The clear plastic covering shall be installed immediately after completion of the application of roadside seeding.
- C. The Contractor shall maintain the cover tightly in place by using sandbags or tires on ropes with a minimum 10-foot grid spacing in all directions. All seams shall be taped or weighted down full length. There shall be at least a 12-inch overlap of all seams.
- D. The Contractor shall be responsible to immediately repair all damaged areas.

3.7 EXISTING DRAINAGE FACILITIES

- A. Should a storm sewer or culvert become blocked or have its capacity restricted due to discharge siltation from Contractor's operations, the Contractor shall make arrangements with the jurisdictional agency for the cleaning of the facility at no additional expense to the Owner.

3.8 DRAINAGE DIVERSION

- A. Contractor shall divert the surface runoff water around the site as may be required.
- B. Drainage shall be restored to condition existing prior to construction unless otherwise shown on the Drawings.

*** END OF SECTION ***

SECTION 02575

PAVEMENT REPAIR AND RESURFACING

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Site Clearing: Section 02110
- B. Demolition: Section 02050
- C. Grading: Section 02210
- D. Excavation, Backfilling, and Compacting for Utilities: Section 02222

1.2 QUALITY ASSURANCE

- A. Qualifications of Asphalt Concrete Producer: Use only materials which are furnished by a bulk asphalt concrete producer regularly engaged in production of hot-mix, hot-laid asphalt concrete.

1.3 PAVING QUALITY REQUIREMENTS

- A. General: In addition to other specified conditions, comply with following minimum requirements:
 - 1. Comply with requirements of Metro.
 - 2. Provide final surfaces of uniform texture, conforming to required grades and cross-sections.
 - 3. Patches shall match existing grade and cross section unless otherwise directed by Metro's Engineer.
- B. Surface Smoothness:
 - 1. Test finished surface of each asphalt concrete course for smoothness, using a 10 foot straight edge applied parallel to and at right angles to centerline of paved areas.
 - 2. Surfaces will not be acceptable if exceeding 0.25 inch in 10 feet.

1.4 SUBMITTALS

- A. Certify that materials comply with Specification Requirements.

1.5 JOB CONDITIONS

- A. Weather Limitations:
 - 1. Construct only when temperatures are above minimum specified in State Highway Standard Specifications unless waived by Road Agency having jurisdiction.
 - 2. Do not construct pavement or base when the base surface is wet or contains an excess of moisture which would prevent uniform distribution and the required penetration.
- B. Grade Control: Establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.

2. PRODUCTS

2.1 ASPHALT CONCRETE PAVEMENT

- A. Asphalt-concrete pavement shall conform to the Technical Requirements of the state highway department in which the project is located for plant mix asphalt concrete unless otherwise set forth in the Special Provisions.

2.2 ASPHALT TREATED BASE

- A. Asphalt treated base shall conform to the Technical Requirements of the state highway department in which the project is located for asphalt treated base.

2.3 CONCRETE

- A. Refer to Section 03300.

3. EXECUTION

3.1 GENERAL PAVEMENT REPAIR REQUIREMENTS

- A. Pavement patching shall be scheduled to accommodate the demands of traffic and shall be performed as rapidly as possible to provide maximum safety and convenience to public travel.
- B. The placing and compaction of the trench backfill, and the preparation and compaction of the subgrade shall be in accordance with the requirements of Section 02222 of these Specifications.
- C. Prior to trench excavation in pavement surfaces, straight vertical trim lines shall be cut in order to minimize breakage and cracking of the remaining surfacing.
- D. Before the patch is constructed all pavement cuts shall be trued so that the marginal lines of the patch will form a rectangle with straight edges and vertical faces. The use of a concrete saw is required for asphalt pavement also.
- E. After completion of the patches, the entire roadway surface shall be cleaned by brooming, flushing, or such other methods as may be required. The early completion of this phase of the restoration is required, not only to facilitate public relations, control dust and traffic problems, but also to prevent the further break-up and cracking of the existing asphalt mat. If, in the opinion of the Engineer, the Contractor is not diligently pursuing the work in such a manner as to place the patch as soon as reasonably possible, the Contractor may be required to re-trim and remove any and all cracked areas in such a manner to produce a straight uniform edge.
- F. Finished grade and cross section of patch shall match grade and cross-section of existing pavement.
- G. All incidental work required to complete the patching of street surfaces as specified, including joints where required, shall be considered as incidental to the patching and the costs thereof shall be included in the items for which payment is provided.

3.2 ASPHALT CONCRETE TRENCH PATCH

- A. Preparation:
 - 1. As soon after compacting the trench backfill and placing and compacting backfill gravel, where required, the Contractor shall place and compact crushed surfacing in the trench area to a minimum depth of four (4) inches or depth to match the original cross section whichever is greater.
 - 2. A tack coat of asphalt applied at the rate of 0.02 to 0.08 gallon per square yard of retained asphalt shall be applied through the use of mechanical equipment to all surfaces on which any course of asphalt concrete is to be placed or abutted. The spreading equipment shall be capable of uniformly distributing asphalt materials over any area in controlled amounts and shall be equipped with hand operated spray equipment for use only on inaccessible and irregularly shaped areas.
 - 3. The tack coat shall be a heated cutback asphalt, or emulsified asphalt, mixing grade. The emulsified asphalt may be mixed with water at the rate of 1 to 2 parts water to 1 part of emulsified asphalt.
- B. Single Lift Patch:
 - 1. Immediately after completion of placing the base the Contractor shall place a two inch minimum thickness of asphalt concrete surfacing.

2. If the existing pavement is more than two inches the asphalt concrete shall be of the same depth as the existing pavement.
3. The edge shall be hand raked to produce a smooth edge where the patch abuts the existing pavement.
4. The thickness shall be adjusted so that a smooth uniform grade exists after rolling.
5. The edge of the patch shall be sealed by painting with a cutback asphalt or SS-1 emulsion and immediately covered with sand and heated.

3.3 ASPHALT CONCRETE PAVEMENT

- A. Full-width asphalt concrete pavement shall conform to the Technical Requirements of the standard specifications of the State Highway Department in which the project is located.
- B. After the subgrade has been properly prepared and compacted, a minimum of two inches of asphalt concrete pavement Class B shall be placed and compacted.
- C. If the existing pavement is more than two inches thick, asphalt concrete shall be of the same depth as existing pavement prior to construction.
- D. The edges of the existing asphalt pavements and castings shall be painted with hot asphalt cement or asphalt emulsion immediately before placing the asphalt patching material.
- E. The asphalt concrete pavement shall then be placed, leveled, and compacted to conform to established cross section and grade and to match adjacent paved surface.
- F. The edge of the new pavement shall be sealed by painting with a cutback asphalt or SS-1 emulsion and immediately covered with sand and heated.

3.4 CEMENT CONCRETE CURBS AND GUTTERS

- A. Constructed with air entrained concrete.
- B. Side forms shall rest throughout their length on firm ground and shall be full depth of the curb. They shall be either metal of suitable gauge for the work or surfaced "construction" grade lumber not less than two inches (commercial) in thickness. Forms shall be cleaned and well oiled prior to use. Forms used more than one time shall be cleaned thoroughly and any forms which have become worn, splintered, or warped shall not be used again. Forms shall be adequately supported to prevent deflection or movement.
- C. The foundation shall be watered thoroughly before the concrete is placed.
- D. Concrete shall be well tamped and spaded or vibrated in the forms.
- E. Exposed surfaces shall be finished full width with a trowel and edger. Remove forms of all roadway face of curbs within 24 hours or placement of concrete and treat with a float finish. The top and face of the curb shall receive a light brush finish and the top of the gutter shall receive a broom finish.
- F. Joints shall be spaced to match joints in the abutting pavement. If the abutting pavement is not jointed or the curb or gutter is not abutting pavement, joints in the curb and gutter shall be spaced at 15 foot intervals. These joints shall be 1/8 inch minimum thickness and constructed to a minimum depth of 1 inch by sawing or scoring with a tool which leaves the corners rounded and destroys aggregate interlock to a depth specified. Expansion joints, filled to full cross section with filler 1/4 inch thick shall be placed in the curb and gutter to match joints in the abutting pavement, at structures, curb returns and where shown in the plans.
- G. Cure for 72 hours by one of the methods specified in Section 03300.
- H. Curb and gutter may be constructed by the use of slip-form equipment provided the completed curb or gutter retains its shape, grade, and line. finishing, joints, and curing shall be as provided above.
- I. Top of the form shall not depart from grade more than 1/8 inch when checked with a 10 foot straight edge. Alignment shall not vary more than 1/4 inch in 10 feet.

3.5 PAVEMENT MARKINGS

- A. The Contractor shall provide and/or restore any and all pavement striping damaged during construction under this Contract including striping as shown on Dwg. No. G-03.

- B. Restoration shall be in accordance with the existing standards of Metro.
- C. Cost of restoration of pavement striping shall be incidental to pavement restoration.

3.6 ADJUSTING MANHOLES TO GRADE

- A. The Contractor shall adjust manhole castings to final grade by adding brick and/or mortar under the casting and patching with asphalt concrete. Paving adjusting rings will not be allowed.
- B. The Contractor shall exercise extreme care in preventing foreign material from entering the manhole.
- C. All manholes shall be adjusted to grade after the asphalt concrete surfacing has been placed. Disturbed area around cover shall be patched and sealed to the satisfaction Metro.
- D. The Contractor shall take care not to extend the manholes above finished grade.

3.7 ADJUSTING MONUMENT CASES AND VALVES BOXES TO GRADE

- A. Monument cases and/or valve boxes shall be adjusted to final grade and patched with asphalt concrete.
- B. Adjustment shall be made after the resurfacing.
- C. Patching around monument cases and/or valve boxes shall be done to the satisfaction of Metro.
- D. Valve boxes shall be adjusted to the satisfaction of the utility having jurisdiction.
- E. The Contractor shall take care not to extend the monument cases and/or valve boxes above the finished grade.

* * * END OF SECTION * * *

SECTION 02605

MANHOLES AND CLEANOUTS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Subsurface Investigation: Section 02010
- B. Dewatering: Section 02140
- C. Shoring: Section 02150
- D. Excavating, Backfilling and Compacting for Utilities: Section 02222
- E. Storm Drainage: Section 02720
- F. Sanitary Sewer: Section 02731

1.2 QUALITY ASSURANCE

- A. Testing By Manufacturer:
 - 1. Manufacturer shall test all material as required by these Specifications and the Standards referenced.
 - 2. Manufacturer shall submit to the Engineer two (2) copies of all test results which shall include a certification that materials to be delivered are represented by the samples tested and that such delivered materials meets or exceeds the specification requirements.
 - 3. No material shall be delivered until test results and certifications are in the hands of the Engineer.
 - 4. The Engineer shall have free access to all testing and records pertaining to materials to be delivered to the jobsite.
 - 5. The Engineer may elect to be present at any or all material testing operations.

2. PRODUCTS

2.1 PRECAST MANHOLES

- A. Precast concrete manholes shall conform to the requirements of ASTM C478 except as specifically modified herein.
- B. Joints between precast elements used for sanitary sewers shall be tongue and groove designed to accommodate a rubber gasket joint similar to pipe joints conforming to ASTM C443. Design of joints shall be approved by the Engineer before manufacture. Shop drawings shall be submitted for review. Variations in joint dimensions shall meet the gasket design requirements but shall in no case be more than the minimum requirement of ASTM C478.
- C. Joints between precast sections used for storm sewers may be rubber gasketed or cement mortar.
- D. Base sections shall be made with the base slab integral with the wall in such a manner to achieve a completely watertight structure. Design of base shall be in accordance with the following table for all manholes up to 25 feet deep using Grade 60 reinforcing steel.

<u>Manhole Inside Diameter</u>	<u>Minimum Base Thickness</u>	<u>Minimum Steel-Sq.In/LF Both Directions</u>	
		<u>Separate Base</u>	<u>Base Integral With Wall</u>
48"	6"	0.23	0.15
54"	8"	0.19	0.19
72"	8"	0.35	0.24
96"	12"	0.39	0.29

- E. Proportion of portland cement in concrete mixture shall be not less than 564 pounds per cubic yard of concrete.
- F. Openings to receive pipes shall be circular, and shall be sized to equal the outside diameter of the pipe to be inserted in the joint plus the manhole wall thickness.
- G. Resilient connectors conforming to ASTM C923 may be used at the Contractor's option.
- H. The manufacturer may produce each manhole riser and base in one section if approved by the Engineer.
- I. Cones with diameter at small end of 36 inches shall be not less than 24 inches in height. Cones with a diameter at the small end of 24 inches shall be not less than 17 inches in height.
- J. The openings in the top slab shall be eccentrically located so as to provide at least 6 inches minimum radial distance from the edge of the opening to the outer edge of the slab but not more than 2.5 inch offset distance from the edge of the opening to the inside face of the standard section.
- K. Unless otherwise provided, steps shall be installed in each section so that sections placed together in any combination will provide a continuous vertical ladder.

2.2 BRICK OR CONCRETE MASONRY MANHOLES

- A. Concrete manhole block shall conform to ASTM C139, except that horizontal thickness shall be 6 inches measured radially, and blocks shall have semicircular mortar grooves approximately 1 inch radius at the ends.
- B. Concrete brick shall conform to ASTM C55, Grade N or S.
- C. Clay brick shall conform to ASTM C32, Grade MS or MM.
- D. Mortar for masonry manhole units shall be one part portland cement to not less than one part, nor more than two parts, plaster sand, mixed with the least amount of clean water necessary to provide a workable mortar.
- E. Mortar for plaster-coating masonry unit manholes shall be proportioned according to either of the two alternates: (1) one part portland cement and one part Type II masonry cement in plaster sand, or (2) one part portland cement and one-quarter part hydrated lime or lime putty in plaster sand. Plaster sand shall be measured in damp loose condition with not less than 2.25 and not more than 3 times the sum of volumes of cement and lime.

2.3 DROP MANHOLES

- A. Drop manholes shall be an inside drop or outside drop as specified and constructed in accordance with the Standard Details.
- B. One length of ductile iron pipe shall be provided outside the manhole.
- C. An outside drop manhole shall be fabricated with the drop outside the manhole section as shown on the drawings.
- D. An inside drop shall be fabricated with polyvinyl chloride pipe as detailed on the drawings.

2.4 MANHOLE STEPS

- A. Conform to applicable requirements of ASTM C478 and as shown on the Standard Details.
- B. Conform to OSHA.
- C. Designed so that foot cannot slide off the ends.
- D. Spaced at 12 inches.
- E. Project uniformly inside wall.
- F. Be deformed bar conforming to ASTM A615, intermediate or standard grade, hot bent and galvanized after bending. For bending, the temperature shall be at least 1600° F. Galvanizing shall conform to ASTM A123.
- G. Design utilizing other materials or shapes that conform to the requirements of this specification may be used upon written approval of the Engineer.
- H. Step dimensions and pattern shall conform to the Standard Details.

- I. Ladders: Base sections of precast manholes may be provided with a ladder made of aluminum or steel galvanized after fabrication, as shown on the Standard Details. Ladder shall be adjusted so that it is in line with manhole steps above and extends out the same distance from the wall as the steps above.

2.5 CAST METAL FRAMES AND COVERS

- A. Conform to the standard drawings.
- B. Conform to the requirements of ASTM A48, Class 30 for cast iron or ASTM A536, Grade 80-55-06 for ductile iron.
- C. Be free of porosity, shrink cavities, cold shuts, or cracks or any surface defects which would impair serviceability.
- D. Repair of defects by welding, or by the use of "smooth-on" or similar material will not be permitted.
- E. Manufacturer shall certify that the product conforms to the requirements of these specifications.
- F. The Owner shall have the right to require inspection and approval of all castings prior to painting.
- G. Machine finish the horizontal seating surface and inside vertical recessed face of the frame, and the horizontal seating surface and vertical outside edge of the cover to the following tolerances.
 - 1. Cover shall not rock when it is seated in any position in its frame.
 - 2. The edge of the upper surface of the cover be one-eighth (1/8) inch below the upper surface of the frame when cover is seated in any position in its frame.
 - 3. In those cases where such alignment is not obtained, the difference in level between the cover and the frame shall not exceed one-sixteenth (1/16) of an inch over a total of more than one-quarter (1/4) of the circumference.
 - 4. There shall be not more than 3/16 of an inch side play in any direction between the cover and the frame when any cover is placed in any position in its frame.
- H. All frames and covers shall be identified by the name or symbol of the manufacturer in a plainly visible location when the frame and cover is installed. In addition to the manufacturer's identification, when ductile iron is furnished, the material shall be identified by the notation "DUC". The manufacturer's identification and the material identification shall be adjacent to each other and shall be minimum 1/2-inch letters recessed to be flush with the adjacent surfaces.
- I. Cover shall have type of service indicated on cover with two inch raised letters such as water, sewer or drain.

2.6 CLEANOUT FRAMES AND COVERS

- A. Conform to requirements for manhole frame and cover.

3. EXECUTION

3.1 MANHOLE INSTALLATION

- A. Manholes shall be constructed of precast units, cast-in-place concrete or brick or concrete masonry.
- B. Foundations:
 - 1. Adequate foundations for all manhole structures shall be obtained by removal and replacement of unsuitable material with well graded granular material, or by tightening with coarse ballast rock, or by such other means as provided for foundation preparation of the connected sewers.
 - 2. Where water is encountered at the site, all cast-in-place base or monolithic structures shall be placed on a one-piece waterproof membrane to prevent any movement of water into the fresh concrete.
 - 3. Place base on a well-graded granular bedding course conforming to the requirements for sewer bedding, not less than 4 inches in thickness and extending either to the limits of the excavation or to a minimum of 12-inches outside the outside limits of the base section. In the latter case, the balance of the excavated area shall be filled with select material, well tamped to the level of the top of the bedding to positively prevent any lateral movement of the bedding when the weight of the manhole is placed upon it.

4. Bedding course shall be firmly tamped and made smooth and level to assure uniform contact and support of the precast elements.
- C. Precast Base Section:
 1. Place on the prepared bedding so as to be fully and uniformly supported in true alignment.
 2. Make sure that all entering pipes can be inserted on proper grade.
- D. Cast-in-place Bases:
 1. At least 6 inches in thickness.
 2. Extend at least 6 inches radially outside of the manhole wall.
 3. Concrete shall have minimum of 4000 psi 28-day compression strength as provided in Division 3.
 4. Place first precast section on the cast-in-place base structure before the base has taken initial set and adjust to true grade and alignment with all inlet pipes installed so as to form an integral, watertight unit or mortar the section into a suitable groove provided in the top of the cast-in-place base.
 5. The first section shall be uniformly supported by the base concrete, and shall not bear directly on any of the pipes.
- E. Precast Sections:
 1. Placed and aligned to provide vertical sides and vertical alignment of the ladder rungs.
 2. The completed manhole shall be true to dimensions, and watertight.
 3. Lift holes shall be thoroughly wetted and then be completely filled with mortar, smoothed and pointed both inside and out to ensure watertightness.
 4. Steel loops must be removed and be covered with mortar, smoothed and pointed.
- F. Pipe Connections:
 1. Provide flexible joint at a distance from the face of the manhole of not more than 1-1/2 times the nominal pipe diameter or 12 inches, whichever is greater, for all rigid pipes entering or leaving any manhole.
 2. Firmly compact bedding under pipe within the area of the manhole excavation.
 3. Openings through which pipes enter the structure are completely and firmly rammed full of mortar to ensure watertightness.
 4. Provide a watertight joint where flexible conduits pass through the manhole wall by utilizing a manhole entry coupling that is mortared into the wall. Pipe connection into entry coupling shall be sealed with a rubber ring.
- G. Channels:
 1. Constructed in field.
 2. Conform accurately to the sewer grade and bring together smoothly with well rounded junctions.
 3. Channel sides shall be carried up vertically to the crown elevation of the various pipes.
 4. Shelf between channels shall be constructed with concrete and smoothly finished and warped evenly with slopes to drain.
- H. Manhole Cover:
 1. Final elevation and tilt of cover shall conform to the restored street surface unless otherwise specified.
 2. Warping of surfacing to meet grade of castings will not be allowed.
 3. Provide not less than 4 inches or more than 16 inches of grade rings between the top of the cone or slab and the underside of the manhole casting ring for adjustment of the casting ring to street grade or ground surface.
- I. Backfill:
 1. Extend around manhole and at least one pipe length into each trench.
 2. Hand place and tamp with selected native material up to an elevation of six inches above the crown of all entering pipes.
- J. Poured in Place Manholes:
 1. Conform with the applicable requirements of Division 3 of these Specifications.
 2. Based on a design furnished by the Contractor and reviewed by the Engineer in accordance with Section 01340 of these Specifications.

3.2 CONNECTIONS TO EXISTING MANHOLES

- A. Excavate completely around the existing manhole to ensure against unbalanced loading on the manhole.
- B. Keep the manhole in operation at all times and take precautions necessary to prevent any debris or other materials from entering the sewer.
- C. Contractor may be required to install a tight pipeline bypass through the existing channel. If the connection is to a dead end manhole, the outlet shall be plugged and sealed with cement grout.
- D. The Contractor shall verify the existing manhole invert elevations prior to construction.
- E. Bring laterals into the existing manhole so that the crowns of the two incoming pipes are at the same elevation unless otherwise specified.
- F. Reshape the existing base to provide a channel equivalent to that specified for a new manhole.
- G. The Contractor shall be responsible for repairing all damage to the manholes resulting from his operations.

3.3 CLEANOUTS

- A. Sewer cleanouts shall be constructed as shown on the standard plan.
- B. All materials incorporated into the cleanout structure shall meet the requirements of the various applicable sections of these specifications.
- C. Pipe joints shall be the type specified for sewer pipe used.
- D. The trench excavation shall be made in such a manner as to provide an undisturbed base upon which the pipe shall be placed.
- E. Bedding around and under the pipe shall be tamped.

* * * END OF SECTION * * *

SECTION 02610

PIPE AND FITTINGS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Excavating, Backfilling and Compacting for Utilities: Section 02222
- B. Water Lines: Section 02660
- C. Storm Drainage: Section 02720
- D. Sanitary Sewers: Section 02731

1.2 QUALITY ASSURANCE

- A. Testing by Manufacturer:
 - 1. Manufacturer shall test all materials as required by these Specifications and the standards referenced.
 - 2. Manufacturer shall submit to the Engineer two (2) copies of all test results which shall include a certification that materials to be delivered are represented by the samples tested and that such delivered materials meet or exceed the specification requirements.
 - 3. No material shall be delivered until test results and certifications are in the hands of the Engineer.
 - 4. Engineer shall have free access to all testing and records pertaining to material to be delivered to the job site.
 - 5. The Engineer may elect to be present at any or all material testing operations.
- B. Joint tests are intended for qualification of joint design and shall be considered to be a qualification test to establish the adequacy of the manufacturer's joint design. The manufacturer shall certify that tests have been performed within the last year with pipes equivalent in size and design and that they have passed the test enumerated in the specifications. Tests may be waived for pipes of different strength class if joint design is the same as the pipe tested.

2. PRODUCT

2.1 DUCTILE IRON PIPE

- A. Conform to AWWA C151 (ANSI A21.51) and shall be Class 50, unless otherwise specified.
- B. Joints shall be mechanical joint or push-on joint and shall conform to AWWA C111 (ANSI A21.11).
- C. Pipe and fittings shall have a cement mortar lining conforming to AWWA C104 (ANSI A21.4).

2.2 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE (4 INCHES AND OVER)

- A. Conform to AWWA C900.
- B. Outside diameter equal to ductile iron pipe and with gasket bell ends.
- C. Minimum wall thickness shall be equal to or greater than dimension ratio (DR) of 18 (150 psi) unless otherwise specified.
- D. Joints shall conform to ASTM D3139 using a restrained rubber gasket conforming to ASTM F477.
- E. All PVC water pipe shall be considered flexible conduit.

2.3 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE (UNDER 4 INCHES)

- A. Conform to ASTM D2241.
- B. Pipe material shall be PVC 1120, PVC 1220 or PVC 2120.

- C. Minimum wall thickness shall be equal or greater than a standard dimension ratio (SDR) of 21 unless otherwise specified.
- D. Pipe shall bear the National Sanitation Foundation Seal for use to transport potable water.
- E. Joints shall conform to ASTM D3139 using a restrained rubber gasket conforming to ASTM F477.

2.4 DUCTILE IRON AND GRAY IRON FITTINGS

- A. Use for ductile iron or PVC pipe.
- B. Conform to AWWA C110 (ANSI A21.10) or AWWA C153 (ANSI 1921.53) as indicated.
- C. Joint shall conform to AWWA C111 (ANSI A21.11).
- D. Dimensions of fittings and design of bell may be modified to conform with the pipe being used.
- E. Cement mortar lining conforming to AWWA C104 (ANSI A21.4).
- F. Gaskets for flat faced or raised faced flanges shall be 1/8-inch thick neoprene having a durometer of 60 plus or minus 5.
- G. Gaskets for flanges having a recess machined to receive an "O" ring shall be neoprene and shall have the dimensions and durometer as recommended for the particular service application by the flange manufacturer.
- H. Provide type, material and identification mark for bolts and nuts.

2.5 STEEL PIPE (4 INCHES AND SMALLER)

- A. Conform to ASTM A120.
- B. Schedule 40, unless otherwise specified.
- C. Fittings shall be malleable iron screw type conforming to ANSI B16.3.
- D. Pipe and fittings shall be hot dipped, galvanized inside and out.

2.6 STEEL PIPE (OVER 4 INCHES)

- A. Conform to AWWA C200.
- B. Design Pressure 150 psi.
- C. Design stress 50% of yield strength.
- D. All pipe and fittings shall receive coal tar protective treatment in accordance with AWWA C203.
- E. Field couplings shall be compression style coupling.
- F. When flanges are required they shall conform to AWWA C207.
- G. All couplings shall be coated the same as pipe.

2.7 FLEXIBLE COUPLINGS

- A. Use for connection between plain end pipe of same or different material.
- B. Sleeve: Gray iron ASTM A126 Class B or ductile iron ASTM A536. Ends have a smooth inside taper for uniform gasket seating.
- C. Followers: Ductile iron ASTM A536.
- D. Gaskets: Grade 30 specially compounded rubber of all new materials.
- E. Bolts and nuts: High strength low alloy steel with heavy, semi-finished hexagon nuts to AWWA C111 (ANSI-A21.11).

2.8 WATER SERVICE PIPE

- A. Copper Tubing:
 - 1. Copper tubing shall conform to the requirements of ASTM B88, Type K, annealed.
 - 2. The tubing shall be coupled using flare-type compression fittings, conforming to the requirements of AWWA C800, minimum 150 psi working pressure.

- B. Polyethylene Pipe:
 - 1. Polyethylene Pipe to be used for water service lines 2 inches in size and smaller shall conform to the requirements of AWWA C901 Class 160 psi manufactured with PE 3406 material.
 - 2. Bear the seal of the National Sanitation Foundation for potable water pipe.
 - 3. Joints shall be made in accordance with the manufacturer's recommendations. Solvent welded pipe joints will not be permitted.
- C. Polybutylene Pipe:
 - 1. Polybutylene pipe to be used for water service lines 2 inches in size and smaller shall conform to the requirements of AWWA C902 Class 160 psi.
 - 2. Bear the seal of the National Sanitation Foundation for potable water pipe.
 - 3. Joints shall be made in accordance with the manufacturer's recommendations. Solvent welded pipe joints will not be permitted.
- D. Compression Couplings:
 - 1. Compression couplings for use in connecting plain end water service pipes shall be applicable for the type of pipe being coupled.
 - 2. Compression couplings shall have armored gaskets when similar metal pipes are being joined.
- E. Insulating Couplings:
 - 1. Insulating couplings shall be required at any point of connection of two dissimilar metallic pipes (i.e., copper to galvanized iron or steel).

2.9 WATER SERVICE MATERIALS

- A. Saddles:
 - 1. Shall be ductile iron, bronze, or stainless steel, double straps or band-type with standard tapping to match service requirement.
- B. Corporation Stops:
 - 1. Conform to AWWA C800.
 - 2. Corporation stops for use with saddles shall be of bronze alloy with inlet I.P. standard thread and outlet thread compatible with connection piping, with no special adapters.
 - 3. Corporation stops for direct tapping shall be bronze alloy with AWWA tapered thread inlet and outlet thread compatible with connecting pipe without special adapters.
- C. Meter Stops:
 - 1. Meter stops shall be angle pattern with lock wings.

2.10 CONCRETE PIPE, NONREINFORCED

- A. Concrete pipe under 12 inches in diameter shall be nonreinforced concrete pipe conforming to ASTM C14, Class 2, except as otherwise provided.
- B. Joints shall conform to ASTM C443.
- C. A differential load test shall be performed on the joints in addition to the joint tests specified in ASTM C443. The test section for the differential load test shall be supported on blocks so that one of the pipes is suspended freely between adjacent pipe bearing only on the joints. A force of 150 pounds per inch of diameter shall be applied over an arc of not less than 120° along a longitudinal distance of 12 inches immediately adjacent to one of the couplings. There shall be no visible leakage when the joint is subjected to 10 psi of hydrostatic pressure for a minimum of 10 minutes.
- D. Proportion of Portland cement in concrete mixture shall be not less than 564 pounds per cubic yard of concrete.

2.11 CONCRETE PIPE, REINFORCED

- A. Concrete pipe 12 inches and over in diameter shall be reinforced concrete pipe conforming to ASTM C76, Class IV, except as otherwise provided.

- B. Joints shall conform to ASTM C443.
- C. Non-reinforced concrete pipe conforming to ASTM C14 may be substituted for reinforced concrete pipe provided that the three-edge strength is equal to or greater than the ultimate specified for ASTM C76 pipe.
- D. Basis of acceptance of pipe shall be the three edge bearing tests for load to produce 0.01 inch crack and the ultimate strength material tests outlined in ASTM C76 and by visual inspection.
- E. A differential load test shall be performed on the joints of all pipe 24 inches and less in diameter in addition to the joint tests specified in ASTM C443. The test section for the differential load test shall be supported on blocks so that one of the pipes is suspended freely between adjacent pipe bearing only on the joints. A force of 240 pounds per inch of diameter shall be applied over an arc of not less than 120° along a longitudinal distance of 12 inches immediately adjacent to one of the couplings. There shall be no visible leakage when the joint is subjected to 10 psi of hydrostatic pressure for a minimum of 10 minutes.
- F. Proportion of Portland cement in concrete mixture shall be not less than 564 pounds per cubic yard of concrete.

2.12 VITRIFIED-CLAY PIPE

- A. Conform to ASTM C700.
- B. Joints shall conform to ASTM C425.

2.13 POLYVINYL CHLORIDE (PVC) SEWER PIPE

- A. Conform to ASTM D3034, SDR 35, or ASTM F789.
- B. Joints shall conform to ASTM D3212 using a restrained rubber gasket conforming to ASTM F477.
- C. Fittings shall be injection molded tees or factory solvent welded saddle tees. Saddles fastened to pipe with external bands are not acceptable on any new system, unless specifically approved by the Engineer.
- D. All PVC sewer pipe shall be considered flexible conduit.
- E. Maximum size - 12 inches.

2.14 TEE FITTINGS FOR SEWERS

- A. Unless otherwise specified, all tee connections shall be 6 inches inside diameter and shall be factory made.
- B. All fittings shall be the same material as the pipe, unless otherwise specified. Cast iron fittings may be used for ductile iron pipe.
- C. Fittings shall have sufficient strength to withstand handling and load stresses normally encountered.
- D. All fittings shall be sealed with plugs of same material as the pipe and gasketed with the same gasket material as the pipe joint.

2.15 GALVANIZED CORRUGATED STEEL PIPE

- A. Conform to the requirements of AASHTO Designation M36, 16 gage unless otherwise provided.
- B. Coated uniformly inside and out with asphalt coating to meet the requirements of AASHTO Designation M190.
- C. Coupling band shall meet the requirements of AASHTO M36 and wide enough to cover at least two annular corrugations. Gasket shall be provided.
- D. When specified, galvanized steel end sections shall be flared, beveled shop-assembled units to serve as structural, hydraulic and aesthetic end treatment to corrugated steel culverts by threaded rods, by riveting or bolting per manufacturer's standard procedure. End sections shall have a turned down lip or toe plate at the wide end to act as a cut-off. The material for the end section shall be galvanized steel meeting the requirements of AASHTO M36 or same gage as pipe.

3. EXECUTION

3.1 INSTALLATION

- A. Install pipe in accordance with specification section for pipeline being installed.

* * * END OF SECTION * * *

SECTION 02640

VALVES

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Excavating, Backfilling and Compacting for Utilities: Section 02222
- B. Pipe and Fittings: Section 02610
- C. Water Lines: Section 02660

1.2 QUALITY ASSURANCE

- A. Testing by Manufacturer:
 - 1. Manufacturer shall test all materials as required by these Specifications and the standards referenced.
 - 2. Manufacturer shall submit to the Engineer two (2) copies of all test results which shall include a certification that materials to be delivered are represented by the samples tested and that such delivered materials meet or exceed the specification requirements.
 - 3. No materials shall be delivered until test results and certifications are in the hands of the Engineer.
 - 4. Engineer shall have free access to all testing and records pertaining to materials to be delivered to the job site.
 - 5. The Engineer may elect to be present at any or all materials testing operations.

2. PRODUCTS

2.1 GATE VALVES - UNDER 16 INCHES

- A. Type: (Iron body and bronze trim)
 - 1. Solid wedge for vertical pipe runs.
 - 2. Double disc, parallel seat for horizontal pipe runs.
- B. Rating: 200 psi WOG.
- C. AWWA C500.
- D. Ends: Flanged, grooved, push-on, bell, mechanical joint.
- E. Stem: Non-rising unless otherwise specified.
- F. Stem Seals: Neoprene o-rings.
- G. Manual Operators: Handwheel type. Counterclockwise direction of rotation to open, with operator marked to show direction to open.
- H. Equipped with 2-inch standard operating nut.

2.2 GATE VALVES-16-INCHES AND LARGER

- A. Conform to applicable provisions of Article 2.1 for gate valves under 16 inches and the following additional requirements.
- B. Arranged for operation in the horizontal position.
- C. Equipped with bronze tracks fastened into a groove or slot within the valve body casting, together with bronze rollers, shafts, bushings and scrapers.
- D. Gears shall be cut tooth steel gears, housed in heavy cast iron extended type grease cases.
- E. Equipped with bypass of the size adopted as standard in the AWWA specification.
- F. Provide three certified copies of performance tests, as specified in Section 5 of AWWA C500 to the Engineer for review.

2.3 CHECK VALVES (SWING CHECK VALVES)

- A. Type: Full opening with outside lever with adjustable weights.
- B. Size: 3-inch and larger.
- C. AWWA C508.
- D. Body and Trim: Iron body, bronze mounted.
- E. Ends: Flanged.
- F. Disc Facing: Bronze.
- G. Hinge Pins: Stainless steel.
- H. Outside Lever Position: Right hand side when facing the valve inlet.
- I. Lever Seal: 3-inch through 12-inch valves; hinge pin extended through outside.
- J. Lubricated bronze bushing and o-ring seals.
- K. Lubrication: Grease fittings for outside lubrication of lever seals.
- L. Valve Position: In all but potable water lines, check valves must be installed only in horizontal runs.

2.4 DOUBLE DETECTOR CHECK VALVE

- A. Design:
 - 1. Specialized double check valve assembly which includes two internally spring loaded check valves with cast iron bodies and bronze internal parts, two gate valves, and four test cocks. Function is to prevent and detect leakage or unauthorized use of fire protection water. Check valves prevent backflow due to backpressure or backsiphonage from the fire protection line.
 - 2. Check valves are of counterbalanced valve construction to ensure accurate bypass meter registration by locking the valves in closed position until opened at predetermined pressure loss. When pressure loss through the bypass meter and fittings approaches 4 psi, the mainline lever check valve shall automatically open.
- B. Mainline Lever Check Valves:
 - 1. Rating: 150 psi maximum working pressure.
 - 2. Body: Galvanized cast iron with bronze internal parts.
 - 3. Ends: Flanged, Class 125.
 - 4. Valve Weight, Swing Arm and Valve Seats: Bronze.
 - 5. Discs: Neoprene, meeting UL chemical and physical specifications.
 - 6. Bushings: Bronze and hard rubber.
 - 7. Servicing: All parts must be removable or replaceable without removal of the unit from the line.
- C. Bypass Section:
 - 1. General: The bypass section includes a disc meter, an inlet gate valve, an outlet swing check valve, and two unions as detailed.
 - 2. Disc Meter: Secure from water purveyor.
 - 3. Remote Reader: Per City of Portland requirements. Remote reader shall be attached to fire department connection.

2.5 FIRE DEPARTMENT CONNECTION

- A. Fittings per NFPA 13.
- B. Assembly must be approved by state and local authorities.

2.6 BUTTERFLY VALVES

- A. Conform to AWWA C504, Class 150B.
- B. Suitable for direct burial.
- C. Mechanical joint or push on joint suitable for installation with type and class of pipe being used or flanged where detailed.

- D. Standard O-ring shaft seal.
- E. Operator shall be traveling nut or worm gear type, sealed, gasketed and permanently lubricated for underground service.
- F. Operator shall be designed to withstand all anticipated operating torques and designed to resist submergence in ground water.
- G. Equipped with a standard two-inch operating nut.
- H. Open counter clockwise.

2.7 STEM EXTENSION

- A. Provide stem extension with standard operating nut and self-centering rockplate support for all valves with operating nut more than 4 feet below grade to raise operating nut to within 36 inches of the ground surface.

2.8 VALVE BOXES

- A. Provide for all buried valves.
- B. Valve boxes and tops shall be cast iron 2 piece slip joint type.
- C. Lengths suitable for the particular project or as specified.
- D. Base corresponding to size of valve.
- E. Cover shall have the word "Water" cast on it.

2.9 VALVE MARKER POST

- A. Shall have a 4-inch minimum square section and a minimum length of 42 inches, with beveled edges.
- B. Contain at least one No. 3 bar reinforcing steel.
- C. Paint exposed portion of the marker posts with two (2) coats of concrete paint in a color selected by the Owner.
- D. Stencil the size of the valve and the distance in feet and inches to the valve on the face of the post, using black paint and a stencil which will produce letters 2 inches high.

2.10 COMBINATION AIR RELEASE VALVE

- A. Designed to operate with potable water under pressure to allow entrapped air to escape from the pipeline.
- B. Body and cover: Cast iron conforming to ASTM A48, Class 30.
- C. Floats: Stainless steel conforming to ASTM A240 and designed to withstand 1,000 psi pressure.
- D. Seats: Buna N rubber.
- E. Internal Parts: Stainless steel or bronze.
- F. Designed to withstand 300 psi pressure with normal operating pressure under 100 psi.
- G. Manufactured by APCO or equivalent with following listed orifice sizes:

<u>Model No.</u>	<u>Size of Valve</u>	<u>Large Orifice</u>	<u>Small Orifice</u>
143C	1"	1"	5/64"
145C	2"	2"	3/32"
147C	3"	3"	3/32"

- H. Precast Concrete Vault:
 1. Vault shall be a precast concrete meter box or utility vault as indicated by detail.
 2. Vault shall conform to ASTM C913.
 3. Vault shall be designed for a 16,000 pound wheel load and 130 pounds per cubic feet earth load.
 4. Vault shall be as manufactured by Utility Vault Company or approved equal.

5. The bottom of the excavation for vaults shall be fine graded to a plane surface on firm undisturbed subgrade material.
6. Uniformly spread granular pipe bedding material to a depth of 4-inches over the bottom of the excavated area to provide a uniform bearing for the vault.
7. Install the vault and accessories in conformance with Drawings, Specifications and recommendations of the vault manufacturer unless otherwise instructed in writing by the Engineer.
8. Provide watertight seal on vault joints, pipeline and conduit penetrations through walls as detailed. Do not allow leakage into the vault.
9. Adjust the manhole ring and cover or access doors to match the finished surface grade.

2.11 TAPPING SLEEVE AND VALVE ASSEMBLY

- A. Furnished with flanged inlet end connections having a machined projection on the flanges to mate with a machined recess on the outlet flanges of the tapping sleeves and crosses.
- B. Outlet ends shall conform in dimensions to the AWWA Standards for hub or mechanical joint connections, except that the outside of the hub shall have a large flange for attaching a drilling machine.
- C. Seat opening of the valves shall be larger than normal size to permit full diameter cuts.
- D. Tapping sleeves shall be cast iron, stainless steel, epoxy-coated steel, or other approved materials.

2.12 PRESSURE REDUCING VALVES

- A. Pressure Reducing Valves for Water Service, 1-1/4 inch and Larger:
 1. Type: Hydraulically-operated, pilot-controlled diaphragm type globe valve.
 2. Service: Valve must maintain a constant downstream pressure regardless of varying inlet pressure.
 3. Rating: 175 psi unless otherwise noted.
 4. Body and Cover: Cast iron ASTM A48.
 5. Body and Main Valve Trim: Brass ASTM B21 and bronze ASTM B61.
 6. Pilot Control System: Cast brass ASTM B62 with 303 stainless steel trim.
 7. Single removable seat and resilient disc.
 8. Stem guarded at both ends by a bearing in valve cover and valve seat.
 9. No external packing glands or pistons to operate main valve or pilot valve.
 10. Provide valve position indicator.
 11. Ends: Screwed or flanged.
- B. Pressure Reducing Valves for Water Service, 1-inch diameter and under:
 1. Type: Hydraulically-operated, direct acting, spring loaded diaphragm type control regulator.
 2. Service: Valve must maintain a constant downstream pressure.
 3. Rating: 300 psi.
 4. Body and Cover: Brass ASTM B62.
 5. Seat: Stainless Steel 303.
 6. Rubber Parts: Buna N synthetic rubber.
 7. Ends: Screwed.

3. EXECUTION

3.1 GATE VALVE OR BUTTERFLY VALVE INSTALLATION

- A. Valves shall be accurately set at places designated on the drawings.
- B. Inspect each valve for defects.

- C. Adjust stuffing boxes to ensure watertightness without binding the stem.
- D. Set valve and valve box plumb.
- E. Set lower casting of valve box so that it is supported by a styrofoam collar not less than 2 inches in thickness.
- F. Tamp backfill around valve box to a minimum distance of 3 feet on all sides or to face of trench.
- G. Set valve box cover flush with surface.

3.2 INSTALLATION OF COMBINATION SEWAGE AIR AND VACUUM RELEASE ASSEMBLY

- A. Install in accordance with standard detail.
- B. Locate so that high point of sewage force main is vented.
- C. Adjust grade of force main so that valve assembly can be properly installed.
- D. Pipe shall slope upward from force main to valve assembly.
- E. Locate valve adjacent to property line unless otherwise indicated.

3.3 BLOCKING

- A. Provide blocking for valve not connected to fitting with bolted connection.

3.4 TESTING

- A. Test valves along with pipeline in which they are installed.

* * * END OF SECTION * * *

SECTION 02660

WATER LINES

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Subsurface Investigations: Section 02010
- B. Dewatering: Section 02140
- C. Shoring: Section 02150
- D. Excavating, Backfilling and Compacting for Utilities: Section 02222
- E. Pipe and Fittings: Section 02610
- F. Valves: Section 02640
- G. Existing Utilities/Facilities-Underground and Overhead: Section 02760

1.2 QUALITY ASSURANCE

- A. Testing Before Acceptance:
 - 1. The Engineer may require that the first section of pipe, not less than 1,000 feet in length, installed by each of the Contractor's crews, be tested in order to qualify the crew and/or the material.
 - 2. Pipelaying shall not be continued more than an additional 1,000 feet until the first section shall have been tested successfully.
- B. Final Acceptance:
 - 1. Prior to final inspection all pipelines shall be flushed and cleaned of all debris, disinfected and hydrostatically tested.
 - 2. Any corrections required shall be made at the expense of the Contractor and the line retested.

2. PRODUCTS

2.1 BEDDING MATERIALS

- A. Conform to Section 02222.

2.2 ALTERNATE PIPE MATERIALS

- A. Pipe used for water line construction may be either ductile iron, or polyvinyl chloride pressure pipe as specified in Section 02610 unless otherwise specified.
- B. Pipe for water services shall be as indicated on the detail for the utility and as specified in Section 02610.
- C. When ductile iron pipe is specified, no substitute is permitted.
- D. Steel pipe shall be used only where specifically called for on the drawings.

3. EXECUTION

3.1 BEDDING FOR RIGID PIPE

- A. Bedding for rigid pipe except ductile iron shall be as specified in Section 02222.
- B. Unless otherwise ordered, bedding for ductile iron may be native bedding material, free of stones.
- C. Bedding shall be carefully placed under the pipe and to a depth of at least six (6) inches over the top of the pipe.

- D. Shall be thoroughly rammed and tamped around the pipe with the proper tools, so as to provide firm and uniform support over the full length of all pipe, valves and fittings.
- E. Care shall be taken to prevent any damage to the pipe or its protective coating.

3.2 BEDDING FOR FLEXIBLE PIPE

- A. Material to be used for bedding for flexible pipe shall be sand/gravel material as specified in Section 02222.
- B. Bedding shall be placed in more than one lift. The first lift is to provide at least 4-inch thickness under any portion of the pipe and shall be placed before the pipe is installed, and shall be spread smoothly so that the pipe is uniformly supported along the barrel.
- C. Subsequent lifts of not more than 6-inch thickness shall be installed to 6 inches over the crown of the pipe and individually compacted to 90 percent of maximum density.

3.3 PIPE LAYING

- A. Pipe laying shall be done in accordance with the Specifications and instructions of the manufacturer of the kind of pipe used.
- B. Tools designed especially for installing each particular type and kind of pipe shall be used.
- C. Short Lengths and Field Cut Joints:
 - 1. Short lengths of pipe supplied by the manufacturer shall be used to provide the proper spacing of valves, tees or special fittings.
 - 2. Whenever it becomes necessary to cut a length of pipe, the cut shall be made by abrasive saw or by a special pipe cutter.
 - 3. Pipe ends shall be square with the longitudinal axis of the pipe and shall be reamed and otherwise smoothed so that good connections can be made.
 - 4. Threads shall be cleanly cut.
 - 5. Flaring of copper tubing shall be accurately and smoothly done.
 - 6. All operations for any connection shall be carefully done in accordance with the manufacturer's instructions.
- D. Laying of Pipe on Curves:
 - 1. Long radius curves, either horizontal or vertical, may be laid with standard pipe by deflections at the joints or by the use of shorter lengths of pipe.
 - 2. When pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected to the curved alignment.
 - 3. Where field conditions require deflection or curves not anticipated by the Plans, the Contractor shall use deflected joints, short lengths or special fittings as required. No additional payment will be made for laying pipe on curves as shown on the Plans or for field changes involving pipe deflected at the joints. When special fittings not shown on the Plans are required to meet field conditions, additional payment will be made for fittings.
 - 4. Maximum deflections at pipe joints and laying radius for various pipe lengths shall be as recommended by the pipe manufacturer.
- E. Contamination Prevention:
 - 1. Pipe, fittings and valves shall be carefully cleaned of all dirt and foreign material as they are placed.
 - 2. Open ends of pipe and fittings shall be plugged with a temporary watertight plug whenever work is stopped and/or when water in the trench threatens to enter the pipe.
 - 3. Groundwater shall be excluded from the pipe at all times.
 - 4. Particular care shall be exercised to guard against the entrance of sewage into the water line trench during the course of construction. All sewer lines, house side sewers or other subsurface drains should be located prior to excavation. Adequate provision shall be made for the flow of sewers, drains, and other water courses during construction.
- F. Condition of Pipe and Fittings:

1. The interior of all pipe, fittings and other accessories stockpiled on the project shall be kept free of dirt and other foreign matter at all times.
2. Each pipe, fitting or other accessory shall be carefully inspected and thoroughly cleaned of any dirt or foreign matter that might be present on the inside.
3. Cleaning shall be accomplished prior to lowering the pipe or other accessories into the trench.
4. Care shall be taken to keep materials internally clean after the pipe is placed in the trench.

3.4 BLOCKING AND BRACING

- A. For restrained joint pipe and fittings, use a mechanical joint with a MEGALUG follower gland as manufactured by the EBAA Iron Corporation, P.O. Box 857, Eastland, Texas 76448, or equal. Other acceptable restrained joints are the "Loc-Tyte" joint as manufactured by the Pacific States Cast Iron Pipe Company and the United States and Foundry Company, the "Locked Fastite" joint as manufactured by the American Cast Iron Company, the "TR Flex" joint as manufactured by the United States Pipe and Foundry Company, the "Snap-Lok" joint as manufactured by the Griffin Pipe Products Co., the "Field-Lok" joint as manufactured by the United States Pipe and Foundry Company. Set screw type retainer glands and joint harness systems will not be allowed. The maximum allowable deflection for all joints shall not exceed 80% of the maximum deflections recommended by the pipe manufacturer.
- B. Restrained Joints: Install restrained joints at all required locations and as shown on the plans, in accordance with the manufacturer's instructions for the type of restrained joint used.

3.5 CONNECTION TO EXISTING WATER MAINS

- A. Type of connections shall be as shown on the Drawings.
- B. Wet tap connections made without shutting off the existing line shall be made unless otherwise approved by the Owner.
- C. Connections to the existing water main shall not be made without first making the necessary arrangements with the Owner in advance.
- D. Work shall not be started until all of the materials, equipment and labor necessary to properly complete the work are assembled on the site.
- E. When work is once started on this connection, it shall proceed continuously without interruption and as rapidly as possible until completed. No shut-off of mains will be permitted overnight or over weekends or holidays.
- F. If the connection to the existing system involves turning off the water, the Contractor shall be responsible for notifying the residents affected by the shut-off. The Owner will advise which owners are to be notified.
- G. The Contractor may be required to perform the connection during times other than normal working hours.
- H. The Contractor shall not operate any valves on the existing system without specific permission of the Owner.
- I. The types of connections are varied and suggested pipe arrangements have been shown on the Plans. In general, they involve deflecting new pipe to match the existing pipe alignment and utilization of necessary fittings and new pipe. For the installation of these connections, the surfaced portion of the road shall not be penetrated unless the connecting point is directly under it. For connection by any other method, the Contractor shall furnish a detailed sketch for approval not less than one week prior to the expected construction.
- J. Interior of pipe and fittings used in making connections shall be swabbed or sprayed with a 1% solution of hypochlorite before they are installed.
- K. Exterior of main shall be cleaned and interior surface of tapping sleeve shall be dusted with calcium hypochlorite powder before tapping sleeve is installed.
- L. Installation of tapping tee shall be tested with air or water at a minimum pressure of 100 psi before cutting into the existing line.

- M. Any replacement pipe used for cutting into existing mains shall be same material and strength as existing pipe except that ductile iron may be substituted for other materials.

3.6 EXISTING SYSTEM MAINTENANCE

- A. The Contractor shall acquaint himself with all aspects of the existing system prior to starting construction on new mains. Pertinent information concerning existing system may be obtained from the Owner and from the Owner's records.
- B. Materials, fittings, pumps, equipment and qualified personnel must be available on the project at all times during construction, so that in the event of damage to or disruption of the existing water system service there will be immediate repair and restoration by the Contractor. Any unnecessary delay in repairs or service restoration due to Contractor's failure to adhere to these requirements shall be reason to immediately suspend any further new main installation until repairs are completed to the Owner's satisfaction.
- C. Existing water services shall be located by the Contractor prior to beginning work so that it may be properly protected and maintained in service during construction and during the changeover from the existing pipes to the pipe installed under this Contract.

3.7 SERVICE CONNECTIONS

- A. Service connections to water mains except ductile iron Class 52 or stronger shall be made, using saddles of the size and type suitable for use with the pipe being installed.
- B. Ductile iron Class 52 or stronger may be direct tapped with a corporation stop.
- C. The depth of trenching for service connection piping shall be such as to provide cover over the top of the pipe as shown on the service detail.
- D. Particular care shall be exercised to assure that the main is not damaged by installation of the service line.
- E. Service lines shall be cut using a tool or tools specifically designed to leave a smooth, even, and square end on the piping material to be cut. Cut ends shall be reamed to the full inside diameter of the pipe.
- F. Where shown in the plans, existing water service connections shall be reconnected to the new water mains installed under this Contract using the materials specified. The location of water service connections shall be verified in the field by the Contractor.
- G. Pipe materials used to extend or replace existing water service lines shall be in accordance with utilities standard details for new service.
- H. Insulating couplings shall be used at any connection between galvanized steel or iron pipe and copper pipe.
- I. Contractor shall arrange his work to minimize interruptions of water service to existing water customers.
- J. Line shall be installed, tested and disinfected up to point of connection prior to interruption of service.
- K. Customer shall be notified prior to shutting off service. Time that water is shut off shall be held to a minimum.

3.8 HYDROSTATIC PRESSURE TEST

- A. Water mains and appurtenances shall be tested in sections of convenient length under a hydrostatic pressure equal to 150 psi in excess of that under which they will operate.
- B. The pumps, gauges, plugs, saddles, corporations, miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be furnished and operated by the Contractor.
- C. Pipeline shall be backfilled sufficiently to prevent movement of pipe under pressure.
- D. Thrust blocks shall be in place and time allowed for the concrete to cure before testing.
- E. Procedure:
 - 1. The mains shall be filled with water and all air removed prior to starting the test.

2. The test shall be accomplished by pumping the main up to the required pressure; stop the pump for fifteen (15) minutes, and then pump the main up to the test pressure again.
3. The quantity of water required to restore the pressure shall be accurately determined by pumping through a positive displacement water meter with a sweep unit hand registering 1 gallon per revolution. The meter to be approved by the Engineer.
4. Acceptability of the test will be determined by two factors:
 - a. The quantity of water lost from the main shall not exceed the number of gallons per hour as determined by the formula:

$$L = \frac{ND(P)^{0.5}}{7,400}$$

in which

L = Allowable leakage, gallons/hour

N = No. of joints in the length of pipeline tested

D = Nominal diameter of the pipe in inches

P = Average test pressure during the leakage test, psig

- b. There shall not be an appreciable or abrupt loss in pressure during the fifteen (15) minute test period.
5. Gauges used in the test shall be accompanied with satisfactory certifications of accuracy from a laboratory approved by the Engineer.
- F. All tests shall be made with the hydrant gate valves open and pressure against the hydrant valve. After the test has been completed, each gate valve shall be tested by closing each in turn and relieving the pressure beyond. This test of the gate valve will be acceptable if there is no immediate loss of pressure on the gauge when the pressure comes against the valve being checked.
- G. Sections to be tested shall normally be limited to 1,500 feet.
- H. Prior to calling out the Engineer to witness the pressure test, the Contractor shall have all equipment set up completely ready for operation and shall have successfully performed the test to assure himself that the pipe is in a satisfactory condition.

3.9 DISINFECTION OF MAINS

- A. Main sterilization shall be accomplished by either of the following two methods at the Contractor's option. Method No. 1 is, however, recommended as the most expedient manner in which good or satisfactory results may be obtained with a single application of disinfectant. No other method of sterilization will be accepted by the Engineer, unless, prior to use, the Contractor obtains written approval from the Engineer.
- B. Method No. 1:
 1. A chlorine gas-water mixture, or dry chlorine gas may be applied by means of a chlorinator, or the gas may be fed directly from a chlorine cylinder equipped with the proper devices for regulating the flow, and the effective diffusion of gas within the pipe. Use of the chlorinator is preferred to direct feed from the cylinder.
 2. The preferable point of application for the chlorinating agent is at the beginning of the pipeline extension, or any valved section thereof, and through a corporation cock inserted in the horizontal axis of the pipe. The water injector for delivering the gas-water mixture into the pipe may be supplied from a tap on the pressure side of the gate valve controlling the flow into the pipeline extension. In a new system, application may be at the pumping station, elevated tank, stand pipe, or reservoir.
 3. Water from the existing distribution system, or other source of supply, shall be controlled to flow very slowly into the newly laid pipeline during application of the chlorine. The rate of chlorine gas-water mixture or dry gas feed shall be in such proportion that the rate of water

- entering the newly laid pipe will be at least 50 parts per million. A color comparator set will be used to determine chlorine residual.
4. Back pressure, causing a reversal of flow in the pipe being treated, shall be prevented.
 5. Treated water shall be retained in the pipe at least twenty-four (24) hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least ten (10) parts per million.
 6. In the process of chlorinating newly laid water pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent.
 7. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity, until the replacement water throughout its length, upon test, shows the absence of chlorine or in the event chlorine is normally used in the source of supply, until the tests shall show a residual not in excess of that carried by the system.
 8. Should the initial treatment prove ineffective, the chlorination procedures shall be repeated until tests show that the water sample from the newly laid pipe conforms to the requirements of this Specification.
- C. Method No. 2:
1. A mixture of either calcium or sodium hypochlorite or chlorinated lime of known chlorine content and water may be substituted as an alternative for liquid chlorine. (Typical commercial products of this type are HTH, Perchloron, Clor, Purex, etc.).
 2. Prepare a solution containing approximately 5% available chlorine by weight, in the case of HTH or Perchloron, at 70% available chlorine, use 6 pounds per 10 gallons of water. In the case of Clor, at 15% available chlorine, add 2 parts of water to 1 part of Clor. For other strength compounds, adjust dilutions accordingly.
 3. To prepare the chlorine compound-water mixture, first make a paste, and then thin to a slurry, to ensure getting all active ingredients into solution. The prepared solution shall be injected by means of a hypochlorinator, or hand or engine operated pump. Pumping into the newly laid pipe shall follow the conditions outlined under Method No. 1 for chlorine applications.
 4. Provisions for final flushing and bacteriological testing under this alternative should be the same as those described in Method No. 1 above.
- D. Before placing the lines in service, a satisfactory report or approval shall be received from the local or state health department on samples collected from representative points in the new system. Sterilized sample bottles and/or instructions shall be obtained by the Contractor from the laboratory where the samples will be tested.
- E. The Contractor shall collect all samples for the bacteriological tests under direct supervision of the Engineer. The Owner will pay for initial testing and the Contractor shall pay for any required retesting.
- F. Should the disinfectant treatment result in an unsatisfactory test, the procedure shall be repeated until satisfactory results are obtained.
- G. The environment to which the chlorinated water is to be discharged shall be inspected and if there is any question that the chlorinated discharge will cause damage to the environment, a reducing agent shall be applied to the water to be wasted to neutralize the chlorine residual remaining in the water. Disposal may be made to any available sanitary sewer provided the rate of disposal does not overload the sewer and the disposal is approved by the sewer agency having jurisdiction. Where necessary, federal, state, and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

3.10 FLUSHING THE MAINS

- A. Upon completion of pipe laying, chlorination and pressure testing, all dirt and foreign matter shall be removed by a thorough flushing through all hydrants, blowoffs or other approved means. Each section of newly laid pipe between valves or dead ends shall be flushed independently, and fire hydrants or other dead end appurtenances shall be flushed simultaneously with the parent line.

- B. The Contractor shall be responsible for rescheduling and organizing his work so as to use flushing water only during off-peak hours and in the most economical manner.
- C. No flushing shall be performed without the prior approval of the Owner.

3.11 PLACING IN OPERATION

- A. Upon completion of the work and before its final acceptance, the entire system shall be put in operation under normal pressure and operated at that pressure for a period of not less than ten (10) days by the Contractor.
- B. Any leaks or defects in the construction of the system that may develop, shall be repaired and the test continued until the system is practically watertight.
- C. No provision of this Section shall be construed as waiving any provision of the Contractor's guarantee.

* * * END OF SECTION * * *

SECTION 02720

STORM DRAINAGE

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Subsurface Investigation: Section 02010
- B. Dewatering: Section 02140
- C. Shoring: Section 02150
- D. Excavating, Backfilling and Compacting for Utilities: Section 02222
- E. Manholes and Cleanouts: Section 02605
- F. Pipe and Fittings: Section 02610
- G. Existing Utilities/Facilities-Underground and Overhead: Section 02760

1.2 QUALITY ASSURANCE

- A. Testing Before Acceptance: The Engineer may require that the first section of pipe, not less than 300 feet in length, installed by each of the Contractor's crews be tested in order to qualify the crew and/or the material. Pipelaying shall not be continued more than an additional 300 feet until the first section shall have been tested successfully.
- B. Final Acceptance: Prior to final inspection all pipelines shall be flushed and cleaned and all debris removed. Before sewer lines are accepted, all lines shall be tested for leakage as specified herein and inspected for line and grade by checking each section between manholes for alignment. A full circle of light shall be seen by looking through the pipe at a light held in the manhole at the opposite end of the section of sewer line being inspected. Any corrections required in line and grade shall be made at the expense of the Contractor.

2. PRODUCTS

2.1 BEDDING MATERIALS

- A. Refer to Section 02200.

2.2 GENERAL REQUIREMENTS FOR PIPE MATERIAL

- A. Pipe used for storm drainage construction may be of nonreinforced concrete, reinforced concrete, vitrified clay, polyvinyl chloride, ductile iron, galvanized corrugated steel pipe or corrugated aluminum alloy as specified in Section 02610 unless otherwise provided.
- B. All pipe shall have flexible watertight joints utilizing rubber gaskets.
- C. All pipe shall meet the minimum strength requirements as specified for concrete pipe unless otherwise provided. Any rigid pipe material substituted for the class specified shall have a minimum three edge strength equal to or greater than that of the concrete pipe class indicated. Flexible pipe of the class specified herein or on the drawings shall be considered equivalent in load supporting capacity to rigid pipe as indicated, unless otherwise specified.
- D. When ductile iron pipe is specified, no substitute is permitted.
- E. Design is based on smooth wall pipe with a Manning friction factor of $n = 0.013$. Contractor may substitute larger size corrugated pipe upon approval of the Engineer. Review will be based on using a friction factor of $n = 0.024$.

2.3 CATCH BASINS AND INLETS

- A. Catch basins and inlets may be constructed of precast units, concrete masonry units, or of concrete or clay brick, or cast-in-place concrete, all in accordance with the drawings.
- B. Precast units shall conform to the applicable requirements of ASTM C478.

2.4 FRAME AND GRATE FOR CATCH BASINS AND INLETS

- A. Conform to Standard Drawing.
- B. Casting for metal frame shall be cast steel, cast iron or ductile iron.
- C. Casting for grates shall be cast steel or ductile iron.
- D. Steel castings shall conform to the requirements of ASTM A27, Mild to Medium Strength Carbon-Steel Castings for General Application, Grade 70-36.
- E. Cast iron castings shall conform to the requirements of ASTM A48, Class 30.
- F. Ductile iron castings shall conform to the requirements of ASTM A536, Grade 80-55-06.
- G. Repair of defects by welding not permitted.
- H. Dimensions to have $\pm 1/16$ inch tolerance.
- I. Machine or grind supporting pads for solid non-rocking bearing in any of four possible positions in frame.
- J. Foundry name shall be embossed on top of grate. Lettering to be recessed $1/16$ inch.
- K. Material used for grate shall be designated by embossing "DI" (Duct Iron) or "CS" (Cast Steel) near Manufacturer's name.

3. EXECUTION

3.1 INSTALLATION

- A. Conform to applicable requirements of Section 02731 except as modified herein.

3.2 BEDDING FOR CORRUGATED METAL PIPE

- A. Material for sidefill around and to the crown elevation of corrugated metal pipe shall be selected and shall not contain stones larger than 3 inches in greatest dimension, frozen lumps, roots, or moisture in excess of that permitting through compaction.
- B. Material placed within the pipe compaction zone shall be brought up simultaneously on each side of the pipe to the top of the pipe and compacted to 90% density as defined by Section 02222.

3.3 TREATMENT OF ALUMINUM PIPE

- A. Whenever plain aluminum pipe is used where it will be in contact with concrete or concrete pipe, all aluminum surfaces in contact with the concrete or concrete pipe shall be painted with 2 coats of asphalt paint.

3.4 CATCH BASINS AND INLETS

- A. Construction details for catch basins and inlets shall follow all applicable provisions for construction of manholes.
- B. Backfill around catch basins shall be placed around the catch basins and compacted in successive layers six (6) inches in thickness and up to six (6) inches over the crown of the highest pipe connected to the catch basin.
- C. The inlet frame may be either cast into a concrete collar or set flange down on concrete adjustment blocks and mortared.
- D. Inlet frame shall not be grouted to final grade until the final elevation of the pavement, gutter, ditch or sidewalk in which it is to be placed has been established.

- E. Location of catch basins will be staked by the Engineer.
- F. All openings in the walls of catch basins constructed with precast sections for the insertion of pipe connections and outlet trap castings shall, after pipe or castings have been placed to their final position, be grouted tightly in place to present an inside and outside surface conforming to the Standard Details.
- G. The spigot end of the pipe shall be cut square with the last point of contact with the inside wall surface.

* * * END OF SECTION * * *

SECTION 02731

SANITARY SEWERS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Subsurface Investigations: Section 02010
- B. Dewatering: Section 02140
- C. Shoring: Section 02150
- D. Excavating, Backfilling and Compacting for Utilities: Section 02222
- E. Manholes and Cleanouts: Section 02605
- F. Pipe and Fittings: Section 02610
- G. Sewer Force Mains: Section 02732
- H. Existing Utilities/Facilities-Underground and Overhead: Section 02760

1.2 QUALITY ASSURANCE

- A. Testing Before Acceptance:
 - 1. The Engineer may require that the first section of pipe, not less than 300 feet in length, installed by each of the Contractor's crews be tested in order to qualify the crew and/or the materials.
 - 2. Pipelaying shall not be continued more than an additional 300 feet until the first section shall have been tested successfully.
- B. Final Acceptance:
 - 1. Prior to final inspection all pipelines shall be flushed and cleaned and all debris removed.
 - 2. Before sewer lines are accepted, all lines shall be tested as specified herein and inspected for line and grade by checking each section between manholes for alignment. A full circle of light shall be seen by looking through the pipe at a light held in the manhole at the opposite end of the section of sewer line being inspected.
 - 3. All lines shall be tested for leakage.
 - 4. Deflection test shall be performed on all flexible pipe.
 - 5. Owner may elect to perform a TV inspection.
 - 6. Any corrections required shall be made at the expense of the Contractor and the line retested.

1.3 PROTECTION OF LIVE SEWERS

- A. All existing live sewers including septic tanks and drain fields shall remain in service at all times. Adequate provision shall be made for disposal of existing sewage flow if any existing sewers are damaged.
- B. Any damage to the Owner's existing system shall be repaired to a condition equal to or better than that existing prior to the damage at no cost to the Owner.
- C. The existing system is discharged through some sewers with flat grades and in some cases through lift stations. All water accumulating during construction shall be removed from the new sewers and shall not be permitted to enter the existing system. The Contractor will be required to flush out the existing lines and/or repair lift stations or other facilities if gravel, rocks or other debris are permitted to enter the existing lines.
- D. The physical connection to an existing manhole or sewer line shall not be made until so authorized by the Owner. This authorization will not be given until all upstream lines have been completely cleaned, all debris removed, and where applicable, a pipe temporarily placed in the existing channel and sealed.

1.4 USE OF SEWERS PRIOR TO COMPLETION

- A. The Owner hereby reserves the right to make use of any portion of the work prior to completion of the entire Contract without invalidating the Contract and without constituting acceptance of any of the work.

2. PRODUCTS

2.1 BEDDING MATERIALS

- A. Refer to Section 02222.

2.2 GENERAL REQUIREMENTS FOR PIPE MATERIAL

- A. Pipe used for sewer construction may be nonreinforced concrete, reinforced concrete, vitrified clay, polyvinyl chloride (PVC) or ductile iron as specified in Section 02610 unless otherwise provided.
- B. All pipe shall have flexible watertight joints utilizing rubber gaskets.
- C. All pipe shall meet the minimum strength requirements as specified for concrete pipe unless otherwise provided. Any rigid pipe material substituted for the class specified shall have a minimum three edge strength equal to or greater than that of the concrete pipe class indicated. Flexible pipe of the class specified herein or on the drawings shall be considered equivalent in load supporting capacity to rigid pipe as indicated, unless otherwise specified.
- D. When ductile iron pipe is specified, no substitute is permitted.

3. EXECUTION

3.1 SURVEY LINE AND GRADE

- A. Survey line and grade-control hubs will be as in Section 01050.
- B. The Contractor shall transfer line and grade and control his work.
- C. In the case the referenced methods are impractical, the Contractor may control his line and grade by the use of approved surveying instruments operated by qualified personnel.
- D. The Contractor shall constantly check line and grade of the pipe and in the event they do not meet specified limits, the work shall be immediately stopped, the Engineer notified, and the cause remedied before proceeding with the work.

3.2 BEDDING

- A. Proper preparation of foundation, placement of foundation material where required, and placement of bedding material shall precede the installation of all sewer pipe. This shall include the necessary preparation of the native trench bottom and/or the top of the foundation material as well as placement and compaction of required bedding material to a uniform grade. Backfill material around the pipe will be placed in a manner to meet requirements specified herein.
- B. If no bedding class is specified for rigid pipe, Class B bedding shall be provided.
- C. Class F bedding shall be provided for all flexible pipe.
- D. The pipe bedding shall be placed so that the entire length of the pipe will have full bearing on the bedding. No blocking of any kind shall be used to adjust the pipe to grade except when used with embedment concrete. Bell holes shall be dug to assure uniform support along the pipe barrel.
- E. It may be necessary to change bedding classifications and the limits thereof during the progress of the construction, consistent with the requirements outlined under the definitions and requirements of the various classifications contained herein.
- F. Where unauthorized excavation has been made below the established grade, the Contractor shall provide, place and compact suitable bedding material to the proper grade elevation at his own expense.

G. Classification of Bedding:

1. Class A (Special Concrete Bedding) shall consist of a pipe cradle constructed of portland cement concrete containing not less than four (4) sacks of cement per yard. Maximum aggregate size shall be 1/2 inches. Maximum slump shall be 4 inches. The Contractor shall protect pipe against flotation during the pouring of the concrete. The bottom of the trench shall be fully compacted before placement of pipe or cradle. Cradle construction shall conform to the Standard Detail.
2. Class B (Normal Gravel Bedding) shall consist of the leveling of the bottom of the trench and/or the top of the foundation material at the appropriate elevation, and the furnishing and placing of bedding materials under the pipe and along the sides of the pipe. Minimum thickness of the layer of bedding material required under any portion of the pipe shall be four inches for all pipe sizes of 27 inches diameter and smaller, and six inches for all pipe sizes of 30 inches diameter and larger. Bedding shall extend up to the spring-line of rigid pipe. Bedding material shall be carefully placed and firmly compacted to provide a firm, uniform cradle for the pipe.
3. Class C (Shallow Gravel Bedding) shall meet the requirements outlined for Class B bedding except that bedding material need be placed only to the lower quadrant of the pipe. This type of bedding will be used only where specifically designated on the Plans and only for shallow pipelines.
4. Class D (Native Bedding) shall consist of carefully excavating the trench to proper grade and placing select native material around the pipe. Native bedding, as described, shall be considered as incidental to the construction and all costs thereof are included in the unit contract price of the Contract. Native bedding shall be used only where specifically called for or specifically authorized by the Engineer.
5. Class F bedding shall be placed in more than one lift. The first lift to provide at least 4-inch thickness under any portion of the pipe shall be placed before the pipe is installed and shall be spread smoothly so that the pipe is uniformly supported along the barrel. Subsequent lifts of not more than 6-inch thickness shall be placed to 6 inches over the crown on the pipe and individually compacted to 90% of maximum density. Material shall be pipe bedding material described in Section 02222.

3.3 PIPE LAYING

- A. Laying of sewer pipe shall be accomplished to line and grade in the trench only after it has been dewatered and the foundation and/or bedding has been prepared.
- B. Mud, silt, gravel and other foreign material shall be kept out of the pipe and off the jointing surfaces.
- C. Pipe laid shall be retained in position by mechanical means or otherwise, as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe in place. Wherever moveable shoring (steel box) is used in the ditch, pipe shall be restrained by use of a winch mounted in the downstream manhole and a line of sufficient strength threaded through the pipe and set tightly before each move. Any indication that joints are not being adequately held shall be sufficient reason to require this or other equivalent method of restraint, whether or not moveable shoring is being used.
- D. Variance from established line and grade shall not be greater than 1/32 of an inch per inch of pipe diameter, not to exceed 1/2 inch provided that such variation does not result in a level or reverse sloping invert; provided also, that variation in the invert elevation between adjoining ends of pipe, due to non- concentricity of joining surface and pipe interior surfaces, does not exceed 1/64 inch per inch of pipe diameter, 1/2 inch maximum.
- E. The sewer pipe shall be laid upgrade from point of connection on the existing sewer or from a designated starting point. The sewer pipe shall be installed with the bell end forward or upgrade.
- F. When pipe laying is not in progress the forward end of the pipe shall be kept tightly closed with a temporary plug.
- G. As the pipe is installed, it shall be backfilled with the specified bedding material and selected native material up to an elevation 6 inches above the pipe crown, taking care that the backfill is in contact

- with the entire periphery of the pipe. The backfill shall be so carefully placed and firmly compacted that the subsequent backfilling operations will not disturb the pipe in any way.
- H. Pipe branches, stubs or other open ends that are not to be connected immediately shall be plugged with approved material consistent with these Specifications and secured in place.
 - I. The markings on reinforced concrete pipe indicating the minor axis of the elliptical reinforcement shall be placed in a vertical plane (top of bottom) when the pipe is laid.
 - J. Install concrete anchors on sewers laid on slopes of 20% or greater in accordance with Standard Detail.

3.4 PIPE JOINTING

- A. All extensions, additions and revisions of the sewer system, unless otherwise specified, shall be made with sewer pipe jointed by means of a flexible gasket which shall be fabricated and installed in accordance with these Specifications.
- B. Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing the gasket and knocking it out of position, or loading it with dirt or other foreign material. Any gaskets so disturbed shall be removed and replaced, cleaned and relubricated if required before the jointing is attempted.
- C. Care shall be taken to properly align the pipe before joints are entirely forced home. During insertion of the tongue or spigot, the pipe shall be partially supported by hand, sling or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.
- D. Sufficient pressure shall be applied in making the joint to assure that it is home, as described in the installation instructions provided by the pipe manufacturer. Sufficient restraint shall be applied to the line to assure that joints once home are held so, until fill material under and alongside the pipe has been sufficiently compacted.
- E. At the end of the work day, the last pipe laid shall be blocked to prevent creep during "down time."
- F. Pipe required to be laid on curved alignment shall be joined in straight alignment and then be deflected, joint by joint. Special care shall be taken in blocking the pipe just previously laid, by tamped fill or otherwise to resist the misaligning forces generated during compression of the joints being made.
- G. For dissimilar pipes where suitable adaptor couplings are not available, the jointing shall be accomplished with a special factory fabricated coupling.

3.5 SIDE SEWERS

- A. All applicable Specifications given herein for sewer construction shall apply to side sewers.
- B. Provide side sewers extending to the right of way line for all properties adjacent to main line sewer unless otherwise directed by the Owner.
- C. Unless authorized in writing by the Owner, excavation for main line sewers shall not begin more than 1,000 feet ahead of the completion of side sewer construction in the public right-of-way.
- D. Sewers are designed to serve the downstream side of properties. Exceptions shall be as directed by the Owner at the time of construction. Such exceptions shall be marked by a stake or other suitable marker. Contractor shall be responsible that a "tee" be located in the main line opposite each marker and shall construct a side sewer to terminate at the property lines, edge of easements, or as otherwise directed by the Owner.
- E. The Contractor shall be responsible that the side sewer depth at the property line is 5 feet below the floor to be served, or 6 feet below street centerline, whichever is deeper. Where the property is vacant, the side sewer shall be constructed on a slope of 2% unless otherwise approved in writing by the Owner.
- F. Side sewers shall not be installed as vertical risers, but shall be laid on a slope not to exceed two feet vertical to one foot horizontal.

- G. Side sewers shall be constructed with a maximum deflection not to exceed manufacturer's recommendations. Larger changes in direction shall be made by use of standard 1/8 bends.
- H. Plugs shall be installed at end of line and blocked to withstand test pressures without leakage.
- I. A length of 2 inch x 4 inch timber S4S shall be placed at the end of the side sewer stub and brought up to 12 inches above the ground surface. The word SEWER shall be stenciled in 2-inch letters and the depth below the ground shall be painted in 2-inch letters.
- J. General requirements for side sewer construction are shown on Standard Detail entitled "Street Side Sewer". Any side sewer contractor shall also satisfy all requirements relating to side sewer construction as set forth in the "Side Sewer Rules and Regulations" of the Owner. Side sewer inspection for work under the Contract will be performed without charge to the Contractor.
- K. No side sewers shall be constructed inside private property unless approved in writing by the Owner.
- L. The Contractor shall not backfill any side sewers until the Owner has visually inspected and approved the installation. Should any such work be covered up without such approval or consent it must, if required by the Owner, be uncovered for examination at the Contractor's expense.

3.6 CLEANING

- A. Before acceptance testing is performed, the pipe installation should be reasonably clean. The pipe shall be cleaned either before or after testing the pipe in the following or equivalent manner.
- B. The Contractor shall furnish an inflatable rubber ball of a size that will inflate to fit snugly into the pipe to be tested. The ball may, at the option of the Contractor, be used without a tag line; or a rope or cord may be fastened to the ball to enable the Contractor to know and control its position at all times. The ball shall be placed in the last cleanout or manhole on the pipe to be cleaned, and water shall be introduced behind it. The ball shall pass through the pipe with only the pressure of the water impelling it. All debris flushed out ahead of the ball shall be removed at the first manhole where its presence is noted. In the event cemented or wedged debris or a damaged pipe shall stop the ball, the Contractor shall remove the obstruction and/or repair any damaged pipe. All visible leaks showing flowing water in pipelines or manholes shall be stopped even if the test results fall within the allowable leakage.

3.7 LEAKAGE TESTING

- A. General Requirements:
 - 1. All sanitary sewer pipe and appurtenances shall be cleaned and tested after backfill by the low-pressure air test method. Pipe over 36-inches in diameter may be tested a joint at a time with the water exfiltration method or by low pressure air test.
 - 2. All work involved in cleaning and testing sewer lines between manholes shall be completed within fifteen (15) working days after the backfilling of sewer lines and structures.
 - 3. The Contractor shall furnish all labor, materials, tools and equipment necessary to make the test, clean the lines and to perform all work incidental thereto.
 - 4. Precautions shall be taken to prevent joints from drawing during tests, and any damage resulting from tests shall be repaired by the Contractor at his own expense.
 - 5. In the event that the Contractor elects to test large-diameter pipe one joint at a time, leakage allowances for water exfiltration per 100 feet shall be converted to allowances per joint by dividing by the number of joints occurring in 100 feet.
 - 6. If the pipe installation fails to meet these requirements, the Contractor shall determine at his own expense the source or sources of leakage, and he shall replace all defective materials or workmanship. The completed pipe installation shall then be retested as required to meet the requirements of this test.
- B. Low Pressure Air Test:
 - 1. Recommended Procedure:
 - a. Pipe may be tested with or without pre-wetting.
 - b. Plug all pipe outlets with suitable test plugs. Brace each plug securely.

- c. If the pipe to be tested is submerged in groundwater, insert a pipe probe by boring or jetting into the backfill material adjacent to the center of the pipe and determine the pressure in the probe when air passes slowly through it. This is the back pressure due to groundwater submergence over the end of the probe. All gauge pressures in the test should be increased by this amount.
 - d. Add air slowly to the portion of the pipe installation under test until the internal air pressure is raised to 4.0 psig in excess of any groundwater backpressure.
 - e. Check exposed pipe and plugs for abnormal leakage by coating with a soap solution. If any failures are observed, bleed off air and make necessary repairs.
 - f. After an internal pressure is obtained, allow at least two minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.
 - g. After that two-minute period, disconnect air supply.
 - h. When pressure decreases to 3.5 psig over groundwater backpressure, start stopwatch. Determine the time in seconds that is required for the internal air pressure to drop 1.0 psig. This time interval should then be compared with the time required by Specification.
2. Safety Precautions:
 - a. Plugs used to close the sewer pipe for the air test must be securely braced to prevent the unintentional release of a plug which can become a high velocity projectile. Gauges, air piping manifold and valves shall be located at the top of the ground. No one shall be permitted to enter a manhole where a plugged pipe is under pressure. Air testing apparatus shall be equipped with a pressure release device designed to relieve pressure in the pipe under test at 6 psi.
 3. Basis of Acceptance:
 - a. Concrete and clay pipe (36 inches and under): The rate of air loss shall not exceed 0.003 CFM per square foot of internal pipe surface except that the computed rate for the test shall be not less than 2 CFM nor more than 3.5 CFM.
 - b. Other pipe materials: The time for the test shall be four (4) times that computed for concrete and clay pipe.
 - c. Pipe over 36 inches in diameter: Each joint shall show no appreciable loss of pressure when held for thirty (30) seconds.
 4. Limit of Test Section:
 - a. Pipe under 36 inches in diameter shall be tested from manhole to manhole or such shorter lengths as the Contractor may choose.
 - b. Pipe over 36 inches in diameter shall be tested one joint at a time.
 5. Excessive Infiltration:
 - a. The Engineer may require an infiltration test if it appears that there is excessive infiltration after air tests are completed. The Engineer shall also be the sole judge of whether or not this test is required. Excessive infiltration shall be cause for rejection.
- C. Exfiltration Test:
1. Exfiltration test shall be used only if specifically authorized by the Engineer.
 2. Contractor may fill the pipe any time up to 24 hours prior to the time of exfiltration testing to permit normal absorption into the pipe walls.
 3. Leakage shall be no more than 0.28 gph per inch diameter per 100 feet of sewer, with a hydrostatic head of six feet above the crown at the upper end of the test section, or above the natural groundwater table at the time of test, whichever is higher.
 4. Where the test head is other than six feet, the measured leakage shall not exceed 0.28 gph per inch diameter per 100 feet times the ratio of the square root of the test head to the square root of six.
 5. The length of pipe tested shall be limited so that the pressure at the lower end of the section tested does not exceed 16 feet of head above the invert, and in no case shall be greater than 700 feet or the distance between manholes when greater than 700 feet.

6. It shall be the Contractor's responsibility to determine the level of the water table at each manhole.
- D. Infiltration Test:
1. Infiltration test shall be used only if specifically authorized by the Engineer.
 2. Infiltration testing shall take place only when the natural groundwater table is above the crown of the higher end of the test section.
 3. Infiltration test leakage shall not exceed 0.16 gph per inch diameter per 100 feet, when the natural groundwater head over the pipe is two feet or less above the crown of the pipe at the upper end of the test section.
 4. Where the natural groundwater head is more than two feet, the measured leakage shall not exceed 0.16 gph per inch diameter per 100 feet times the ratio of the square root of the natural groundwater head to the square root of 2.
 5. The length of pipe tested shall not exceed 700 feet or the distance between manholes when greater than 700 feet.

3.8 DEFLECTION TEST FOR FLEXIBLE PIPE

- A. Sanitary sewers constructed of flexible pipe shall be deflection tested not less than 30 days after the trench backfill and compaction has been completed.
- B. The test shall be conducted by pulling a solid pointed mandrel with a circular cross section with diameter equal to 95% of the inside pipe diameter through the completed pipeline. Minimum length of circular portion shall be equal to the diameter of the pipe.
- C. Testing shall be conducted on a manhole to manhole basis and shall be done after the line has been completely flushed out with water.
- D. Contractor will be required, at his expense, to locate and repair any sections failing to pass the test and to retest the section.

3.9 REPAIRS

- A. Any pipe or appurtenance which has been laid or jointed that is not in conformance with the Specifications shall be repaired or be removed and replaced at the expense of the Contractor.
- B. Any concrete pipe or manhole with any continuous crack having a surface width of 0.01 inch or more extending for a length of 12 inches or more regardless of position in the wall of the pipe or main shall be removed and replaced.
- C. Repair bands or clamps or concrete collars shall not be used to repair defective pipe.

*** END OF SECTION ***

SECTION 02732

SEWER FORCE MAINS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Field Engineering: Section 01050
- B. Inspection Services: Section 01420
- C. Shoring: Section 02150
- D. Excavating, Backfilling and Compacting for Utilities: Section 02222
- E. Manholes and Cleanouts: Section 02605
- F. Pipe and Fittings: Section 02610
- G. Existing Utilities/Facilities-Underground and Overhead: Section 02760

1.2 QUALITY ASSURANCE

- A. Final Acceptance:
 - 1. Prior to final inspection all pipelines shall be flushed and cleaned and all debris removed, and hydrostatically tested.
 - 2. Any corrections required shall be made at the expense of the Contractor and the line retested.

2. PRODUCTS

2.1 STEP TANKS

- A. General: STEP tank shall be 1,500 gallon, single compartment concrete tank.
 - 1. Tank shall be certified by a licensed structural engineer or an engineer licensed in the State of Oregon with specific expertise in design of similar vessels that the tank will meet the loading conditions specified herein. The engineer certifying the tank shall submit drawings including but not limited to the following:
 - a. Plan view showing dimensions of tank and the size and location of any openings in the tank.
 - b. Side section of tank showing dimensions and thickness.
 - c. End section of tank showing dimensions and thickness.Calculations shall be submitted for review.
 - 2. Water required for exfiltration tests will be the Contractor's responsibility.
- B. Loading Criteria
 - 1. There shall be 135 lb/cu.ft. weight of backfill.
 - 2. The water table is at ground level. Lateral loading is 85 lb/cu.ft., which includes hydrostatic water pressure.
 - 3. Tank shall be designed to withstand HS-20 truck loading with appropriate impact factors and minimum soil cover or 18 inches or as specified by the tank manufacturer.
 - 4. Tank shall be structurally sound and watertight and shall be guaranteed in writing by the tank manufacturer for a period of seven (7) years from the date of final acceptance. The tank guarantee/warranty shall be furnished at the time of submittal. Tank warranty shall not limit liability to replacement cost of the tank.
- C. Concrete Tank
 - 1. Walls, bottom and top of reinforced-concrete tank shall be designed across the shortest dimension using one-way slab analysis. Stresses in each face of monolithically constructed tank may be determined by analyzing the tank cross section as a continuous fixed frame.

2. The walls and bottom slab shall be poured monolithically; alternatively, water stops may be provided.
3. Reinforcing steel shall be ASTM A615 Grade 60, $f_y = 60,000$ psi. Details and placement shall be in accordance with ACI-318.
4. Concrete shall be ready mix with cement conforming to ASTM C150, Type II. It shall have a cement content of not less than six (6) sacks per cubic yard and maximum aggregate size of 3/4-inch. Water/cement ratio shall be kept low ($0.35 \pm$) and concrete shall achieve a minimum compressive strength of 4,000 psi in 28 days. Calcium chloride will not be allowed in the mix design.
5. Tank shall be protected by applying a heavy cement-base waterproof coating (Thoroseal or equal as approved by the Engineer), on both inside and outside surfaces, in compliance with Council of American Building Officials (CABO) Report #NRF-168; 6181.
6. Form release used on tank molds shall be Nox-Crete or equal as approved by the Engineer. Diesel or other petroleum products are not acceptable.
7. Tank shall not be moved from the manufacturing site to the job site until the tank has cured for seven (7) days or has reached two-thirds of the design strength.
8. Tank shall be manufactured and furnished with access openings of the size and configuration to accommodate individual packaged pump systems. The tank manufacturer will use cast-in-place (ABS) riser adapters for each riser. Risers shall be Model PRTA24 as manufactured by Orenco Systems, Inc., or equal.
9. The septic tank and the top slab shall be sealed with a preformed flexible plastic gasket. The flexible plastic gasket shall be equal to the flexible butyl resin sealant conseal CS-102 or CS-202 as manufactured by Concrete Sealants, Inc., of New Carlisle, Ohio, and shall conform to federal specification SS-S-00210(210A) and AASHTO M-198.
10. Field Test: After the tank has been set in place, but prior to backfilling, the tank shall be tested for a two-hour period. Any leakage is cause for rejection. If a tank fails the exfiltration test, it shall be repaired and/or replaced until the tank passes said test. After backfilling, the tank shall be filled with water to ground level and tested for exfiltration over a two-hour period. Tank will not be accepted if there is any leakage over the two-hour period.

2.2 RISER

- A. Riser shall be required for access to internal vault and access into the septic tank for septage pumping. Riser shall be constructed of PVC or fiberglass and shall be constructed water tight. The riser shall be attached to the tanks such that a watertight seal is provided. Epoxy required to adhere the PVC or fiberglass risers to either fiberglass or ABS tank adaptor shall be a two-part epoxy model MA320 manufactured by Plexus or equal.
- B. When applicable, Neoprene grommets shall be installed by the manufacturer for discharge piping, vent piping and/or the electrical conduit to assure a watertight seal. Riser shall be Model RR24 (length as required) as manufactured by Orenco Systems, Inc.

2.3 LIDS

- A. Traffic Bearing Lid: The traffic bearing lid shall be a cast iron frame and cover, part number 6024, 3060, 4036, as manufactured by Sather Manufacturing Co., Inc., which will fit over a standard lid. The cover shall have the word "SEWER" cast into it and both frame and cover shall meet requirements of Section 02605.

2.4 DUPLEX PUMP SYSTEM

- A. General
 1. Provide Orenco Systems, Inc. (20OSIO7HHF) or equal. Pump shall be listed by an approved testing laboratory, e.g., UL or CSA, for use as an effluent pump.

2. Pump shall be stainless steel and/or thermoplastic.
3. All wetted fasteners shall be 300-series stainless steel.
- B. Motor
 1. Each motor shall be permanent split phase-type operating at 3450 RPM. Each motor shall be 3/4 HP, 108 volt, single-phase, 60 Hz.
 2. Motor shall be thermally protected with an automatic-reset features.
- C. Bypass
 1. A 1/8-inch bypass orifice shall be drilled in the discharge head of the pump to allow for cooling pump motor during periods of no discharge.

2.5 PUMP VAULT

- A. Internal Vault.
 1. Pump assembly shall require a 15-inch diameter screened vault with a single flow inducer as manufactured by Orenco Systems, Inc., Model Number SV 1544 Fi or an equal mechanism to meet the intent of a screened vault.

2.6 INTERNAL SPLICE BOX

- A. For class I, Division I installation (non-residential unit), riser requiring electrical connection shall have two separate splice boxes. Splice boxes shall be UL listed for the application. All splice boxes shall be installed with 1'0" of the riser lid for access purposes. One splice box shall be for the pump wire and one splice box shall be for the low voltage wire for the float system. The splice boxes for the pump leads shall meet all requirements of the Department of Labor and Industries for a Class I, Division I, Type D gas application. The splice box for the low voltage float leads on an intrinsically safe relay shall be a non-metallic PVC splice box. The PVC splice box shall be complete with cord grips and dual wall heat shrink butt connectors. The number of cord grips and wire nuts within the PVC splice box shall be equivalent to the number of floats. The splice box for low voltage float leads shall be Model SBX as manufactured by Orenco Systems, Inc., or approved equal. The pump wire splice box shall be single gang, aluminum receptacle and malleable iron mounting box - Model SBX-S, as manufactured by Orenco Systems, Inc., or equal as approved by the Engineer. Mounting box shall be mounted to riser with stainless steel bolts. An explosion-proof EY fitting shall be provided for the pump wire connection.

2.7 LEVEL CONTROL AND ALARM FLOATS

- A. Level control floats shall be mechanical floats, UL or CSA listed for use in effluent on an adjustable or preset PVC stem which attaches directly to the pump vault. Floats shall consist of high level alarm, on, off, and redundant off, or as shown on the Contract Plans. Level control floats shall be Model MF-ABR as manufactured by Orenco System, Inc., or equal.
 1. Pump control pen shall be Model DAX-2 10 rated at 208 VAC, 3/4 HP, single phase, 60 Hz as manufactured by Orenco Systems, Inc., or approved equal.
 2. Pump control panel shall have NEMA 4X fiberglass enclosures, integral power disconnect, audio and visual alarm, elapsed time meter, event counter, stainless steel latch, and internal 120 volt, 20 amp circuit breaker.
 3. Pump control panel will be supplied with a clear plastic pouch on the inside of the pump control panel door. The plastic pouch will be glued onto the pump control panel door and will be large enough to accommodate the panel schematic and at least one other folded 8-1/2" by 11" piece of paper.

2.8 HOSE AND VALVE ASSEMBLY

- A. Hose and valve assembly shall include a 1-inch diameter, 100 psi, PVC hose with PVC union, ball valve, and anti-siphon valve. Model Number HV 100BAS as manufactured by Orenco Systems, Inc., or approved equal.

2.9 ADDITIONAL MATERIAL REQUIREMENTS

- A. Pump Assembly
 - 1. All equipment including but not limited to pump vault, riser, standard lid, bonding epoxy, splice box, discharge piping, control float assembly, pump, pump control and alarm panel, etc., shall be supplied by one single supplier or manufacturer as a packaged unit. The supplier or manufacturer shall, upon request by the Engineer, submit information on availability of replacement parts, and/or maintenance records of operating pump assemblies. The package as supplied by the manufacturer or supplier will have a standard guarantee against material defect for a period of not less than one year. The date of guarantee shall begin on the date equipment is installed on a particular site and may be a single guarantee incorporating all the components or individual guarantees on the various components. The manufacturer or supplier will be responsible to supply replacement parts during the one-year period. In the one-year bond period, the Contractor will be responsible for coordinating with the supplier or manufacturer on any defects and will also be responsible for field installation of defective parts.

3. EXECUTION

3.1 CLASS I, DIVISION I INSTALLATION

- A. All materials used for control and electrical connections shall meet requirements of the State of Oregon's Department of Labor and Industries and the National Electrical Code.
- B. All materials and installation methods used for pumping assembly, control and electrical connections shall meet the requirements of Labor and Industries and National Electrical Code for Class I, Division I classification. In order to meet this classification, the following requirements shall apply:
 - 1. Use intrinsically safe wiring and components for float signal system.
 - 2. Use a pump control panel with the appropriate interior barriers meeting the requirements of the NEC and NFPA for intrinsically safe systems.
 - 3. Use intermediate metal conduit (IMC), rigid metal, or PVC conduits plus all appropriate conduit seals for separation of low and high voltage lines between the control panel and the pump, floats and valves.
 - 4. Provide separate electrical splice boxes, a cast one for high voltage wire, and one for low voltage wire. Splice boxes shall be UL listed for installation inside the riser.

3.2 BEDDING AND BACKFILL

- A. Septic tank shall be installed on a leveling course of a minimum of 6 inches of bedding.
- B. Backfill with native backfill shall be incidental to laying the pipe or STEP tank installation.
- C. During excavation for STEP tank, the Contractor may encounter foundation and/or backfill materials which are unsuitable. The Engineer shall determine the suitability of the material, which may include clay, peat and large diameter rocks. If determined unsuitable, the Contractor shall remove and dispose of unsuitable material. If requested, the Contractor shall remove and replace the native material, including compaction or backfill with backfill gravel.
- D. All excess excavated material will be disposed of after removal from the site.
- E. Tank shall not be connected to the sewer line from the building until the tank has been tested and approved, and the collection and treatment facilities are ready for operation and have been accepted as substantially complete by the Owner.

*****END OF SECTION*****

SECTION 02760

EXISTING UTILITIES/FACILITIES UNDERGROUND AND OVERHEAD

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Grading: Section 02210
- B. Excavating, Backfilling and Compacting for Utilities: Section 02222

1.2 LEGAL REQUIREMENTS-UNDERGROUND FACILITIES

- A. The Contractor shall, before commencing excavation in any area, comply with the provisions of any applicable laws relating to or governing the identification, location, marking, and responsibility for protecting and repairing of underground facilities.
- B. Whenever there may be a conflict between the provisions of any law and the provisions of these specifications, the provisions of law shall control.

1.3 DEFINITIONS

- A. Utility means any facility or item placed above or below ground for use in connection with the storage or conveyance of water, sewage, electronic, telephonic or telegraphic communication, cablevision, electric energy, petroleum products, gas, gaseous vapors, hazardous liquids, or other substances and including, but not limited to pipes, sewers, conduits, cables, valves, lines, wires, manholes, and attachments.
- B. Utility conflict limit shall be as shown on Standard Detail entitled "Utility Conflict Limits".
- C. Pipe zone is defined as extending from the bottom of the required excavation to six (6) inches over the top of the pipe.

1.4 IDENTIFICATION

- A. All underground utilities known by the Owner to be in the proposed area of excavation are identified on the project plan.
- B. The underground utilities identified on the plans have not and cannot be precisely located by the Owner or its agents or engineers and location is approximate only because such information is within the control of the owners of the underground utilities. The Owner, under this Contract, does not warrant the location of underground utilities.
- C. NOTICE: Overhead electrical service lines are generally not shown on the drawings. Electrical transmission lines shown on the drawings are located by point to point, power pole to power pole connections. The transmission cables or wires may be located on either side of the drawing location depending upon the configuration of the crossarms on the power poles or towers. Line voltage is not shown.
- D. Other overhead utility lines are generally not shown on the drawings.

1.5 NOTIFICATION

- A. It is the responsibility of the Contractor to give notice to the Owner or owners of any utilities known or suspected to be within the area of any proposed excavation or construction activities.
- B. The Contractor is responsible to have the locations of underground utilities marked by the utility owners prior to beginning excavation.
- C. The Contractor is responsible for determining the extent of any hazard created by electrical power in all areas and shall follow procedures during construction as required by law and regulation. Prior to

construction, the Contractor shall meet with utility owners and determine the extent of hazards and remedial measures and shall take whatever precautions may be required.

- D. The Contractor's attention is directed to federal, state, and local safety codes relative to limitations of work in proximity to overhead power lines.

1.6 QUALITY ASSURANCE

- A. The Contractor will be required to have available a pipe finder and a man capable in its use and to utilize same to satisfy himself as to the exact location of such underground facilities in the interest of avoiding unnecessary damage, maintenance costs, and to insure continuity of customer service.
- B. Contractors shall cooperate with utility owners to aid in locations and maintenance of existing utilities.

1.7 ELECTRICAL TRANSMISSION AND SERVICE LINES

- A. Since neither the Engineer nor the Owner can anticipate the construction methods or techniques and equipment to be used by the Contractor in performing the work, the extent of the possibility of the Contractor's equipment and personnel coming in contact with electrical transmission lines cannot be fully anticipated, and there is no representation that all electrical transmission lines are shown on the plans.
- B. The Contractor is charged with the responsibility of observing and investigating the presence of any electrical transmission lines which might impinge on his work whether overhead or underground and shall consult with and utilize the information given by utility owners and operators to determine the extent of any hazards and remedial measures required, and follow appropriate safety procedures.

1.8 ABOVE GROUND UTILITIES

- A. Existing above ground utilities, whether shown on the drawings or not, shall be maintained, relocated, rerouted, removed and restored as may be necessary by the Contractor in a manner satisfactory to owners and operators of the utilities.

1.9 MAJOR UNDERGROUND UTILITIES

- A. Existing major underground utilities and appurtenant structures within the "Utility Conflict Limits" or area of excavation shall be maintained, relocated, rerouted, removed and restored by the Contractor.
- B. Existing major underground utilities and appurtenant structures outside of the "Utility Conflict Limits", whether shown on the drawings or not, shall be maintained and restored by the Contractor if damaged.
- C. In the following special cases, the Contractor will be reimbursed in accordance with Article 13 of the General Conditions for all direct costs and expenses of modifying, rerouting, relaying or maintaining service of major underground utilities.
 - 1. The existing utility is not shown on the plans and found to be within the "Utility Conflict Limits".
 - 2. The existing utility is shown within the "Utility Conflict Limits" but not located within 24 inches of its outside dimension.
 - 3. The existing utility is found during construction to cross the ditch line at an elevation between the top and bottom of the proposed pipeline or structure to be constructed under this contract together with the required pipe zone.
 - 4. The existing underground utility is found during construction to cross or project within the "Utility Conflict Limits" for the proposed work at an angle of 30° or less at any elevation.
 - 5. The utility is not identified as required by any law which makes such lack of identification a changed condition.
 - 6. Where a design change is required to maintain separation of water and sewer lines to not less than 10 feet horizontally or 18 inches vertically at crossings in accordance with regulations,

modification shall be in accordance with state or local regulations and approved by the Engineer.

1.10 UTILITY SERVICE LATERALS

- A. Minor underground utility service lines, including but not limited to sanitary sewer services, gas services, water services, house or yard drains, and electricity or telephone services and driveway culverts shall be maintained, relocated, rerouted, removed and restored by the Contractor with the least possible interference with such services.
- B. Even though the presence of minor underground utility service lines may be deemed changed or differing conditions, in no case shall the interference of such service lines be the basis for extra compensation except in the case of a conflict, not shown on the plans, with sanitary sewer service occurring at an elevation between the top and bottom of the proposed pipeline or structure together with the pipe zone, the Contractor will be reimbursed for costs thereof in accordance with Article 13 of the General Conditions.

1.11 RESTORATION BY UTILITY OWNER

- A. The right is reserved by owners of public utilities and franchises to enter upon any street, road, right-of-way, or easement for the purpose of maintaining their property and for making necessary repairs or adjustments caused by the Contractor's operations.
- B. The Contractor shall save the Owner harmless of any costs so incurred in restoration of a utility damaged by the Contractor except in special cases outlined above, and subject to the provisions of any law.

1.12 RESTORATION OF DRAINAGE FACILITIES

- A. Where it is necessary for drainage facilities to be removed and replaced, existing pipe and catch basins may be reinstalled when approved by the agency having jurisdiction.
- B. The materials shall be cleaned.
- C. When it is necessary to replace existing pipe or catch basins, the new materials shall be of equal strength and similar design to existing materials.
- D. Installation shall be in accordance with the applicable provisions of these specifications.
- E. All costs, whether new or existing facilities are installed, shall be considered to be included in the unit prices bid for the various items and no additional payment shall be allowed.

*** END OF SECTION ***

SECTION 02831

CHAIN LINK FENCES

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Concrete: Division 3

1.2 QUALITY ASSURANCE

- A. Erector shall be a Contractor regularly engaged in installation of similar fencing.

1.3 SUBMITTALS

- A. Certification of quality of all fence elements.
- B. Shop drawings illustrating locations of all posts, structural details of all fence elements and removable chain gate construction.
- C. Submit results of ASTM A90 test for zinc coating weight.

1.4 SCOPE OF WORK

- A. Chain link fencing contractor shall furnish and install a new custom-designed storage area chain link fencing wall as shown on the drawings and as described in the specifications.

2. PRODUCTS

2.1 GENERAL

- A. Posts, rails, rods, bars, fittings, chain and hardware shall be hot-dipped, zinc-coated steel per ASTM Specifications A120, A123 and A153, as applicable.
- B. Fence components to be galvanically compatible.

2.2 CHAIN LINK FABRIC

- A. Chain link in accordance with ASTM A392, high carbon steel, zinc-coated Class II (2.0 ounces per square foot).
- B. No. 9 gauge x 2-inch mesh, hot-dipped after weaving, twisted and barbed at top and bottom selvages.
- C. 72-inch height (fabric roll width) or other sizes as indicated on drawings.

2.3 POSTS

- A. Terminal Posts: All end, corner and pull posts, 3 inch O.D. standard pipe, 5.79 pounds per lineal foot (deflection in horizontal fence line of 15° or more requires a terminal post).
- B. Intermediate Posts: "H" column, 2-1/4 inch x 2 inch, 4.1 pounds per lineal foot; or 2-1/2-inch O.D. pipe, 3.65 pounds per lineal foot.
- C. Post Braces and Top Rail: 1-5/8 inch O.D. pipe, 1.17 pounds per lineal foot.

3. EXECUTION

3.1 CHAIN LINK FENCE INSTALLATION

- A. General:
 - 1. Install as illustrated on approved shop drawings by skilled mechanics experienced in erection of chain link fence.
 - 2. The fence shall be constructed to the dimensions shown on the drawings.
- B. Posts:
 - 1. All posts shall be anchored vertically to wood floor at bottom and to steel building framing at top as shown on the drawings.
- C. Tension Wire:
 - 1. Stretch tension wire prior to fabric stretching and fasten to terminal posts.
 - 2. Secure chain link fabric to tension wire with 11 gauge hog rings spaced 24 inches apart.
- D. Chain Link Fabric:
 - 1. Stretch taut and securely fasten to posts.
 - 2. Fasten chain link fabric to all terminal posts by tension bars with heavy one inch by 11 gauge pressed steel bands spaced 14 inches apart.
 - 3. Fasten to line posts with 2 gauge wire clips spaced 14-inches apart.

* * * END OF SECTION * * *

SECTION 02900

SANITARY SEWER LIFT STATION

1. GENERAL

1.1 DESCRIPTION

- A. The Contractor shall furnish and install one factory-built, automatic pumping station. The station shall be complete with all needed equipment, factory-installed on a welded steel base with fiberglass cover.
- B. The principal items of equipment shall include two vertical, close-coupled, motor driven, vacuum primed, non-clog pumps; valves, internal piping, central control panel with circuit breakers; motor starters and automatic pumping level controls; heater; ventilating blower; priming pumps and appurtenances; and all internal wiring.
- C. The Contractor shall also supply one "wet-well". The wet-well shall be as follows:
 - 1. Circular in plan - up to 6'-0" diameter to suit the pumps installed.
 - 2. The depth shall suit the invert elevations indicated on the drawings and provide the necessary volume as recommended by the pump manufacturer.
 - 3. Constructed per City of Redding standards for circular manholes.
 - 4. Provide an access hatch.

1.2 DESIGN CRITERIA

- A. Each pump shall be capable of delivering 250 GPM of raw water or wastewater against a total dynamic head of 70 feet. The minimum acceptable pump efficiency at this condition shall be 45%. Due to the energy conservation requirements, the minimum efficiency will be enforced. The maximum allowable speed shall be 1170 RPM. The minimum rated horsepower of each pump motor shall be 15. The maximum static suction lift shall be 15 feet.
- B. All openings and passages shall be large enough to permit the passage of a sphere 3" in diameter.
- C. The station shall be constructed in one complete factory-built assembly. It shall be sized to rest on the top of the wet well. The supporting floor plate shall be minimum 3/8" thick steel with reinforcing, as required, to prevent deflection and insure an absolutely rigid support.
- D. The pump station shall be enclosed by a hinged fiberglass cover. The cover shall have a suitable drip-lip around the edge and shall be provided with a hasp and staple connection to the floor plate to allow the pump chamber to be locked with a padlock.
- E. The cover shall have a latch mechanism to keep the cover open under load. Adjustable ventilating louvers shall be provided on each end of the fiberglass cover which are capable of being closed during cold weather operation.
- F. A 1/4" thick sliding aluminum manway cover located exterior to the fiberglass pump chamber shall be provided, complete with padlocking provisions. The manway shall be an integral part of the station floor plate and provide access to the wet well.

1.3 QUALITY CONTROL

- A. The manufacturer of the lift station shall have a minimum of five (5) years experience in the design and manufacture of vacuum-priming type factory-built automatic pumping stations.
- B. All components of the pump station shall be given an operational test of all equipment at the factory to check for excessive vibration, for leaks in all piping or seals, for correct operation of the vacuum priming and control systems and all auxiliary equipment. Pumps shall take suction from a deep well, simulating actual service conditions.

1.4 GUARANTEE

- A. The Contractor shall guarantee the structure and all equipment to be free from defects in materials and workmanship for a period of one year from date of start-up.
- B. Warranties and guarantees by the suppliers of various components in lieu of a single-source responsibility by the Contractor will not be accepted. The Contractor shall be solely responsible for the guarantee of the station and all components.
- C. In the event a component fails to perform as specified or is proved defective in service during the guarantee period, the Contractor shall provide a replacement part without cost to the owner. He shall further provide, without cost, such labor as may be required to replace, repair or modify major components such as the pumps, pump motors and sewage piping manifold.

2. PRODUCTS

2.1 ACCEPTED MANUFACTURERS

- A. Smith & Loveless, Inc., Lenexa, Kansas

2.2 PUMPS

- A. The pumps shall be 4" vertical, non-clog type of heavy cast iron construction, especially designed for the use of mechanical seals and vacuum priming. In order to minimize seal wear caused by linear movement of the shaft, the shaft bearing nearest the pump impeller shall be locked in place so that end play is limited to the clearance within the bearing. To minimize seal wear resulting from shaft deflection caused by the radial thrust of the pump, the shaft from the top of the impeller to the lower bearing supporting the impeller shall have a minimum diameter of 1-7/8". The dimension from the lowest bearing to the top of the impeller shall not exceed 6".
- B. The bearing nearest the impeller shall be designed for the combined thrust and radial load. The upper bearing shall be free to move linearly with the thermal expansion of the shaft and shall carry only radial loads.
- C. The shaft shall be solid stainless steel through the pump and bottom bearing to eliminate corrosion within the pump or the mechanical seal. Removable shaft sleeves will not be acceptable if the shaft under the sleeve does not meet the specified minimum diameter.
- D. The pump impellers shall be of the enclosed type made of close-grained cast iron and shall be balanced. The impeller shall be keyed with a stainless steel key and secured to the motor shaft by a stainless steel cap screw equipped with a Nylock or other suitable self-locking device. The impeller shall not be screwed or pinned to the motor pump shaft and shall be readily removable without the use of special tools. To prevent the build-up of stringy materials, grit and other foreign particles around the pump shaft, all impellers less than full diameter shall be trimmed inside the impeller shroud. The shroud shall remain full diameter so that close minimum clearance from shroud to volute is maintained. Both the end of the shaft and the bore of the impeller shall be tapered to permit easy removal of the impeller from the shaft.
- E. The pump shall be so constructed so as to permit priming from the low pressure area behind the impeller. Priming from high pressure connections tending to cause solids to enter and clog the priming system, will not be acceptable. The priming bowl shall be transparent to enable the operator to monitor the priming level.

2.3 MOTORS

- A. The pump motors shall be vertical, solid shaft, NEMA P-base, squirrel-cage induction type, suitable for 3-phase, 60-cycle, 480 volt electric current. They shall have Class F insulation, suitable for temperatures up to 105° C. Insulation temperature shall, however, be maintained below 80° C. The motors shall have normal starting torque and low-starting current, as specified by NEMA Design B characteristics. They shall be open drip-proof design with forced air circulation by integral fan. Openings for ventilation shall

- be uniformly spaced around the motor frame. Leads shall be terminated in a cast connection box and shall be clearly identified.
- B. The motors shall have 1.15 service factor. The service factor shall be reserved for the owner's protection. The motors shall not be overloaded beyond their nameplate rating, at the design condition, nor any head in the operating range as specified under Operating Conditions.
 - C. The motor-pump shaft shall be centered, in relation to the motor base, within .005". The shaft runout shall not exceed .003".
 - D. The motor shaft shall equal or exceed the diameter specified under sewage pumps, at all points from immediately below the top bearing to the top of the impeller hub.
 - E. A bearing cap shall be provided to hold the bottom motor bearing in a fixed position. Bearing housings shall be provided with fittings for lubrication as well as purging old lubricant.
 - F. The motor shall be fitted with heavy lifting eyes, each capable of supporting the entire weight of the pump and motor.

2.4 CONTROLS

- A. The control equipment shall be mounted in a NEMA Type 1 steel enclosure with a removable access cover and mounted on a separate concrete pad. The circuit breakers, starter reset buttons, and control switches shall be operable without removing the access cover.
- B. The grounding type convenience outlet shall be provided on the side of the cabinet for operation of 115 volt AC devices.
- C. The equipment shall include a 2 KVA-120 volt control power transformer, outdoor meter panel, motor starters, programmable liquid controllers, bubble system, and automatic alternator. The control equipment supplier shall be approved by the Owner.

2.5 VACUUM PRIMING SYSTEM

- A. A separate and independent priming system shall be furnished for each sewage pump, providing complete standby operation. Each priming system shall include a separate vacuum pump. Vacuum pumps shall have corrosion resistant internal components. They shall each be capable of priming the sewage pump and suction piping in not greater than 60 seconds, under rated static suction lift conditions of 15-feet at mean sea level.
- B. Each priming system shall be complete with vacuum pump, vacuum control solenoid valve, prime level sensing probe, and a float operated check valve installed in the system ahead of the vacuum pump to prevent liquid from entering the vacuum pump. The float-operated check valve shall have a transparent body for visual inspection of the liquid level and shall be automatically drained when the vacuum pump shuts off.
- C. The priming system shall automatically provide positive lubrication of the mechanical seal each time the sewage pump is primed. To prevent excessive stoppage due to grease accumulation, no passageway in the priming system through which sewage must pass shall be smaller than the equivalent of a 2-1/2" opening.

2.6 ENVIRONMENTAL EQUIPMENT

- A. A ventilating blower shall be provided, capable of delivering 250 cfm at 0.1" static water pressure, in order to remove the heat generated by continuous motor operation. The ventilating blower shall be turned on and off automatically by a pre-set thermostat. The ventilating blower shall be rigidly mounted from the station floor. The discharge outlet shall have a thick resilient gasket which will match with a louvered opening in the fiberglass cover to seal the discharge to the cover when the cover is closed. An electric heater controlled by a pre-set thermostat shall be furnished. The heater shall be rigidly mounted in the station to prevent removal.

2.7 SEWAGE PIPING

- A. The pump suction shall be drilled and tapped for a 125 pound American Standard flange for ready connection of the suction riser. The discharge line from each pump shall be fitted with a clapper-type check valve and eccentric plug valve. Size, location and quantity of check valves and plug valves shall be as shown on the construction drawing. The check valve shall be of the spring-loaded type with external lever arm and an easily replaced resilient seat for added assurance against vacuum leaks. Check valves shall have stainless steel shaft with replaceable bronze shaft bushings and shall be sealed through the bearings with O-rings. An operating wrench shall be provided for the plug valves.
- B. Protrusions through the floor plate shall be gas-tight where necessary to effect sealing between the equipment chamber and the wet well. Bolted and sealed points shall be provided at the volutes or suction pipes in order to prevent corrosive, noxious fumes from entering the station. The lift station manufacturer shall extend the suction and discharge connections below the floor plate at the factory, so that field connections can be made without disturbing the gas-tight seals.
- C. The manufacturer of the lift station shall provide a compression-type sleeve coupling for installation in the common discharge pipe.

2.8 PROTECTION AGAINST CORROSION

- A. After welding, all inside and outside surfaces of the structure shall be blasted with steel grit to remove rust, mill scale, weld slag, etc. All weld spatter and surface roughness shall be removed by grinding. Immediately following the cleaning, a single heavy inert coating shall be factory-applied to all inside and outside surfaces prior to shipment. This coating shall be Versapox epoxy resin especially formulated by Smith & Loveless for abrasion and corrosion resistance. The dry coating shall contain a minimum of 85% epoxy resin with the balance being pigments and thixotropic agents.

2.9 SPARE PARTS

- A. A complete replacement pump shaft seal assembly shall be furnished with each lift station. The spare seal shall be packed in a suitable container and shall include complete installation instructions. A spare volute and seal gasket shall be provided.

3. EXECUTION

3.1 INSTALLATION AND OPERATING INSTRUCTIONS

- A. Installation of the pump chamber shall be done in accordance with the written instructions provided by the manufacturer.
- B. Operation and maintenance manuals shall be furnished which will include parts lists of components and complete service procedures and troubleshooting guide.

*** END OF SECTION ***

DIVISION 3 - CONCRETE

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PRECAST CONCRETE VAULTS

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SECTION 03100

CONCRETE FORMWORK

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Concrete Reinforcement: Section 03200
- B. Anchors and Inserts: Section 03251
- C. Expansion and Contraction Joints: Section 03252
- D. Waterstops: Section 03253
- E. Cast In Place Concrete: Section 03300

1.2 QUALITY ASSURANCE

- A. Standards:
 - 1. "Recommended Practice for Concrete Formwork", ACI 347.
 - 2. "Chapter 26", Uniform Building Code.
 - 3. U.S. Product Standard PS 1 for Plywood.
 - 4. Standard Grading and Dressing Rules No. 16 of the West Coast Lumber Inspection Bureau.

1.3 SUBMITTALS

- A. A description of the forming system with complete details. Specify panel width (chord lengths) for circular structures. Illustrate the proposed location of all construction joints, method of securing embedded items and blockout procedures (if proposed).

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. On delivery to job site, place materials in area protected from weather.
- B. Store materials above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.
- C. Handle materials to prevent damage.

2. PRODUCTS

2.1 MATERIALS

- A. Plywood: New or in new condition "B-B Plyform Class 1 Exterior" grade plywood, 5/8 inch minimum thickness.
- B. Steel Panels: Flat steel sheet or plate of sufficient thickness, or braced sufficiently, to prevent noticeable deflection from pressure of concrete. Steel forms galvanized and/or coated to prevent rust and staining.
- C. Framing, Studding, and Bracing: "Standard" or "Construction" grade West Coast species lumber.
- D. Form Ties: Prefabricated rod of the cone-type snap-tie configuration; or approved threaded internal disconnecting type to resist all imposed loads of freshly placed concrete, and permit tightening and spreading of forms. Plastic cone snap-ties shall break back 1 to 1-1/2 inches.
- E. Form Coating:
 - 1. Lacquer, plastic or epoxy coating or non-staining form oil that will not impair the bonding quality for final finish of the painting or protective coating.
 - 2. Coatings containing mineral oils or other non-drying ingredients will not be permitted.
- F. Shores and Falsework: Standard patented, manufactured shores, or sound commercial construction lumber.

- G. Chamfer Strips: Chamfer strips (for all exposed edges) 3/4 inch, 45° bevel wood strips or reusable plastic triangular strips.

3. EXECUTION

3.1 DESIGN OF FORMWORK

- A. Design formwork to safely support vertical and lateral loads which might be applied until such loads can be supported by the concrete structure. Carry vertical and lateral loads by formwork system to ground or to in-place construction which has attained adequate strength for that purpose.
- B. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.
- C. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof. Provide trussed supports when adequate foundations for shores and struts cannot be secured.
- D. Form facing materials shall be supported by structural members spaced to prevent deflection. Design camber in formwork as required for anticipated deflections.
- E. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent material.
- F. Keep oil or other agents from getting on reinforcing steel, embedded items, or other surfaces requiring bond with concrete.

3.2 LAYOUT OF FORMWORK

- A. Locate and stake out all forms and establish all lines and levels and elevations.

3.3 CONSTRUCTION OF FORMS

- A. Formwork - General:
 - 1. Before concrete is placed in any form, verify horizontal and vertical form position and correct all inaccuracies. Complete all wedging and bracing in advance of placing of concrete.
 - 2. When setting form ties, leave no metal to remain in wall closer than one inch from surface. Ties shall fit tight to prevent mortar leakage at holes in forms. Ties shall be protected from rusting at all times. No wire ties or wood spreaders will be permitted. Cutting ties back from concrete face will not be permitted.
 - 3. At construction joints, anchor forms by using an adequate number of form ties in the new pour a few inches from the construction joints. Do not rely on ties adjacent to the joint used in previous placements. All joints horizontal and vertical.
 - 4. For exposed concrete, forms shall be of new plywood, metal panel, or approved panel materials, smooth, and continuous.
 - 5. For unexposed concrete, forms shall be plywood, metal, boards, or approved material. Boards: nominal one inch minimum thickness, sound and tight, commercial construction lumber, shiplapped or tongue-and-grooved, dressed on at least one side and both edges for tight fit. Plywood, metal, or approved material equal to or better than board surface.
- B. Camber: Forms for girders and slabs cambered unless otherwise noted.
- C. Chamfered Corners: All corners chamfered 3/4 inch, unless shown otherwise on drawings. Provide 45-degree triangular moldings in forms for all chamfering required.
- D. Inspection and Cleanout Openings: Provide inspection and cleanout openings at the bottom of all forms for columns, pilasteres, walls over 8 feet in height, and for forms for irregularly shaped placement where cleaning and inspection from the top would be impractical.

- E. Coordination: Coordinate the installation of all items to be inserted or embedded in concrete. Support all items to maintain accurate alignment and prevent distortion during concrete placement.
- F. Cleaning: All dirt, chips, sawdust, mud, water and other foreign matter shall be removed from within the forms or within the excavated areas before any concrete is deposited therein.

3.4 NOTIFICATION AND INSPECTION

- A. Prior to placing of any concrete, and after placement of reinforcing steel in the forms, notify the Engineer at least 24 hours in advance of placing concrete to permit inspection.

3.5 DEFECTIVE WORK

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

3.6 REMOVAL OF FORMS

- A. Do not remove forms and supports until concrete has attained sufficient strength to support anticipated loads.
- B. The listing below serves only as a guide in determining the minimum length of time required before removal of forms and is based on the use of Type I Portland Cement. When high early strength Portland Cement is used, the length of time listed below may be reduced to not less than one-third time listed, but not less than 1 day.

1. Walls in mass work	24 hours
2. Thin walls (12 inches or less) and sides of beams and girders	48 hours
3. Columns	7 days
4. Bottom forms and supports of beams, girders and slabs	14 days
- C. Use methods of form removal which will not cause overstressing of the concrete. Remove supports to permit the concrete to uniformly and gradually take the stress due to its own weight. Do not use high impact methods to remove supports.
- D. Break back ties after concrete has cured sufficiently to maintain unbroken bond with steel rod.

3.7 REUSE OF FORMS

- A. Any reused form for exposed concrete work shall be reconditioned to "like new" condition. Any reused form shall be cleaned, repaired, and recoated before each reuse.

3.8 BLOCKOUTS

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

* * * END OF SECTION * * *

SECTION 03200

CONCRETE REINFORCEMENT

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Masonry Accessories: Section 04150
- B. Concrete Formwork: Section 03100

1.2 QUALITY ASSURANCE CONTROL

- A. Manual of Standard Practice for Detailing Reinforced Concrete Structures, ACI 315.
- B. Manual of Standard Practice, Concrete Reinforcing Steel Institute.

1.3 SUBMITTALS

- A. Placing drawings, bending and cutsheet schedules.
- B. Mill test reports for each shipment of reinforcement shall be submitted to the Engineer for review.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver reinforcement to project site in bundles marked to coordinate with placement drawings.
- B. Handle and store to prevent contamination from dirt, oil and other materials which will affect bond.
- C. Store a minimum of 6" above ground and in locations where the materials will not be subject to abuse.

2. PRODUCTS

2.1 MATERIALS

- A. Reinforcing Bars: Unless specified otherwise, deformed bars meeting requirements of ASTM A615, Grade 60. Supplementary Requirements S1 shall apply.
- B. Welded Wire Fabric: Wire mesh shall meet requirements ASTM A185, "Welded Steel Wire Fabric for Concrete Reinforcement".
- C. Tie Wire: Steel, black annealed, 16-gauge minimum.
- D. Reinforcing Bar Supports: Per CRSI Manual Chapter 3, pregalvanized or plastic-coated.

3. EXECUTION

3.1 INSTALLATION

- A. Placement and Tolerances: Conform to CRSI "Manual of Standard Practice".
- B. Splices:
 - 1. Do not splice bars except at locations shown or noted on the drawings or as otherwise approved.
 - 2. Tie lap slices securely with wire to prevent displacement of splice during placement of concrete.
 - 3. Perform welded splices in accordance with ACI Building Code (ACI 318).
 - 4. Lap wire fabric one full mesh minimum and tie with wire.
- C. Cleaning: Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that may reduce bond with concrete.
- D. Protection During Concreting: Keep reinforcing in proper position during concrete placement.

- E. Concrete Cover: Maintain minimum concrete cover over reinforcement as specified in ACI 318 or as noted.

* * * END OF SECTION * * *

SECTION 03251

ANCHORS AND INSERTS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Concrete Formwork: Section 03100
- B. Waterstops: Section 03253
- C. Cast-In-Place Concrete: Section 03300

1.2 QUALITY ASSURANCE

- A. Use only materials compatible with embedded concrete environment.

1.3 SUBMITTALS

- A. Shop drawings for all anchors, inserts and embedded products (wall castings, pipes with seep rings, and special castings).

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store all items to be embedded in a manner to prevent damage or contamination.

2. PRODUCTS

2.1 MATERIALS

- A. Anchor Bolts: ASTM A307, Steel unless otherwise noted.
- B. Threaded or Slotted Inserts: Galvanized malleable iron or stainless steel size and type as specified.

3. EXECUTION

3.1 INSTALLATION

- A. Coordinate the location and placement of all items to be embedded in concrete.
- B. Coat any embedded aluminum with asphalt paint.

3.2 EMBEDDING

- A. Set accurately and hold in position all embedded products during placement until the concrete is set.

3.3 DRILLED IN GROUTED ANCHORS

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

* * * END OF SECTION * * *

SECTION 03252

EXPANSION AND CONTRACTION JOINTS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Concrete Formwork: Section 03100
- B. Waterstops: Section 03253
- C. Cast-In-Place Concrete: Section 03300

1.2 QUALITY ASSURANCE CONTROL

- A. Prepare and use in strict accordance with manufacturer's instructions. Discard materials after specified "shelf life".
- B. Deliver products in manufacturer labeled containers with complete preprinted instructions by manufacturer included.
- C. Installers experienced in use of products.

1.3 SUBMITTALS

- A. Sealant type and manufacturer.
- B. Premolded composition board and backer rod samples.
- C. Certification of conformance to Specifications.

2. PRODUCTS

2.1 MATERIALS

- A. Preformed board shall conform to Federal Specification HH-F-341, Type I, Class B (moderately resilient) unless otherwise noted.
- B. Joint Sealant:
 - 1. Polyurethane material designated for bonding to concrete for service, which when cured, develops a high bond between surfaces and provides flexible watertight seal, non-sag, resistant to mild alkalis and acids, oils and meets all requirements for Federal Specifications TT-S-00230, Type II, Class A.
 - 2. Prior to ordering the sealant, submit to the Engineer for review, sufficient data to show experience record of sealant and general compliance with the Specification requirements.
 - 3. Joint primer supplied by the same manufacturer supplying the sealant.
- C. Backer-Rod: Closed cell polyethylene backer-rod shall be used in sealant joints. The backer-rod shall be resilient and of a diameter at least 1/8 inch larger than the groove and shall be approved by the sealant manufacturer.

3. EXECUTION

3.1 INSTALLATION

- A. Joints constructed and located as shown on the drawings.
- B. Sealant Surfaces: Clean, free of oil, grease, residue and other foreign materials, prior to application of sealant in accordance with manufacturer's recommendations. Prime all joints with joint primer.
- C. Sealant Application:

1. Tape or otherwise protect surfaces adjacent to joints not intended to receive sealants. The backer rod shall be accurately placed in the joint to provide the depth of sealant called for on the drawings.
2. Neatly apply sealants to fill void required to level non-sag surface. Maintain uniform application procedures to continuously apply sealant. Complete joint system without intermediate stops and starts.
3. Sealant shall be applied according to manufacturer's recommendations in a manner so as to avoid entrainment of air in the joint. All sealant shall cure at least 7 days before the structure is filled with water.
4. Secure preformed board to surfaces with fasteners and procedures recommended by manufacturer.

* * * END OF SECTION * * *

SECTION 03253

WATERSTOPS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Concrete Formwork: Section 03100
- B. Cast-In-Place Concrete: Section 03300

1.2 QUALITY CONTROL ASSURANCE

- A. Qualify each PVC welder by demonstrated welding performance on straight and intersection welds. Test samples to 75% of tensile and shear stresses of original product. Testing by independent testing laboratory.
- B. Design waterstop intersection fastening methods where normal welding is not appropriate. Design by waterstop manufacturer.

1.3 SUBMITTALS

- A. Welder qualifications and certification by testing laboratory.
- B. Specification and descriptive literature for welding tools to be used (same as those used to certify welders).
- C. Complete shop drawings of all weld locations, intersection details, support and forming details.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver in original container.
- B. Store and handle in manner to prevent damage or contamination which would cause leaks or affect bond with concrete.

2. PRODUCTS

2.1 MATERIALS

- A. Extruded virgin polyvinyl chloride, minimum tensile strength 1,900 psi, ultimate elongation 375% in accordance with ASTM D412.
- B. PVC Configurations:
 - 1. Hollow-center bulb waterstops 6-inch overall dimension, 3/16 inch minimum thickness, Water Seals, Inc., "Flex-bulb"; Tecon Products Co., "Multi-seal type 6", or equivalent.
 - 2. Labyrinth waterstops 4-7/16 inch overall dimension, 3/16 inch minimum thickness, Water Seals, Inc., type B-3, 3-rib; Structural Specialties Corp., Type SS-22, or equivalent.
- C. 6" - 16 gauge galvanized steel. Use only where and when specifically noted.

3. EXECUTION

3.1 AREAS REQUIRED

- A. Provide in all joints below grade or liquid level except joints within liquid-containing chambers not intended to be watertight. Waterstops may also be provided in other locations as shown on drawings.

3.2 SPLICES

- A. Make splices and intersections in accordance with the manufacturer's instructions and with approved welding unit. Align splices as illustrated on approved detail drawing submittals. Control heat application.

3.3 INSTALLATION

- A. Install in accordance with the manufacturer's installation instructions for continuous watertightness. Thoroughly vibrate or compact concrete under and around the waterstop to achieve concrete contact with all waterstop surfaces.
- B. Prevent waterstops from being deformed or forced out of place when concrete is placed. Support with reinforcing steel or in conformance with the manufacturer's published recommendations. Hand placement of concrete around waterstops may be required.
- C. Clip hog-rings through top of waterstop used in wall to footing joints at maximum of 1'0" spacing and support rings with continuous horizontal reinforcement. Lap galvanized waterstop 12" and fasten laps with four 1/8" galvanized bolts.

* * * END OF SECTION * * *

SECTION 03300

CAST IN PLACE CONCRETE

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Testing Laboratory Services: Section 01410
- B. Concrete Formwork: Section 03100
- C. Concrete Reinforcement: Section 03200
- D. Anchors and Inserts: Section 03251
- E. Expansion and Contraction Joints: Section 03252
- F. Waterstops: Section 03253

1.2 QUALITY ASSURANCE

- A. Delivery: Furnish a certificate with each truckload of concrete product delivered to the site, indicating the composition and quality of the mix. Include size and weight of each aggregate, amount of cement, amount of water and amount and kind of any additives included in the concrete, grout fill, or mortar.
- B. Standards: All applicable standards of the following:
 - 1. American Concrete Institute - ACI
 - 2. Concrete Reinforcing Steel Institute - CRSI
 - 3. Uniform Building Code - UBC
 - 4. Other local codes or criteria noted on drawings.
- C. Concrete Consistency:
 - 1. Test each truckload of concrete for slump. Calibrate each mixer or haul unit to be used by measuring slump near the beginning and near the end of the discharge cycle. Mix units determined by the Engineer to be deficient in mixing capability shall not be used in subsequent deliveries. Slump testing procedures per ASTM C143.
 - 2. Consistency per values below with tolerance of ± 1 inch.
 - a. 2-3 inches slump for structural elements 12 inches and greater in thickness.
 - b. 2-4 inches slump for structural elements less than 12 inches in thickness and columns.
- D. Concrete Test Cylinders:
 - 1. Prepare a minimum of four (4) test cylinders for each location (slab, wall, column, beam, etc.) for each days placement or each 50 cu. yd. whichever is greater.
 - 2. Test set of four (4) cylinders as follows:
 - a. One at 7 days.
 - b. One at 14 days or as required.
 - c. Two at 28 days.
 - 3. Prepare and test cylinders per ASTM C31 and C39.
- E. Prior to placement have available at placement location all tools, cylinder molds, slump cone, rod, curing containers and all other apparatus required for sampling and testing.
- F. Air Entrained: One test for each mix design.

1.3 SUBMITTALS

- A. Concrete mix design (for each concrete type used) by independent laboratory, including strength tests of four (4) cylinders proportioned to mix design formula.

- B. Certification of quality of all concrete, mortar, and grout mix design ingredients including admixtures with supporting test data, mill quality control results and all information specified and requested by the Engineer.
- C. Qualifications of Quality Assurance Control personnel responsible for concrete consistency, strength, air content and all testing.
- D. Curing materials and methods proposed with certification statements of materials quality.
- E. Test results, in approved format, at specified intervals for all field sampling and specimens.
- F. Certification of quality and type of epoxy bonding materials.
- G. Trip tickets for each load of concrete, grout or mortar indicating weights of all materials and additives used in the batch.
- H. Location of construction joints not shown on the plans.

1.4 STORAGE OF MATERIALS

- A. Maintain in continuously clean environment and in manner required to maintain homogeneity.
- B. Cements, grouts, and mortar containerized and kept in dry humidity environment. Engineer shall reject materials which have hardened or show any evidence of initial hydration.

2. PRODUCTS

2.1 CONCRETE

- A. ASTM C94 with mix design approved by Engineer.
- B. Compression strength and water cement ratio: The minimum compressive strength and cement content of concrete shall be not less than that shown in the tabulation that follows. The Engineer may order the cement content for any class of concrete to be increased over the quantity specified in the tabulation if it is determined that such increase is necessary to attain the required strength. Such increased quantities of cement, if so ordered, shall be furnished by the Contractor at no additional cost to the Owner.

Class of Concrete Min. 28-day Compr. Strength (psi)	Type of Work	Max. Size Aggregate (in.)	Min. Cement Pounds Per cu. yd.	Max. W/C Ratio
4,000	Walls, foundations, pits and slabs on grade	1-1/2	564	0.45
4,000	Elevated slabs	1	564	0.45
3,000	Cradles, thrust blocks, encasements and all other uses.	1-1/2	517	0.45
Lean	Encasement of dowels for future expansion	--	188 (235 max.)	--

- C. Cement ASTM C150:
 - 1. Type II for all wastewater holding or process structures.
 - 2. Type I or II for all other structures.

- D. Aggregates:
 - 1. Conform to ASTM C33.
 - 2. Maximum wear 50% at 500 revolutions, AASHTO T96.
- E. Water:
 - 1. Clear free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.
- F. Admixtures:
 - 1. Use only those specified in approved mix design.
 - 2. Air entrain all concrete unless elsewhere excepted, with agent conforming to ASTM C260. Freshwater concrete air content between 4% and 6% by volume.
 - 3. Apply in strict accordance with manufacturer's printed instructions.
 - 4. No chloride contents permitted.
 - 5. Compatible with coatings specified elsewhere.

2.2 AGGREGATE FOR MORTAR

- A. Conform to 2.1 except gradation as follows:

Sieve Size <u>Square Opening</u>	Percent Passing <u>By Weight</u>
No. 4	95 - 100
No. 8	80 - 90
No. 16	55 - 97
No. 30	30 - 60
No. 50	12 - 30
No. 100	0 - 10

2.3 GROUT

- A. For equipment and column bases and drilled in anchors use nonshrink, nonstaining, premixed grout, Masterflow 713 by Master Builders; or equivalent. Mix in accordance with the manufacturer's directions.
- B. For Fill: Driest consistency practical composed of 1 part Portland Cement 3 parts sand (by volume). Aggregate proportions may be varied slightly to give the most workable mix.
- C. For placement at base of walls, one part fine aggregate, one part cement. In a thick cream consistency.
- D. Cure in accordance with manufacturer's recommendations.

2.4 CURING MATERIALS

- A. Polyethylene Sheeting 0.004 inch thick.
- B. Waterproof Paper: Polyethylene-coated, Fed. Spec. UU-B-790 Type I, Grades A, B, C, Style 4. Define lap control lines clearly by printed markings.
- C. As recommended by floor hardener manufacturer in conjunction with their product.

2.5 FLOOR SEALER

- A. General
 - 1. The floor sealer shall be a 2-component water-based epoxy product polyamide designed to protect concrete surfaces from dusting, enhance the cleanability of floors and to minimize surface damage caused by most types of chemical spillage.
 - 2. Sealer shall be applied to the maintenance building floor. Various colors are available.

3. Product shall be water-based, containing no flammable solvents; VOC compliant with low odor and designed to minimize floor surface clean-up and traffic wear.
4. Material Specifications:

<u>Property</u>	<u>CC400EP</u>
Solids Content	45-50%
Color	Clear, pale amber
Coverage	250-350 SF/gal.
Recommended Thickness	3 mils dry
Weight per gallon	Part A: 6.55 lbs. Part B: 1.90 lbs.
Mix Ratio	4 : 1 by volume
Shelf Life	12 months
VOC Content	Part A: 1.26 lbs./gal. Part B: 0.0 lbs./gal. Mixed: 1.0 lbs./gal.
Abrasion Results	56 mg loss Taber Abrasor CS-17 Calibrase Wheel 1000 gm. Load, 500 cycles
Impact Resistance	Gradiner Variable Impactor 50 in-lb., direct passed
Flexibility	No cracks on 1/8" mandrel
Cure Schedule at 75°	Tack Free 4 hrs. Recoat 5-7 hrs. Light Traffic 8-16 hrs. Full Cure 2-7 days
Pot Life	45-90 minutes at 75° F.

<u>Chemical Resistance:</u>	<u>Immersion</u>	<u>Splash</u>
Weak Acids	Good	Good
Strong Acids	Not Recommended	Not Recommended
Bases (Alkali)	Very Good	Excellent
Petroleum Solvents	Not Recommended	Not Recommended
Hydraulic Fluid	Good	Good
Gasoline	Very Good	Very Good
Ethylene Glycol	Excellent	Excellent
Battery (Sulfuric) Acid	Very Good	Very Good

5. Installation: Surfaces to be coated must be clean and free of surface contamination such as dust, dirt and laitance. Surfaces can be damp, but there must be no standing water. Concrete surfaces may be prepared by high pressure water cleaning, wire brushing, sand blasting or acid etching.
6. Application: Product may be rolled, brushed or sprayed on floor surface.
7. Product: Product shall be CC400EP water-based epoxy sealer as manufactured by Hilti, P.O. Box 21148, Tulsa, OK 74121, or approved equal.

2.6 VAPOR BARRIER

- A. Glass fiber reinforced waterproof paper coated with polyethylene (both sides). Fed. Spec. UU-B-790 Type I grades A, B, C Style 4. Define lap control lines clearly by printed markings.

3. EXECUTION

3.1 MIXING AND TRANSPORTATION

- A. Ready-Mixed Concrete: Conform to ASTM C94 Alternate No. 3.

3.2 PLACING

- A. Deliver only in sufficient quantities required for specified time interval use and placement. Discard concrete having initial set before placement. No remixing with water or supplementing with other materials will be permitted once initial set has occurred. Initial set as evidenced by typical hydration characteristics to be determined by Engineer and Contractor quality assurance representative.
- B. Place as nearly as possible to final position to avoid segregation of the materials and displacement of reinforcement. Placement shall be completed within 30 minutes after water is first added to the mix. However, at the Engineer's discretion if climatic and temperature conditions are suitable and when the concrete is continually agitated, the time may be extended to 1-1/2 hours.
- C. Place no concrete in the absence of the Engineer.
- D. Do not change consistency (slump) for a given placement without the Engineer's written permission.
- E. Keep open trough and chutes of steel or steel lined, clean and free from coatings of hardened concrete.
- F. Do not drop concrete a distance of more than 5 feet unless approved in writing by the Engineer.
- G. Do not place concrete in horizontal members or sections until the concrete in the supporting vertical members or sections has been consolidated and a 2-hour period has elapsed since placement in the vertical member to permit shrinkage to occur.
- H. In walls containing door and window openings, hold up placements at the top and bottom of the openings. Stop other placements at levels to conform to drawing details.
- I. Layout and sequence of placing of concrete in monolithic structures as shown on the drawings or approved by the Engineer.
- J. Within a placement, deposit concrete in horizontal layers not to exceed 18 inches in depth. Place at rate such that: (1) no concrete surface shall obtain initial set before additional concrete is placed on it and (2) yielding of forms is not so great as to cause the concrete surfaces to exceed the tolerances specified.
- K. Unless specified otherwise, place all slabs and finished floors to finish elevation in one continuous operation, except that the Contractor may place a separate finish topping if prior approval is received from the Engineer. Floor and roof slab sectional thicknesses shown are minimum thicknesses. Slopes on floors or roofs increase, rather than decrease, slab thicknesses.
- L. Where a separate finish topping is placed, decrease structural slab thickness by the maximum thickness of the finish topping and maintain finished floor elevation as noted on the drawings.
- M. Construction Joints:
 - 1. Locate construction joints as shown on the drawings or as approved by the Engineer.
 - 2. Locate construction joints so as not to impair the strength of the structure, and only at locations shown on the drawings or approved by the Engineer.
 - 3. Construct bulkheads to neatly fit reinforcement and waterstops and prevent concrete leakage.
 - 4. Provide waterstops or sealants in construction joints where required.
 - 5. Unless shown otherwise, key all construction joints.
 - 6. Continue reinforcement through construction joint unless otherwise shown or noted.
 - 7. Before placing concrete against previously placed concrete, thoroughly roughen and clean by wet sandblasting or green cutting with an air-water jet.
 - a. Use air-water cutting at the proper time after the initial set. Use a high pressure air-water jet to expose clean, sound aggregate without undercutting the edges of the larger aggregate. Protect adjacent subgrade when cutting is used on slab edges.

- b. After cutting or sandblasting, rinse the surface until wash water contains no cloudiness. Dispose of wastes from cutting, washing and rinsing so they do not stain or abrade exposed surfaces.
8. Place concrete continuously to a predetermined construction joint.
- N. Care shall be taken in placing concrete through reinforcement so that no segregation of the coarse aggregate occurs. On the bottom of beams and slabs where the congestion of steel near the forms makes placing difficult, a layer of mortar, of the same strength as used in concrete, shall first be deposited in the forms, followed immediately by the concrete. The thickness and use of this mortar layer shall be as approved by the Engineer.
- O. Special care shall be taken to prevent splashing forms or reinforcement with concrete. Any hardened concrete or partially hardened concrete on the forms or reinforcements above the level of the concrete already in place shall be removed before proceeding with the work.
- P. Cold Weather Placement:
 1. Concrete shall be placed only when the temperature is at least 40°F., and rising, unless permission to pour is obtained from the Engineer.
 2. Material shall be heated and otherwise prepared so that batching and mixing can proceed in full accord with the provisions of this Specification.
 3. Suitable means shall be provided for maintaining the concrete at a temperature of at least 50°F for a period of at least the first five (5) days and at a temperature above freezing for the remainder of the specified curing period, except that where high-early-strength cement is used, this period may be reduced to 72 hours. The methods proposed for heating the materials and protecting the concrete shall be approved by the Engineer.
 4. Salt, chemicals, or other materials shall not be mixed with the concrete for the purpose of preventing freezing. Accelerating agents shall not be used.
- Q. Hot Weather Placement:
 1. The temperature of fresh concrete at the time of placement during hot weather shall be a maximum of 90°F to prevent an accelerated setting of the concrete.
 2. A retarding densifier admixture shall be used when the high expected atmospheric temperature for the day is 85°F or above. Admixture shall be used in accordance with the manufacturer's recommendations.
- R. Placing Concrete Against Earth:
 1. Unless otherwise called for on the drawings, earth cuts shall not be used as forms for vertical surfaces without the prior approval of the Engineer.
 2. Concrete placed on or against earth shall be placed only upon or against firm, damp surfaces free from frost, ice and standing or running water. Concrete shall not be placed upon mud, or upon fills until the required compaction has been obtained.
- S. Placing Concrete Slabs:
 1. Smooth subgrade surface irregularity with thin film of masonry sand prior to placing vapor barrier.
 2. Place vapor barrier on subgrade in maximum widths commercially available. Longitudinal laps 6 inch minimum. End laps 2 feet minimum.
 3. Edge and side laps to be in continuous contact. Place materials to maintain tight lap contact.
 4. Repair any tears in the material.
 5. Place concrete without displacing vapor barrier.
- T. Depositing Concrete in Water:
 1. Concrete may be deposited in water only when specifically authorized.
 2. Methods and equipment used shall be acceptable to the Engineer.
 3. When deposited by the tremie method, the tremie shall be watertight and sufficiently large to permit a free flow of concrete. The discharge end shall be kept submerged continuously in the concrete and the shaft kept full of concrete to a point well above the water surface. Placing shall proceed without interruption until the top of the concrete has been brought to the required height.

3.3 COMPACTING

- A. Compact all concrete with high frequency internal vibrators immediately after placing.
- B. Use external vibrators for compacting concrete where the concrete is inaccessible for adequate compaction by internal vibrators; construct forms sufficiently rigid to resist displacement or damage from external vibration.
- C. Penetrate concrete with a sufficient number of vibrations immediately after it is deposited. Move vibrator throughout the mass so as to thoroughly work the concrete around reinforcement and embedded fixtures and into corners and form recesses. Vibrate the minimum time required to compact the concrete in place and not cause separation of the materials. Concrete shall be compacted to maximum density as determined by tests for yield. Select vibrator size to efficiently accommodate reinforcement clearances.

3.4 CURING AND PROTECTION

- A. General:
 - 1. Maintain at site ready to install, before actual concrete placing begins, all equipment and materials needed for optimum concrete curing and protection; maintain extra vibrators on standby in case of malfunction of any unit.
 - 2. Protect finished surfaces or edges from stains, abrasions and breakage during the entire construction period.
 - 3. Protect all concrete from accelerated drying and excessive heat at all times. Close all galleries, conduits and other formed openings through the concrete during the entire curing period and as long thereafter as practicable to prevent drying of concrete by air circulation.
 - 4. Install slab curing covers immediately after initial set or as soon as free water has disappeared from the surface of the concrete after finishing or surfacing.
- B. Water Curing (Preferred):
 - 1. Use water curing specified herein for concrete placement.
 - 2. Keep concrete continuously wet by covering with burlap or an approved material utilizing a system of perforated pipes or mechanical sprinklers or other approved methods. (Periodic wetting acceptable.)
 - 3. Keep forms wet at all times to prevent opening of joints and the drying out of the concrete.
 - 4. Water for curing shall be clean and free from any elements which might cause objectionable staining or discoloration of the concrete.
 - 5. Cover surfaces completely with sheeting. Where a single sheet does not cover the entire surface, lap ends and edges at least 4 inches and continuously seal with tape or other suitable means recommended by the manufacturer.
 - 6. Continue waterproof sheet curing for 7 days. Maintain sheeting and edge and end seals intact for entire period. Repair immediately any breaks in the sheeting envelope.
- C. Curing Compounds (Use only when specifically approved and for optimum climatic conditions):
 - 1. Do not use curing compounds unless their use is authorized in writing by the Engineer. Curing compounds unacceptable where concrete is exposed to the direct rays of the sun or accelerated drying conditions.
 - 2. Curing compounds shall not be used unless their use is face membrane type and shall be applied in accordance with the manufacturer's recommendations. They shall be of such composition and characteristics as will spread readily on moist concrete and deposit a hard, tenacious film without permanently coloring the concrete surfaces that will be exposed. The resultant film shall adhere to the concrete surface without chemical reaction therewith, and shall not peel. Maintain coverage for 28 days to prevent detrimental loss of water from the concrete.
 - 3. Prior to applying curing compounds to formed surfaces, the surfaces shall be moistened with a spray of water immediately after forms are removed. Moistening shall be continued until the surfaces will not readily absorb more water. The compound shall be applied as soon as the moisture film has disappeared and while the surface is still damp.

4. On unformed surfaces, the compounds shall be applied immediately after finishing and after bleeding water and "shine" has disappeared.
5. Curing compounds shall not be used on surfaces where future bonding, painting or protective coating is required. In cold weather, curing compounds shall not be used on concrete surfaces that are kept at curing temperature by the use of steam.

3.5 REPAIRING CONCRETE

- A. Immediately after removal of forms, break back all form ties and inspect concrete surfaces for defects. Complete repair of defects within 48 hours after removal of forms. No repairs shall be made until the defects have been reviewed and method of repair approved by the Engineer.
- B. Remove all defective or damaged concrete, including honeycombed, sand streaked, or fractured material from the area to be repaired. Chip out areas to one inch minimum depth. Edge shall be squared with the surface to eliminate feather edges.
- C. Before placing the repair material obtain Engineer inspection. Clean area free of chipping dust, dried mortar, and all other foreign materials.
- D. Keep surfaces to be repaired continuously wet for at least three hours prior to placing new concrete or mortar. No free water on the surface when the repair material is placed.
- E. Apply a bonding agent to the area to be repaired before placing repair material. Apply the bonding agent per manufacturer's published instructions attached to container.
- F. For all repair surfaces permanently exposed to atmosphere use white cement in proportions found by trial to be effective in producing a color that, in the hardened patch, will match the surrounding concrete surface.
- G. Make repairs or patch form tie holes by (1) dry-packing, (2) filling with concrete, or (3) plastering with mortar or a combination of all 3 in conformance with the following:
 1. Use the dry-pack method for holes at least one inch deep where the depth is equal to, or greater than the smallest surface dimension of the defect, such as cone-bolt or form tie holes, and for narrow slots cut for the repair of cracks. Do not use the dry-pack method where lateral restraint cannot be obtained. Place and pack dry-pack mortar in layers having a compacted thickness of approximately 3/8 inch. Solidly compact each layer over its entire surface by use of a hardwood stick and hammer. Do not use metal tools for compacting. Compact surface just flush with adjacent area. Do not use steel finishing tools or water to facilitate finishing.
 2. Use concrete replacement for (1) holes extending entirely through concrete sections; (2) for holes larger than one square foot and deeper than four inches in which no reinforcement is encountered; (3) for holes larger than 1/2 of one square foot where reinforcement is exposed. Concrete used for replacement shall be of the same strength and mixture as used in the structure except for color matching as specified above.
 3. Use mortar replacement for holes too wide to dry-pack and too shallow for concrete replacement and when approved by the Engineer for other conditions not covered above.
- H. Cure all repairs with the same methods as new concrete.

3.6 CONCRETE FINISHES AND TOLERANCE

- A. General Finish:
 1. Finish concrete surfaces to conform with the following table unless otherwise noted on the drawings.
 2.

<u>Formed Surfaces</u>	<u>System</u>
Exterior - Exposed and One Foot Below	F4
Exterior - Below Grade	F2
Interior	F3

3. Slabs
 - Tops of exterior footings in contact with soil or backfill U2
 - Exterior - Except as Otherwise Noted U5
 - Interior - Walking Surface Except as Otherwise Noted (with hardener)
(As per requirements of floor hardener manufacturer and specialty contractor.)
 - Interior - Tank and Channels U4
 - Exterior and Interior Walks on or over structures including
interior clarifier slab to receive swept in grout fill U1
- B. Formed Surfaces: Finishes for formed surfaces shall be as designated below:
 1. Finishing for F1 and F2 finishes consists of concrete repairing only, which is to be completed within 48 hours after forms are removed.
 2. Finishing for F3 and F4 finishes shall immediately follow concrete repairing and be completed within 96 hours after the forms are removed. Except where forms are left in place for the duration of the curing period, finishing shall be done during the curing period, keeping the interruptions to the curing process as short as possible. Where forms left on prevent finishing during the curing period, finishing shall be completed within 48 hours after forms are removed. All finishes shall receive a minimum of 24 hours of curing after completion of the finish. Curing shall be carefully done so as not to disturb or remove any of the mortar.
 3. Finish F1: Rough formed surface with defective concrete repaired and form tie holes and other holes over ½ inch deep filled. Forms may be built with a minimum of refinement and form sheathing may be any material that will not leak mortar or yield beyond specified tolerances when the concrete is vibrated.
 4. Finish F2: Smooth, formed concrete surface with all fins, projections and loose material removed and defective concrete and form tie holes and other holes over ½ inch deep, repaired and filled. Forms in contact with concrete shall be plywood or steel.
 5. Finish F3: Smooth, formed concrete surface with all fins, projections and loose material removed, and defective concrete, form tie holes, air bubble holes, surface pits, holes from defective forms, nailhead holes and similar surface defects, repaired and filled. Forms in contact with concrete shall be plywood or steel. Form construction shall be planned so that if any pattern from the forms is left in the concrete surface it will harmonize with the structure or building. All joints shall be horizontal or vertical.
 6. Finish F4: Exceptionally smooth, formed concrete surface with all fins, joint marks, bulges, projections and loose material removed. Sandblast to expose air bubble holes, surface pits and similar minor surface defects. Defective concrete, form tie holes, holes from defective forms, and other holes too large to fill by "sack rubbing" shall be repaired and filled. Finish with sack rubbing as follows.
 - a. Thoroughly wet the surface and begin treatment while the concrete is still damp. Use 1 part cement, 2 parts (by volume) of sand which will pass a No. 16 screen, and enough water so that mortar consistency will be that of thick cream. Rub mortar thoroughly over the area with clean burlap or a cork or sponge rubber float to fill all pits, surface holes and air bubble holes. While the mortar in the pits is still plastic, rub the surface with a dry mix of mortar. This dry rub shall remove all excess mortar and place enough dry material in the pits to stiffen and solidify the mortar flush with the surface. No material shall remain on the surface except that within the pits. When the ambient temperature is 85°F or higher, keep the mortar continuously damp by means of a fog spray for 24 hours during the setting period. Take care that the fog spray does not remove any of the mortar. Break finish for any area only at natural breaks in the finished surface.
 - b. Rub all surfaces that are to be finish painted with a carborundum stone to provide a smooth texture and to remove any latent material on the surface. Pre-blast walls to remove any residual form oils prior to finishing when walls are to be finish painted.
 - c. Form requirements shall be the same as Finish F-3.
- C. Unformed Surfaces:

1. Working on unformed surfaces in various finishing operations shall be held to the minimum required to produce the desired finish. Use of any finishing tool in areas where water has accumulated will not be allowed. Work in these areas shall be delayed until the water has been absorbed, has evaporated, or has been removed by draining, mopping, dragging off with a loop of hose, or by other means. In no case, shall cement or mixture of cement and sand be spread on the surface to absorb excess moisture nor shall such materials or water be added to facilitate troweling. Joints and edges, unless specified otherwise, shall be carefully finished with edging tools.
2. Finishes for unformed surfaces shall be as designated below:
 - a. Finish U1: Even, uniform finish. Consolidate level and screed concrete to obtain an even, uniform surface. Surplus concrete shall be removed immediately after consolidation by striking it off with a sawing motion of the straight edge or template across wood or metal strips, that have been set as guides. When the surface is curved use screed strips at approved intervals. For long, narrow stretches of curved surfaces such as on invert paving, a heavy slip form may be used. In the case of extensive flat paving, a paving and finishing machine is preferred.
 - b. Finish U2: A wood float finish. Follow treatment specified for finish U1 by floating either by hand, or by power driven equipment. Floating to be started after some stiffening has taken place in the surface concrete and the moisture or "shine" has disappeared. Work the concrete no more than necessary to produce a surface known as "wood float finish" which is uniform in texture and free of screed marks. Do any necessary cutting and filling during the floating operations.
 - c. Finish U3: A steel troweled finish. Follow the treatment specified for the finish U2, except leave a small amount of mortar without excess water at the surface to permit effective troweling. Start steel troweling after the moisture film or "shine" has disappeared from the float surface and after the concrete has hardened enough to prevent an excess of fine material and water from being worked to the surface. Trowel with firm pressure that will flatten the sand surface left by the floating and produce a dense, uniform surface free of blemishes, ripples and trowel marks.
 - d. Finish U4: A hard, steel troweled finish burnished. Follow the treatment specified for finish U3 with additional steel troweling after the surface has nearly hardened, using firm pressure and troweling until the surface has a burnished appearance.
 - e. Finish U5: Broom finish. Follow the treatment specified for finish U3 by roughening the surface immediately after troweling with a fiber bristle broom in a direction perpendicular to the direction of traffic. Broom grooves not more than 1/16 inch deep. After brooming, neatly tool all joints and edges to configuration.
 - f. Finish U6: Anti-slip finish. Follow the treatment specified for finish U3 and immediately after troweling, dust 30 to 40 lbs. or regular non-slip aluminum oxide 14/36 grit abrasive grain uniformly over each 100 sq. ft. of area. Trowel the grit into the surface and after troweling, brush with a fiber bristle broom in a direction perpendicular to the direction of traffic. Broom grooves not more than 1/16" deep. After brooming neatly tool all joints and edges to configuration.

D. Tolerances:

1. Unless otherwise required, allowable tolerances for concrete surfaces shall be in accordance with those shown in the table below. Surface irregularities are classified as either "abrupt" or "gradual". Offsets caused by displaced or misplaced form sheathing, lining, or form section or by defective form lumber shall be considered as abrupt irregularities. All others are classed as gradual irregularities. Gradual irregularities shall be measured with a template consisting of a straight edge for plane surfaces and its equivalent for curved surfaces.
2. The length of the template for testing formed surfaces shall be 5 feet. The length of the template for unformed surfaces shall be 10 feet. Maintain a 5 foot length and 10 foot length steel template on the job site.
3. Maximum allowable irregularities in concrete:

DIVISION 5 METALS

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SECTION 05030

GALVANIZING

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Metal Fabrication: Section 05500

1.2 DEFINITIONS

- A. Hot-Dip Galvanizing: The dipping of steel members and assemblies into molten zinc for lasting (or long-term) corrosion protection. The resultant zinc coating fuses permanently with the base steel material.
- B. Passivating: The chemical treatment of freshly galvanized steel materials to prevent humid storage stain (white rust or white corrosion). This treatment (passivation) consists of quenching freshly galvanized steel in water to which a chromate or a chromic-acid solution, or other proprietary solution, has been added.

1.3 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. American Hot-Dip Galvanizers Association, Inc. (AHDGA): Publication, "Inspection Manual for Hot-Dip Galvanized Products."
- B. Certification: Furnish Certificates of Compliance with ASTM Specifications, and Standards specified herein. Each certificate to be signed by Contractor and galvanizer certifying that steel materials, bolts, nuts, washers, and items of iron and steel hardware conform with specified requirements.

1.4 SUBMITTALS

- A. Furnish the certified original and two copies of the Certificates of Compliance.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Packaging: Of type to prevent damage to galvanized surfaces and distortion of steel materials and components.
- B. Handling and Storage: Handle and protect galvanized materials from damage to zinc coating. To avoid humid storage stain, space surfaces of galvanized materials to permit free circulation of air.
- C. Damaged Material: Repair material showing evidence of damage to zinc coating. If not repairable, material with damaged coating will be subject to rejection.

2. PRODUCTS

2.1 STEEL MATERIALS

- A. Material for galvanizing to be geometrically suitable for galvanizing as specified in ASTM A384 and A385. Steel materials suitable for galvanizing include structural shapes, pipe, sheet, fabrications, and assemblies.
- B. Material to be chemically suitable for galvanizing.

2.2 IRON AND STEEL HARDWARE

- A. Bolts, nuts, washers, and items of iron and steel hardware furnished for galvanizing to be suitable for hot-dip galvanizing.
- B. Inspect iron and steel hardware before galvanizing and ascertain whether suitable for galvanizing. Replace items which are not suitable for galvanizing.

2.3 ZINC FOR GALVANIZING

- A. Conform with ASTM B6, and specified in ASTM A123.

2.4 GALVANIZING

- A. Steel members, fabrications, and assemblies to be galvanized after fabrication, by hot-dip process in accordance with ASTM A123. Weight of zinc coating to conform to requirements specified under "Weight of Coating" in ASTM A123.
- B. Safeguard against steel embrittlement in conformance with ASTM A123.
- C. Safeguard against warpage or distortion of steel members to conform with ASTM A384. Notify Owner of potential warpage problems which may require modification in design, before proceeding with steel fabrications.
- D. Finish and uniformity of zinc coating and adherence of coating to conform with ASTM A123, A153, or A386, as applicable.
- E. Bolts, nuts, and washers, and iron and steel hardware components to be galvanized in accordance with ASTM A153. Weight of zinc coating to conform to requirements specified under "Weight of Coating" in ASTM A153. Nuts to be tapped after galvanizing to minimum diametral amounts specified in ASTM A563. Coat nuts with waterproof lubricant, clean and dry to touch. High strength bolts for structural steel joints to be galvanized in accordance with ASTM A325.

2.5 PASSIVATING

- A. Galvanized materials subject to extended periods of storage in open, exterior locations to be given passivating treatment or light oiling to prevent humid storage stain. Treatment, solution and process subject to review and acceptance by Owner. Chromate passivation should not be used on items galvanized after fabrication which are to be painted after erection.

2.6 PRESERVATIVE OILS

- A. Do not treat freshly galvanized or passivated surfaces with oils, grease, or chemicals which might interfere with adhesion of subsequent paint primers and coatings.

3. EXECUTION

3.1 INSTALLATION OF STEEL MATERIALS

- A. Steel materials, fabrications, and assemblies are to be installed as shown on the Drawings or specified.

3.2 FIELD INSPECTION

- A. Inspect installed galvanized materials, fabrications, and assemblies in accordance with the applicable requirements of AHDGA "Inspection Manual for Hot-Dip Galvanized Products," for visual inspection.

3.3 TOUCH UP AND REPAIR

- A. Repair damaged galvanized surfaces in accordance with ASTM A780.
- B. Dry film thickness of applied repair materials to be not less than galvanized coating thickness required by ASTM A120, A123, A153, as applicable.
- C. Touch up primed-painted surfaces with same galvanized primer applied in shop. Clean damaged surfaces first to assure proper paint adhesion.

* * * END OF SECTION * * *

SECTION 05120
STRUCTURAL STEEL

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Galvanizing: Section 05030
- B. Metal Fabrications: Section 05500

1.2 QUALITY ASSURANCE

- A. Materials, Fabrication, and Erection: Conform with the latest edition of AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.
- B. Welding: By operators qualified by tests as prescribed by the AWS in Standard Qualification Procedure for performance of the type of work required.

1.3 SUBMITTALS

- A. Shop Drawings: All fabricated metals illustrating dimensions, erection details, cuts, copes, connections, holes, threaded fasteners, and welds. Base dimensional data on actual field measurements where connections interface with other materials required.
- B. Mill Test Reports: Submit mill test reports for each shipment of materials or products.

1.4 PRODUCT HANDLING

- A. Delivery of Materials Installed Under Other Sections:
 - 1. Deliver anchor bolts, anchorage devices, sleeves and other steel to be embedded in cast-in-place concrete or masonry prior to start of concrete or masonry work.
 - 2. Provide setting drawings, templates, and direction for installation of anchor bolts and other devices.
- B. Store above grade. Protect from corrosive elements.
- C. Handle and store during construction to prevent overstressing any elements.

2. PRODUCTS

2.1 MATERIALS

- A. Structural Steel:
 - 1. All new material, clean and free from damage:
 - a. Rolled shapes, bars, and plates - ASTM A36.
 - b. Steel pipe - ASTM A53.
 - c. Structural tubing - ASTM A500, Grade B.
- B. Bolts:
 - 1. Standard bolts and nuts - ASTM A307.
 - 2. High strength bolts and nuts for all structural joints-ASTM A325.
 - 3. Anchor bolts - conform to ASTM A307.
- C. Galvanizing: Galvanize bolts, fasteners and hardware unless otherwise noted in conformance with Section 05030.
- D. Galvanized surfaces need not to be painted.

2.2 FABRICATION

- A. Fabricate structural and architectural steel in accordance with the appropriate AISC Specifications with the modifications and additional requirements specified in this section.
- B. Weld all shop connections unless otherwise noted:
 - 1. Conform to AWS Code for Arc Welding in Building Construction.
 - 2. Remove all weld spatter from exposed surfaces.
- C. Bolt all field connections with high strength 3/4-inch minimum diameter bolts, unless shown otherwise.
- D. Bearing Plates: Provide bearing plates under beams, girders and trusses resting on footings, piers and walls.
- E. Straightness of Structural Members: Straightness of structural members and fabricated assemblies shall conform to AISC specification. Straighten galvanized items after galvanizing.
- F. Shop Assembly:
 - 1. Fabricate units in as large parts and sections as practicable.
 - 2. Holes in Members: Punch or drill as necessary to receive bolts and similar items. Do not cut holes with a torch. Provide adequate fastenings for wood nailers and similar items.

3. EXECUTION

3.1 ERECTION

- A. Set and secure structural steel members and appurtenant connections accurately to the required lines and levels shown on drawings.
- B. All procedures and tolerances per AISC Standards and Specifications.
- C. Bolts, Anchors and Other Accessories: Install as necessary and as required for erection of structural steel.
- D. Bearing Plates:
 - 1. Provide under all steel, such as ends of beams, girders and trusses, bearing on masonry or concrete.
 - 2. Shim with metal only and protect shims in nonshrink mortar.
- E. Columns:
 - 1. Set on leveling nuts to accurate elevations and grout solid with nonshrink mortar.
- F. Grouting: After all structural members have been properly positioned and all bolts and anchor bolts tightened, pack nonshrink mortar between concrete or masonry-bearing surfaces. Finish exposed surfaces flush and smooth.
- G. Field Painting: As specified in Division 9.
- H. Repairing Galvanizing: Repair all zinc coatings that have been damaged in handling or transporting or in welding or bolting by Galvwelding. Thoroughly clean and remove weld slag before applying Galvweld. Heat surfaces to be coated with a torch so that all metallics in the paste will melt when applied to the heated surface. Care shall be taken to see that adjacent zinc-coated surfaces are not damaged by the torch. Spread molten metal uniformly over all surfaces to be coated by wire brush or other procedures.

* * * END OF SECTION * * *

SECTION 05400

COLD-FORMED METAL FRAMING

1. GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. Types of cold-formed metal framing units include the following:
 - 1. Load-bearing punched channel studs.
 - 2. C-shaped load-bearing steel studs.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data and installation instructions for each item of cold-formed metal framing and accessories.
 - 2. Shop drawings for special components and installations not fully dimensioned or detailed in manufacturer's product data.
 - a. Include placing drawings for framing members showing size and gage designations, number, type, location, and spacing. Indicate supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.

1.4 QUALITY ASSURANCE

- A. Component Design: Calculate structural properties of studs and joists in accordance with American Iron and Steel Institute (AISI) "Specification for Design of Cold-Formed Steel Structural Members."
- B. Welding: Use qualified welders and comply with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel."
- C. Fire-Rated Assemblies: Where framing units are components of assemblies indicated for a fire-resistance rating, including those required for compliance with governing regulations, provide units that have been approved by governing authorities that have jurisdiction.
- D. Pre-Installation Conference: Prior to start of installation of metal framing systems, meet at project site with installers of other work including door and window frames and mechanical and electrical work. Review areas of potential interference and conflicts, and coordinate layout and support provisions for interfacing work.
 - 1. Coordinate with provisions of Division 1 Section "Project Meetings."

2. PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:
- B. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - 1. Superior Steel Studs, Inc.

2. USG Industries
3. United States Steel

2.2 METAL FRAMING

- A. System Components: Manufacturers' standard load-bearing steel studs and joists of type, size, shape, and gage as indicated. With each type of metal framing required, provide manufacturer's standard, steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories for applications indicated, as needed to provide a complete metal framing system.
- B. Materials and Finishes:
 1. For 16-gage and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 40,000 psi; ASTM A 446, A 570, or A 611.
 2. Provide galvanized finish to metal framing components complying with ASTM A 525 for minimum G 60 coating.
 - a. Finish of installation accessories to match that of main framing components, unless otherwise indicated.
 3. Fasteners: Provide nuts, bolts, washers, screws, and other fasteners with corrosion-resistant plated finish.
 4. Electrodes for Welding: Comply with AWS Code and as recommended by stud manufacturer.
 5. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

2.3 FABRICATION

- A. General: Framing components may be prefabricated into assemblies before erection. Fabricate panels plumb, square, true to line, and braced against racking with joints welded. Perform lifting of prefabricated units to prevent damage or distortion.
- B. Fabricate units in jig templates to hold members in proper alignment and position and to assure consistent component placement.
- C. Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer.
- D. Wire tying of framing components is not permitted.
- E. Fabrication Tolerances: Fabricate units to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet.

3. EXECUTION

3.1 INSTALLATION

- A. General: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations.
- B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24 inches o.c. spacing for nail or power-driven fasteners or 16 inches o.c. for other types of attachment. Provide fasteners at corners and ends of tracks.
- C. Installation of Wall Studs: Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges.
- D. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- E. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
- F. Install supplementary framing, blocking, and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and

furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.

- G. Frame wall openings larger than 2 feet square with double stud at each jamb of frame except where more than two are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.
- H. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.
- I. Install horizontal stiffeners in stud system, spaced (vertical distance) at not more than 54 inches o.c. Weld at each intersection.
- J. Erection Tolerances: Bolt or weld wall panels (at both horizontal and vertical junctures) to produce flush, even, true-to-line joints.
 - 1. Maximum variation in plane and true position between prefabricated assemblies should not exceed 1/16 inch.
- K. Field Painting: Touch-up damaged shop-applied protective coatings. Use compatible primer for prime-coated surfaces; use galvanizing repair system for galvanized surfaces.

* * * END OF SECTION * * *

SECTION 05410

METAL STUD SYSTEM

1. GENERAL

1.1 DESCRIPTION

- A. Work includes, but is not necessarily limited to, the following:
 - 1. all metal studs, channel tracks, and other metal accessories, etc., necessary to produce structural steel bearing partitions, non-bearing partitions, and suspended ceiling grillage.

1.2 CODES AND STANDARDS

- A. Codes: Materials and work shall conform to the governing building code. In case of conflict between these Specifications, the reference specifications, and the building code, the more stringent shall govern.
- B. Standards: Published specifications, standards, tests or recommended methods of trade, industry or government organizations apply to work of this Section where applicable.
 - 1. AISI - American Iron and Steel Institute, current edition.
 - 2. AWS - American Welding Society "Code of Welding in Building Construction".
 - 3. ASTM - American Society for Testing and Materials.
 - 4. ML/SFS - Metal Lath/Steel Framing Association.
 - 5. Steel Joist Institute
- C. "Code for Welding in Building Construction" of American Welding Society.

1.3 QUALIFICATIONS

- A. The fabricator and the erector of the metal studs shall each have had not less than five (5) years' continuous experience in their respective fields. All fabrication of metal studs shall be by a member of the Steel Joist Institute or Metal Lath/Steel Framing Association.

2. PRODUCTS

2.1 MATERIALS

- A. All light-gauge metal framing shall be detailed, fabricated, and erected in accordance with the latest edition of the American Iron and Steel Institute Specification for the Design of Cold-Formed Steel Structural Members and with the latest edition of Uniform Building Code Standard Number 27-9.
- B. Light-gauge metal framing shall comply with all applicable recommendations of the latest edition of the Metal Lath/Steel Framing Association Specification for Metal Lathing and Furring.
- C. Light-gauge metal framing shall comply with all recommendations of the manufacturers of the components used in the work.
- D. Light-gauge metal studs and joists shall be made of cold-formed steel meeting the minimum requirements given below:

For 14 and 16 gauge		ASTM A446 Grade D (galvanized)
Designated Grade 50	or	ASTM A570 Grade E (hot-rolled)
($F_y = 33$ ksi)	or	ASTM A607 Grade 50

For 18 gauge and lighter or		ASTM A446 Grade D (galvanized)
for 14 and 16 gauge	or	ASTM A570 Grade C (hot-rolled)
Designated Grade 33	or	ASTM A611-C
($F_y = 33$ ksi)		

- E. Metal studs shall be minimum 3-5/8" at 16" o.c. (or as determined by Design), roll-formed channels, hot-dip galvanized steel fabricated of 20-gauge steel with a minimum yield of 33,000 psi. Use same size metal stud for all blocking required.
- F. Structural metal studs shall be minimum 6" at 16" o.c. (or as determined by Design), roll-formed channels, hot-dip galvanized steel, structural studs fabricated of 18 gauge and heavier steel and shall have a minimum yield of 30,000 psi. Use same size metal stud for all blocking required.
- G. Light-gauge studs, runners, and rigid furring channels shall meet all applicable requirements of ASTM C754.
- H. All welds shall be touched up with a zinc-rich paint to protect against corrosion.
- I. Connections to concrete shall be by power-driven fasteners or expansion anchors as shown on the Drawings or as required by good practice. Power-driven fastened in tension shall not be used to support the weight of structural components unless specifically approved by the Structural Engineer.
- J. Lateral bracing and bridging as required by the AISI Specification and as recommended by the manufacturer shall be provided to ensure the stability of all members.
- K. Where light-gauge metal framing connects primary structural elements, such as floors in a building, provisions to accommodate anticipated structural deflections under both gravity and seismic load shall be incorporated into the construction.

3. EXECUTION

3.1 SURFACE CONDITIONS

- A. Prior to erection of the work of this Section, verify that all work of other trades is sufficiently complete to allow this installation to proceed, and verify that all such work enables the work of this Section to be completed in accordance with these Specifications.

* * * END OF SECTION * * *

SECTION 05500

METAL FABRICATIONS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Galvanizing: Section 05030

1.2 QUALITY ASSURANCE

- A. Materials, Fabrication, and Erection: Conform with the latest edition of AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.
- B. Welding: By operators qualified by tests as prescribed by the AWS in Standard Qualification Procedure for performance of the type of work required.
- C. Comply with OSHA and Building Code requirements.

1.3 SUBMITTALS

- A. Shop Drawings: All fabricated metals illustrating dimensions, erection details, cuts, copes, connections, holes, threaded fasteners, and welds. Base dimensional data on actual field measurements where connections interface with other materials required.
- B. Mill Test Reports: Submit mill test reports for each shipment of materials or products.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle materials in such a manner as to prevent damage to finished surfaces.
- B. Store above grade in clean dry locations. Protect from corrosive elements.
- C. Handle and store during construction to prevent overstressing any elements.

2. PRODUCTS

2.1 STEEL PIPE RAILING

- A. Welded construction with 1-1/2 inch black iron pipe. Grind welds smooth.
- B. Pipe shall conform to ASTM A53, Type S, Grade B, Schedule 40 for rails and Schedule 80 for posts.
- C. All hand rails shall be galvanized after fabrication. Field welds shall be galvanized with Galvweld as per drawings. Certain hand rail sections shall be field painted with approved "Safety Yellow".
- D. Suitable supports, sleeves and brackets shall be provided.
- E. On level runs, the top of the top rail shall be 42 inches above the floor. On stairway runs, the top of the top rail shall be not more than 34 inches nor less than 30 inches to the surface of tread in line with face of riser at forward edge of tread.
- F. Maximum spacing of posts shall be 6 feet.
- G. Toe boards consisting of 1/4 inch thick by 4 inches wide steel plate shall be provided on all exposed sides of all floor openings above space occupied by people. Not more than 1/4 inch clearance shall be permitted between toe board and floor level.
- H. Chain for use in conjunction with hand railing shall be common or proof coil chain galvanized, trade size 1/4 inch inside, length 1 inch-- 12 links per foot, weighing 70 pounds per 100 feet. Provide galvanized eyehooks and half-eyes as required. Provide chain at all openings in railing unless otherwise noted.

2.2 LADDERS

- A. Fabricate from steel or aluminum as indicated on the Drawings.
- B. Fabricate to comply with OSHA requirements.
- C. Provide cage or safety climbing devices where required by height or where illustrated or noted.
- D. Provide anchors and connections compatible with structural attachment surface, corrosion resistant and permanently sound not subject to loosening or pullout.
- E. Field paint "Safety Yellow". (See Section 09900, Painting, for details.)

2.3 FRAMED OPENINGS

- A. Provide metal framed openings with structural steel shapes as indicated, mitered and welded with welded-on masonry anchors, as detailed on Drawings, including edge angles for pit openings, etc.
- B. Provide adequate bracing to prevent distortion during shipment and placement.

2.4 ANCHORS

- A. All anchor bolts, anchors and other type members to be embedded in the concrete shall be zinc-coated after fabrication if pieces are fabricated, or shall be of corrosion resisting material to perform the function required in the substances which cause corrosion.
- B. Standard bolts and nuts -- ASTM A307.
- C. High strength bolts and nuts for all structured joints -- ASTM A325.
- D. Anchor bolts -- ASTM A307.

2.5 FABRICATION

- A. Fabricate in accordance with the Drawings and additional requirements specified in this section.
- B. Weld all shop connections unless otherwise noted.
- C. Bolt all field connections with high strength 5/8 inch minimum diameter bolts, unless shown otherwise.
- D. Bearing Plates: Provide bearing plates under beams, girders and trusses resting on footings, piers and walls.
- E. Shop Assembly:
 - 1. Fabricate units in as large parts and sections as practicable.
 - 2. Holes in Members: Punch or drill as necessary to receive bolts and similar items. Do not cut holes with a torch. Provide adequate fastenings for wood nailers and similar items.
 - 3. Close all ends of pipe railing or hand rail with post terminal or cap with hemispherical caps of approved design.
- F. Galvanize all steel including bolts, fastenings, and hardware unless otherwise noted.

3. EXECUTION

3.1 ERECTION

- A. Set and secure accurately to the required lines and levels shown on Drawings.
- B. Protect the finish from scratches, nicks, and dents during erection.
- C. Handrail:
 - 1. Install true to line and grade. Fabricated elements and in place elements centerline not to exceed a variation greater than 1/16 inch from design line and grade at any point.
 - 2. Pipe may be fastened to concrete by floor or wall flanges or by dry packing into concrete.
- D. Repairing Galvanizing: Repair all zinc coatings that have been damaged in handling or transporting or in welding, riveting or bolting by Galvwelding. Thoroughly clean and remove weld slag before applying Galvweld. Heat surfaces to be coated with a torch so that all metallics in the paste will melt when applied to the heated surface. Care shall be taken to see that adjacent zinc-coated

surfaces are not damaged by the torch. Spread molten metal uniformly over all surfaces to be coated by wire brush or other procedures approved by the Engineer.

- E. Anchor Bolts and Anchors: Locate and build into connecting work. Preset anchor bolts and anchors attached to templates of configuration required for fastening to structural members.
- F. Grouting: After all structural members have been properly positioned and all bolts and anchor bolts tightened, pack nonshrink mortar between concrete or masonry-bearing surfaces. Finish exposed surfaces flush and smooth.

* * * END OF SECTION * * *

DIVISION 6 - WOOD

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06100

CARPENTRY

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 - 2.3 ROUGH HARDWARE
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SECTION 06100

CARPENTRY

1. GENERAL

1.1 DESCRIPTION

- A. Work includes, but is not necessarily limited to, the following:
 - 1. Supply and construct elevated storage floor, extend existing wood fence systems, etc.
 - 2. Install 1-inch T&G plywood floor boards. Installation shall be as per the manufacturer's specifications and nailing schedule.
 - 3. Supply and installation of miscellaneous braces, floor joists, etc., for a complete system.
 - 4. Supply and installation of 1-1/8-inch plywood protective wall 4'-0" high as per Dwg. G-05.

1.2 QUALITY ASSURANCE

- A. Grading rules of the following shall apply for lumber and plywood:
 - 1. West Coast Lumber Inspection Bureau (WCLIB).
 - 2. Western Wood Products Association (WWPA).
 - 3. Softwood Plywood - Construction and Industrial Product Standard PS-1.
 - 4. FS - Federal Specifications.
- B. Identify all lumber and plywood by official grade mark.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Immediately upon delivery to the job site, place materials in an area protected from weather.
- B. Store materials a minimum of 6-inches above the ground on blocking.
- C. Protect sheet material surfaces and corners while unloading.

2. PRODUCTS

2.1 LUMBER

- A. Specified lumber dimensions are nominal.
- B. Moisture Content: unseasoned or 19% maximum.
- C. Grade: Douglas Fir, Hemlock or Cedar. Structural wood elements, other than studs, No. 1 grade, Fb = 1400 psi minimum. Studs shall be No. 3 grade.
- D. All sills, etc., which come in contact with concrete, grout or masonry shall be pressure treated.

2.2 PLYWOOD

- A. All plywood exterior grade DFPA C-C or better.

2.3 ROUGH HARDWARE

- | | | |
|----|-------------------|---|
| A. | Bolts | FS FF-B-575 |
| B. | Nuts | FS FF-N-836 |
| C. | Expansion Shields | FS FF-S-325 |
| D. | Screws & Bolts | FS FF-B-561 |
| E. | Nails | Galvanized common FS FF-N-105 |
| F. | Framing Anchors | Simpson, Timber Engineering Co., or approved equal. |

3. EXECUTION

3.1 SURFACE CONDITIONS

- A. Verify that surfaces to receive carpentry are prepared to exact grades and dimensions.

3.2 INSTALLATION

- A. Floor Sheeting:
1. Install 1-inch T&G plywood sheeting with face grain perpendicular to supports; using panel with continuous end joints, over two or more spans staggered between panels and locate over supports.
 2. Allow minimum space of 1/8-inch between end joints and 1/4-inch between edge joints for expansion and contraction.
- B. Protective Wall:
1. Install 1-1/8" T&G plywood protective wall. Attach to girts as required.
- C. Pressure Treated Wood:
1. Provide pressure treated wood for all wood fencing material. Also for all blocking, furring and nailing strips and wood in contact with concrete.
 2. Apply two brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.
- D. Nailing Schedule:
1. The nailing schedule for T&G board attachments to the floor joists shall be as recommended by the manufacturer.
- E. Wood Fence:
1. Architectural design of fence shall match existing.

* * * END OF SECTION * * *

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

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SECTION 07600

FLASHING AND SHEET METAL

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Siding and roof decking: Section 07610

1.2 QUALITY ASSURANCE

- A. Conform to requirements of Uniform Building Code.

1.3 SUBMITTAL

- A. Shop Drawings: Submit for review complete details of flashings and list of materials.

2. PRODUCTS

2.1 MATERIALS

- A. Flashing shall be made of material identical to material used for roof panels.
- B. Bolts, Screws, Rivets, Clips: Bolts, screws, rivets, clips and accessories shall be stainless steel.
- C. Sealant (Caulking Compound): Comply with Federal Specifications TT-S-00230, TT-S-00227 or ANSI Standard A116.1: polysulfide, polyurethane polymercaptan, silicone.

2.2 FABRICATION

- A. Workmanship: Conform to first class commercial practice as illustrated in Architectural Sheet Metal Manual (ASMM) by Sheet Metal and Air Conditioning Contractors National Association, Inc. Fabricate in accordance with shop drawings. Hem all edges. Form drips on bottom edges. Solder subcomponent places. Make work neat, strong, weathertight and serviceable, with adequate provisions for expansion and contraction.
- B. Downspouts: Fabricate downspouts and gutters from same material and finish as the roof and siding. Downspouts and gutter shall be minimum 20 gauge.

3. EXECUTION

3.1 PREPARATION

- A. Cooperate with other trades performing adjacent work.

3.2 INSTALLATION

- A. Seams and Joints: Maximum allowable lengths shall be no more than eight feet. Where long spans of metal are involved, allowance must be made for expansion and contraction to avoid buckling and tearing of metal. Use of expansion joints and slip fastenings rather than rigid attachments is essential. Lap all joints for a minimum of four inches and set in mastic. Where necessary for strength or stiffness, join parts with rivets or sheet metal screws.
- B. Manufactured Items: Install in accordance with the manufacturer's recommendations or instructions. Coordinate work of other trades affecting this work.
- C. Joints: Seal all end joints with elastomeric sealant. Miter corner joints similar to end joints and seal with sealant. Apply sealant in 1/4 inch diameter beads centered in overlap.

- D. Install watertight without waves, warps, buckles, fastening stresses or distortion allowing for expansion and contraction. Separate dissimilar metals, if any, from direct contact except stainless.
- E. Solder subcomponent pieces as indicated in SMACNA manual. Major lengths sealed with elastomeric sealant and fastened with slip fittings to allow for expansion and contraction.
- F. Provide elbows at bottom of downspouts that will empty onto paved areas.

3.3 CLEANUP

- A. The Contractor shall clean all visible sheet metal flashing surfaces upon completion of installation using solvent or cleaner specified by sheet metal manufacturer for cleaning such surfaces.

* * * END OF SECTION * * *

SECTION 07610

SIDING AND ROOF DECKING

1. GENERAL

1.1 DESCRIPTION

- A. The Owner is desirous of obtaining an insulated metal roof deck and siding system. This section includes the design, fabrication, delivery and erection of a complete insulated panel system. The following systems are acceptable to the Owner:
 - 1. A factory assembled preformed roof deck and wall panel system consisting of an exterior panel, insulation and interior panel.
 - 2. A field assembled system consisting of an exterior panel, rigid board insulation, and interior panel.
 - 3. A field assembled system consisting of an exterior panel, plus a "batt" or blanket type insulation with a protective vinyl coating on the inside surface. No interior panel will be required.
- B. The profile of the exterior roof panel does not necessarily have to match the profile of the exterior siding panel.
- C. All fastenings, clips and washers to match color of panels.
- D. Architectural trim members, closures, flashing and associated items.
- E. The Contractor shall clearly present, in his bid, the details of the insulated roof and siding system on which he has prepared his bid.

2. PRODUCTS

2.1 MATERIALS

- A. The exterior roof and siding panels shall be roll formed with a "V" rib, 12-inches on center. The panel shall have a nominal covering width of 36-inches. The overall depth of the panel shall be per the manufacturer's recommendation.
- B. The interior roof and siding panels shall be a roll formed panel with a "V" rib or corrugated profile.
- C. The exterior and interior faces, when securely fastened together, shall form a box beam-type section.
- D. A weather-sealing gasket or approved equal shall be provided between the exterior face and the interior face of the panel.
- E. A double interlocking vertical joint having a thermal break shall be provided for both mechanical and thermal horizontal movement.
- F. Panels shall be manufactured of 24 gage sheet steel conforming to ASTM A446 with a minimum yield strength of not less than 42,000 psi.
- G. Panel insulation requirements: minimum insulation values for all roof and wall panel insulation shall be R-11, completely nonorganic and non-absorptive material, with a flame rating not over 25.
- H. The panel design shall be in accordance with the ANSI "Specification for the Design of Cold Formed Steel Structural Members" and in accordance with sound engineering methods and practices. The panels shall be capable of withstanding fiber stress of a minimum of 42,000 psi.
- I. The roof deck panel system shall have a UL Class 90 wind uplift rating. The design of the roof deck panel system shall be to Factory Mutual approval.
- J. Ridge: The standing seam ridge shall consist of 22 gauge steel seam caps.
- K. Translucent roof and wall panels shall be an insulated type of translucent roof and wall panel. Panels shall be made from UV stabilized thermosetting polyester resins reinforced with woven

fiberglass. panels shall be "clear" and provide 32% minimum light transmittance, and shall meet or exceed the requirements of UBC Standard No. 52. Configuration shall match the Panel Rib design of the steel roof and wall panels. Installation pattern shall be as shown and described on the drawings.

- L. Protective coating for the roof and wall panels shall be zincalume or galvalume or equal, conforming to ASTM A792, approximately 50% zinc and 50% aluminum by weight with a minimum thickness of 1.8 mils.
- M. Both sides of the roof and wall panels (exterior and interior) paint finish shall consist of a baked-on modified acrylic based primer, or approved equal, not less than 0.2 mil thickness and a baked-on polyvinylidene fluoride finish coat, or approved equal, not less than 0.8 mil thickness.
- N. Paint finish shall meet the following criteria:
 - 1. Weathering: No checking, blistering or adhesion loss when tested for 5000 hours in accordance with ASTM G-23-69.
 - 2. Chalking: Will not chalk greater than #8 rating when tested for 2000 hours in accordance with ASTM D-659.
 - 3. Fading: Color change will not exceed 5 NBS units when tested for 5000 hours in accordance with ASTM D-2244.
 - 4. Humidity: Shall be less than 5% of #8 blisters when tested for 5000 hours in 100% humidity at 100 degrees F. in accordance with ASTM D-2247.
 - 5. Salt Spray: No more than 3/16" creep or tape off from scribe and less than 5% #6 blisters when tested for 1000 hours in 5% salt fog at 95 degrees F. in accordance with ASTM B-117.
 - 6. Flexibility: No rupture of coating when subjected to a 180 degree bend around a 1/8-inch mandrel in accordance with ASTM D-1737.
 - 7. Hardness: Will be F-2H pencil hardness when tested in accordance with ASTM D-3363.
 - 8. Formability Test: When subjected to a 180 degree bend over 1/8-inch diameter mandrel in accordance with ASTM D-1737, exterior coating film shall be flexible to the point of metal rupture without separation of the coating from the substrate.
 - 9. Abrasion Resistance: Coating system shall withstand a minimum of 65 liters of falling sand before appearance of base metal per ASTM D-968.
 - 10. See Dwg. S-09 for selected color details.

2.2 FORMING

- A. Roof panels shall be suitable for installation at one-inch in 12-inch pitch.

2.3 MOUNTING CLIPS

- A. Mounting clips and hardware shall allow thermal expansion and contraction of the installed roof both in the longitudinal direction of the panels and across.

2.4 FLASHING

- A. Use same material and finish as the roofing and siding. Box flashing shall be a minimum thickness of 24 gauge. The color of all flashing shall be as described on Dwg. S-09 and approved by Metro.

2.5 TRIM

- A. Use same finish as the exterior face sheets on interior corners, exterior corners, base and roof trim. The color of all trim shall be as described on Dwg. S-09 and approved by the Owner.

2.6 FASTENERS

- A. All connections of panels to structural members shall be made with aluminum pull type, self-clinching rivets. Locations shall be shown on drawings.

3. ERECTION

3.1 ROOFING AND SIDING PANELS

- A. Erect in accordance with AISC-S310 Specifications for the Design, Fabrication and Erection of Structural Steel for Building Section 1.28.3, AISC-S302 Code of standard Practice Section 7(h), and the Manufacturer's Recommended Installation Procedures and Instructions.
- B. Erect square, level, plumb and in proper alignment.
- C. Fasten panels to structural members by the method recommended by the manufacturer. Seal joints as required for weather and dust tightness. Install with panel joints oriented in accordance with manufacturer's recommendation for prevailing wind direction.
- D. End laps for any one type of roofing and siding shall be at the same elevation, occur at a girt and lap not less than two inches.
- E. Space and align fasteners at supports, end and side laps as recommended by the manufacturer.
- F. Install flashings as needed to provide weather and dust tightness.
- G. Provide closures as required for weather and dust seal.
- H. Apply sealant in accordance with the sealant manufacturer's published specifications.
- I. Reinforce penetrations and openings larger than one square foot and less than ten square feet to sustain design loads.
- J. Touch up scratches, gouges and other damage to the finish on roofing and siding and flashing as recommended by the coating manufacturer.

* * * END OF SECTION * * *

SECTION 07920

SEALANTS AND CAULKING

1. GENERAL

1.1 DESCRIPTION

- A. Work includes, but is not necessarily limited to, the following:
1. Submittals
 2. Caulking and sealing
 3. Compressible filler behind caulking and sealant at expansion joint.
 4. Caulking of wall openings for all accessories in public and private toilets, including, but not limited to, grab bars, towel bars, dispensers, soap dishes, receptacles, etc.
 5. Exterior Joints:
 - a. Joints between metal frame and precast concrete, poured-in-place concrete, or masonry. Sealant #1, #2, #10.
 - b. Vertical expansion and control joints. Sealant #2, #10.
 - c. Exterior sills, jambs, and heads of window frames, door frames, louvers, and similar openings and where metal, wood, or other materials abut or join masonry, concrete, or each other shall have sealant applied around their perimeters. Sealant #1, #2, #10.
 - d. Horizontal joints in sidewalks and concrete floors. Sealant #3, self-leveling.
 - e. Structural Glazing: Sealant #11.
 - f. Exterior sills, jambs, and heads of window frames having insulating glass. Sealant #13.
 - g. Other exterior joints as indicated or shown. Sealant #1, #2, #4, #10.
 6. Interior Joints:
 - a. Vertical expansion and control joints. Sealant #1, #2, #10.
 - b. Horizontal expansion and control joints. Sealant #3.
 - c. Other interior joints as indicated or shown.
 - d. Hidden metal-to-metal curtain wall joints expected to undergo minimal movement. Sealant #5, #8.
 - e. All joint openings and areas that must meet Sound Transmission Class Values in non-exposed areas. Sealant #9.
 - f. Any glazing system to use preformed tapes. Sealant #7.
 - g. Any glass glazing, cap beads (on glass) to surfaces made of a silica substance. Sealant #4, #10.
 - h. For sink, tub, or bath areas. Sealant #12.

1.2 JOB CONDITIONS

- A. Do not proceed with the installation of sealants under adverse weather conditions when joint to be sealed is damp, or frozen or when temperatures are below or above the manufacturer's recommended limitations for installation. Consult the manufacturer for specific instructions before proceeding.

2. PRODUCTS

2.1 MATERIALS

- A. Federal Specifications: Conform to Federal Specifications.

- B. Colors: As selected by the Architect to match adjoining surfaces. Provide special colors when required by the Architect.
- C. Sealant Primer: Suitable to substrate surfaces as recommended by the sealant manufacturer. Obtain knowledge of whether the primer is staining or non-staining prior to application.
- D. Joint Backing: Preformed compressible, resilient, non-waxing, non-extruding, non-staining strips (polyethylene foam, urethane foam, urethane foam, butyl) as recommended by the sealant manufacturer. Backing shall be of sizes and shapes to suit the various conditions and shall be compatible with sealant, primers, and substrates.
- E. Bond Breaker: As recommended by the sealant manufacturer.
- F. Cleaning Agent: As recommended by the sealant and substrate manufacturer.

2.2 SEALANT TYPES

- A. Use sealants selected from the following types as appropriate to the joint being sealed.
 1. Type 1 - One-Part Moisture Cured Polyurethane Sealant: Comply with Federal Specification TT-S-00230C, Class A, Type II and ASTM C920, Type S, Grade NS, Class 25.
 2. Type 2 - Multi-Part Polyurethane Base: Comply with Federal Specifications TT-S-00227E, Class A, Type II and ASTM C920, Type M, Grade NS, Class 25.
 3. Type 3 - Multi-Part Polyurethane Base: Comply with Federal Specifications TT-S-99227E or TT-S-00230C, Class A, Type I (self-leveling), or Class A, Type II (non-sage) and ASTM C920, Type M, Grade P, Class 25. Shore hardness 35, typical.
 4. Type 4 - One or Two-Part Silicone Sealant: For application to non-porous surfaces. Comply with Federal Specification TT-S-001543A (COM-NBS) and ASTM C920, Type S, Grade NS, Class 25.
 5. Type 5 - One-Part Butyl Rubber Based Sealant: Comply with Federal Specifications TT-S-001657, Type I (gun grade). Sealant shall be on a blend of polyisobutylene.
 6. Type 6 - One-Part Non-Drying Sealant for Concealed Metal Joints: Comply with AAMA Specifications 809.2. Sealant shall be a composition of butyl-polyisobutylene.
 7. Type 7 - Preformed Tape Sealant: Comply with AAMA 804.1. Sealant shall be based on butyl-polyisobutylene and may require built-in continuous synthetic rubber shim.
 8. Type 8 - Preformed Tape Sealant: Comply with AAMA 804.1 and 807.1. Sealant shall be based on butyl/macro-polyisobutylene and may require built-in continuous synthetic rubber shim.
 9. Type 9 - Acoustical Sealant: Non-drying, non-hardening, permanently flexible. Composed of a synthetic rubber base of a consistency conforming to ASTM D217.
 10. Type 10 - One-Part Silicone Sealant: Comply with federal Specifications TT-S-001543A (COM-NBS) and TT-S-00230C*. (COM-NBS) and ASTM C920, Type S, Grade NS, Class 25.
*Not recommended for plaza decks or any horizontal joints in concrete slabs on-grade.
 11. Type 11 - One or Two-Part Silicone for Structural Glazing: Comply with Federal Specifications TT-S-00230C and TT-S-001543A and ASTM C920.
 12. Type 12 - One-Part Silicone Sealant: Comply with federal Specification TT-S-001543A and ASTM C920, Type S, Grade NS, Glass 25 with mildew resistant additive.
 13. Type 13 - One or Two-Part Neutral Cure Structural Silicone Sealant: Comply with Federal Specifications TT-S-001543A and TT-S-00230C and ASTM C920.

3. EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Mix sealing compounds in strict accordance with the manufacturer's printed directions. Initial mixing and application shall be under the direct supervision of the manufacturer's representative.
- B. Keep copies of manufacturer's printed materials (data sheets and instructions) available on the job site for reference at all times.

* * * END OF SECTION * * *

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SECTION 08110

STEEL DOORS AND FRAMES

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Painting: Section 09900

1.2 DESCRIPTION

- A. Standard steel doors and frames.

1.3 STANDARDS

- A. "Recommended Specifications--Standard Steel Doors and Frames: SDI 100: Steel Door Institute".

1.4 SUBMITTALS

- A. Shop drawings showing anchorage and reinforcing specifically designed for required structural attachment. Illustrate all height, width, and thickness dimensions.
- B. Certification of conformance to specified standards.
- C. Manufacturer's cutsheets illustrating and specifying products.

1.5 HANDLING

- A. Store in an upright position.
- B. Protect from the elements on wood blocking in a manner to prevent damaging or marring the finish.

2. PRODUCTS

2.1 MATERIALS

- A. Sheet Steel: ASTM A525 commercial grade hot-dipped galvanized or galvanealed, 1 mil minimum thickness. ASTM A167 stainless steel sheet, AISI Type 302-304 where indicated on drawings.
- B. Core Filler: Where indicated, provide mineral wool or fiberglass filler polyurathane foam, completely filling all voids and having a "U" factor not to exceed 0.07 at exterior doors or doors where insulated door is scheduled. At all other doors provide sound deadening.
- C. Paint: Rust-inhibitive primer. For field painting, see Section 09900.

2.2 STEEL DOORS

- A. General: Doors shall be as shown and described on Dwg. S-12 Door Schedule.
- B. Fabrication: Fabricate doors in accordance with SDI 100 except as modified herein from two galvanized 16-gauge steel cover sheets rigidly locked together and internally reinforced with ladder or grid pattern construction formed of 18-gauge galvanized cold-rolled channels. Grid of no less than four continuous vertical members and no less than eight horizontal members. Turn flanges of top channel down to permit flush head construction, with no recesses to accumulate water and dust. Bevel vertical edges at 18-inch in 2-inch.
- C. Hardware Reinforcement and Location: Doors mortised, reinforced with 14-gauge or thicker reinforcement plates for all surface applied hardware. Field drill and tap for surface applied

hardware by installer. Location of hardware shall conform to NBHA recommended standards for standard doors and frames, AIA File #27.

2.3 STEEL DOOR FRAMES

- A. Door frames of section and dimensions shown, fabricated from 16-gauge steel, except doors 3'-6' wide and larger shall be 14-gauge, with mitered corners. Weld corners and grind smooth. Provide a temporary metal spreader at the bottom of frame or jamb extensions with permanent spreaders where noted in hardware schedule.
- B. Provisions for Hardware: Door frames neatly, accurately mortised and reinforced per referenced standards at hinges, box strike and other finish hardware items. Drill and tap as required. Hinge reinforcing 3/16-inch thick steel; reinforcing for other hardware minimum 12-gauge steel. Reinforcing plates spot welded to interior surface of frame. Provide three rubber silencers per frame. Provide plaster guards for other frame openings not covered by hardware. Fabricate special door frames similar and equal to stock steel doors. Fabricate exterior frames of galvanized steel stock.

2.4 SHOP PAINTING

- A. Clean metal door and frame thoroughly by power washer. Rinse and phosphate coat all exposed surfaces. Press down rough or uneven spots, and fill any pits, dents, or scratches in exposed surfaces with metal putty. Prime exposed surfaces with one shop coat of rust-inhibitive metal primer a minimum of one mil thick which will form a satisfactory base for final finish. Back of frame protected with a coat of rust-inhibitive primer.

3. EXECUTION

3.1 PREPARATION

- A. Coordinate delivery of templates from hardware supplier to frame fabricator for installation of hardware.

3.2 INSTALLATION

- A. Install steel frames in accordance with drawings and shop drawings, and in rigid, substantial manner, square, plumb and level, utilizing anchors or other approved installation devices required.
- B. Apply hardware and hang door plumb and level with not more than 1/8 inch clearance at jamb and head. Make any adjustments necessary for satisfactory operation. Install doors in accordance with SDI-105 and manufacturer's recommended instructions.
- C. Check doors for weathertightness. Weatherseal doors so that R value of installed door is not less than 14.

3.3 FIELD TOUCH UP

- A. Clean metal door and frame thoroughly and touch up any spots where shop coat is damaged with same paint used for shop coat.

* * * END OF SECTION * * *

SECTION 08210

STEEL SLIDING DOOR

1. GENERAL

1.1 DESCRIPTION

- A. A manual steel sliding door (10-feet wide x 14-feet high) fitted with an integral man door (3'-0" x 7'-0") complete with mounting members and hardware. Door shall be provided with a locking device on the inside face.

1.2 SUBMITTALS

- A. Follow Section 08110, Paragraph 1.4

1.3 HANDLING

- A. Follow Section 08110, paragraph 1.5

2. PRODUCTS

2.1 DOORS

- A. Manufacturer: Cookson, Cornell, Kinnear, Pacific, Wilson, Balfour, Mahon, North American, Overhead, Crawford, or approved equal.
- B. Door Design: Manufacturer's standard face-mounted type. Contractor is reminded that a basic wind speed of 80 MPH is required for the door designs.
- C. Material: Galvanized Steel, hot dip galvanized G-90 coating, 22 gauge, per ASTM A-525.
- D. Finish: Painted beige over factory applied prime coat. (See Dwg. S-09 and S-12.)
- E. See Door Schedule (Dwg. S-12).
- F. Accessories: Manufacturer's standard types; provide all necessary including the following:
 - 1. Weatherstripping to resist 25 psf wind pressure.

3. EXECUTION

3.1 PREPARATION

- A. Existing Conditions
 - 1. Verify that Openings to receive doors are true, square, plumb, accurately sized and located, with level headers and sills, and otherwise properly prepared.
 - 2. Prior to starting work, notify General Contractor about defects requiring correction.
 - 3. Do not start work until conditions are satisfactory.
- B. Protect against damage and discoloration caused by work of this Section.

3.2 INSTALLATION

- A. Installation
 - 1. Follow Manufacturer's directions and approved shop drawings.
 - 2. Install guide rails and tracks true within 1/4-inch per 10-ft., non-accumulating.
 - 3. Secure against displacement
 - a. Install doors free of warp, twist, and distortion.
- B. Protect contacting dissimilar metals against galvanic corrosion.

- C. Adjust moving parts to operate satisfactorily at time of project substantial completion and during warranty period.

3.3 FIELD TOUCH-UP

- A. Including work of other trades, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this Section.

* * * END OF SECTION * * *

SECTION 08307

ACCESS PANELS

1. GENERAL

1.1 DESCRIPTION

- A. Work includes, but is not necessarily limited to, the following:
 - 1. Submittals
 - 2. Furnish access panels, except panels provided by Division 15 and 16.
 - 3. Coordination related to all trades concerned with the installation of special access panels furnished by the mechanical trades (ceiling and wall).

2. PRODUCTS

2.1 GENERAL

- A. All materials shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles or pieces of equipment are required, they shall be of the same manufacture.

2.2 MATERIALS

- A. Typical access doors shall be steel, primed, 24" x 36" or as called out otherwise on the Design Drawings.
- B. Special access doors as called out in the mechanical traces shall be of a type matching that specified above.
- C. Access doors in fire-rated partitions and ceilings shall carry same rating as partition or ceiling.

3. EXECUTION

3.1 SURFACE CONDITIONS

- A. Prior to the work of this Section, carefully inspect the installed work of other trades and verify that all such work is complete to the point where this installation may commence. Verify that the final installation will be in complete accordance with the approved shop drawings and the manufacturer's recommendations.

* * * END OF SECTION * * *

SECTION 08330

COILING DOORS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Sealants & Caulking: Section 07920

1.2 SUBMITTALS

- A. Follow Section 08110, Paragraph 1.4

1.3 HANDLING

- A. Follow Section 08110, paragraph 1.5

2. PRODUCTS

2.1 DOORS

- A. Manufacturer: Cookson, Cornell, Kinneair, Pacific, Wilson, Balfour, Mahon, North American, Overhead, Crawford, or approved equal.
- B. Model: Similar to Cookson FCWI with locking assembly.
- C. Slat Design: Manufacturer's standard Flat Type. Contractor is reminded that a basic wind speed of 80 MPH is required for the door designs.
- D. Material: Galvanized Steel, hot dip galvanized G-90 coating, 22 gauge, per ASTM A-525.
- E. Finish: Galvanized, as described above.
- F. See Door Schedule.
- G. Operation: For all coiling doors - heavy duty operator - model 5 vertical mounted - 120/208 volt, 3-phase - Cookson or approved equal. Complete with "electromagnetic" clutch design; NEMA 4 motor controller; over-current protection, and a NEMA 4 pushbutton station marked "open-close-stop". A "constant contact down" feature shall be utilized for all coiling doors. Supplier responsible for selecting proper HP for proper door operation.
- H. Accessories: Manufacturer's standard types; provide all necessary including the following:
 - 1. Weatherstripping to resist 25 psf wind pressure.
- I. Door supplier to provide electrical disconnect.

3. EXECUTION

3.1 PREPARATION

- A. Existing Conditions
 - 1. Verify that Openings to receive doors are true, square, plumb, accurately sized and located, with level headers and sills, and otherwise properly prepared.
 - 2. Prior to starting work, notify General Contractor about defects requiring correction.
 - 3. Do not start work until conditions are satisfactory.
- B. Protect against damage and discoloration caused by work of this Section.

3.2 INSTALLATION

- A. Installation
 - 1. Follow Manufacturer's directions and approved shop drawings.
 - 2. Install guide rails and tracks true within 1/4-inch per 10-ft., non-accumulating.
 - 3. Secure against displacement
 - a. Install doors free of warp, twist, and distortion.
- B. Protect contacting dissimilar metals against galvanic corrosion.
- C. Adjust moving parts to operate satisfactorily at time of project substantial completion and during warranty period.

3.3 FIELD TOUCH-UP

- A. Including work of other trades, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this Section.

* * * END OF SECTION * * *

SECTION 08500
METAL WINDOWS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Metals: Division 5
- B. Thermal and Moisture Protection: Division 7

1.2 STANDARDS

- A. Architectural Aluminum Manufacturer's Association (AAMA).
- B. Sealed Insulating Glass Manufacturer's Association (SIGMA).
- C. Uniform Building Code.

1.3 SUBMITTALS

- A. Shop drawings showing anchorage and sash details.
- B. Certification of conformance to specified standards.
- C. Manufacturer's cut sheets illustrating and specifying products.

1.4 HANDLING

- A. Deliver material to the job site and store in a safe area, upright and shored up off the ground surface.
- B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer.

2. PRODUCTS

- A. Windows - See window schedule for type and size (Dwg. S-12).

3. ERECTION

- A. Windows shall be installed plumb, level and square.

* * * END OF SECTION * * *

SECTION 08520

ALUMINUM WINDOWS

1. GENERAL

1.1 DESCRIPTION

- A. Work including, but not necessarily limited to, the following:
 - 1. Fixed type aluminum windows, including glazing, complete with hardware, integral flashing, and accessories as required for complete, weathertight window installation. Windows shall be as shown and described on Dwg. S-12, Window Schedule.

1.2 REFERENCES

- A. American Architectural Manufacturers Association ANSI/AAMA 101-85: Aluminum Prime Windows and Sliding Glass Doors.
- B. Flat Glass Marketing Association (FGMA): Glazing Manual.
- C. National Association of Architectural Metal Manufacturers (NAAMM): Metal Finishes Manual.

1.3 QUALITY ASSURANCE

- A. Manufacturer: Provide units by a single manufacturer listed in Architectural Aluminum Manufacturers Association (AAMA) Certification Program Directory.
- B. Standards: Conform with ANSI/AAMA 101, window types as indicated.
- C. Design Criteria:
 - 1. Structural: Withstand code required wind loads on exterior and on interior when tested in accordance with ASTM E330, without breakage, failure of any part, or malfunction of operation.
 - a. Code: Uniform Building Code, latest edition.
 - 2. Air Infiltration: Construct and weatherseal in accordance with ASTM E283; air infiltration shall not exceed 0.37 cfm/ft² of overall frame area.
 - 3. Water Resistance: Construct and weatherseal in accordance with ASTM E331 test; pressure equal to 6.24 psf; no uncontrolled water penetration.

1.4 SUBMITTAL

- A. Shop Drawings: Indicate component connections and locations, anchor methods and locations, and installation details.
- B. Product Data: Submit manufacturer's literature.
- C. Samples: Metal finish.

1.5 WARRANTY

- A. Warranty shall provide for failure of materials or workmanship including water penetration to interior surfaces, excessive deflections, or deterioration of finishes, weatherstripping or accessories.
- B. Provide for replacing insulated glass which have defective hermetic seals, excluding that due to glass breakage.
- C. Warranty Period: Two years.

2. PRODUCTS

2.1 MANUFACTURER

- A. Aluminum Windows:
 - 1. Mercer Industries, Inc., Mercer Series 2.00 or approved equal.
- B. Glass:
 - 1. Ford Glass Division
 - 2. Guardian Industries Corp.
 - 3. Hordis Brothers, Inc.
 - 4. PPG Industries, Inc.
- C. Substitutions:
 - 1. Items of same appearance, function and performance are acceptable when approved by the Architect.

2.2 MATERIALS

- A. Aluminum Windows: Provide fixed windows, meeting requirements of AAMA Certification Program.
 - 1. Grade: Commercial "-C" grade or better for each type of window indicated for project; higher grade may be required to comply with code requirements.
 - a. Performance Class: Provide AAMA performance class as required to comply with wind loads listed in Uniform Building Code, Chapter 23.
 - 2. Fixed Windows: Designed to match other windows, in style and performance.
 - 3. Provide windows designed for use with indicated glass.
 - 4. Finish: Factory applied thermosetting silicone polyester coating conforming to AAMA 605.2. For finish coat, see Specifications.
- B. Glass: Hermetically sealed 1-in. thick insulating glass consisting of two layers of glass and 1/2-in. dry air or gas filled space with -20°F dew point; Class A sealant type edge construction.
 - 1. Glass: Select glazing quality, float glass, meeting ASTM C11036; 1/4-in. thickness.
 - 2. Outside Lite: Solar Gray tinted glass.
- C. Glazing Materials: Of type recommended by door and frame manufacturer to suit security locations and applications.
 - 1. Setting Blocks: Neoprene or EPDM, 70-90 durometer hardness; 4-in. long x 3/8-in. thick x 1/4-in. high.
 - 2. Spacer Shims: Neoprene or EDPM; 50 durometer hardness; 3-in. long x 3/32-in. thick x 1/4-in. high.
 - 3. Glazing Gaskets: Exterior neoprene or EDPM; interior neoprene EPDM or vinyl; molded corner joints.
- D. Miscellaneous Materials:
 - 1. Fasteners: Anodized aluminum or non-magnetic stainless steel of type not causing electrolytic action or corrosion; provide flush Phillips flathead or allen screws where exposed.
 - 2. Finish exposed aluminum fasteners to match aluminum work.
 - 3. Brackets and Reinforcements: Aluminum wherever possible; where steel units are required for higher strength of other unavoidable necessity, hot-dip galvanize after fabrication; ASTM A123 G-90.
 - 4. Bituminous Paint: Cold applied asphalt mastic complying with SSPC-Paint 12, compounded for 30-mil thickness per coat.

2.3 FABRICATION

- A. Fabricate windows to allow for clearances and shim spacing around perimeter to enable installation; provide for thermal movement.
- B. Provide anchorage devices to securely and rigidly fit windows in place.
- C. Accurately fit together joints and corners; match components ensuring continuity of line and design; ensure joints and connections are flush, hairline and weatherproof.
- D. Apply coat of bituminous paint on concealed aluminum surfaces to be in contact with cementitious or dissimilar materials.

3. EXECUTION

3.1 PREPARATION

- A. Examine surfaces of openings and verify dimensions.
- B. Installation of frames constitutes acceptance of existing conditions.

3.2 INSTALLATION

- A. Install windows in accordance with referenced standards and manufacturer's recommendations.
- B. Install work plumb, straight, square, level and in their proper elevation, plane and location, and in proper alignment with other work.
- C. Maintain dimensional tolerances and alignment with adjacent work.
- D. Anchor securely in place, separate aluminum and other corrodible metal surfaces from corrosion and electrolytic action with other materials.
- E. Glass Installation:
 - 1. Comply with FGMA Glazing Manual and Glazing Sealing Systems Manual and glass or glazing manufacturer's instructions.
 - a. Do not allow glass to touch metal surfaces.
- F. Upon completion of installation, remove protective coatings or coverings and clean aluminum surfaces.
- G. Check and adjust operating hardware.

3.3 CLEANING

- A. Mark glass after installation by crossed streamers attached to framing and held away from glass.
- B. Remove nonpermanent labels immediately after sealant cures; cure sealants for high early strength and durability.
- C. Remove and replace glass which is broken, chipped, cracked, abraded or damaged during construction period, including natural causes, accidents and vandalism.

* * * END OF SECTION * * *

SECTION 08710

FINISH HARDWARE

1. GENERAL

1.1 DESCRIPTION

- A. Work includes, but is not necessarily limited to, the following:
 - 1. Submittals
 - 2. Finish hardware to be furnished for doors.
 - 3. Hardware templates as required for doors and metal frames and other work to be factory-prepared for the installation of hardware.
- B. Provide additional items of hardware which are necessary to make a complete workmanlike installation, even though not specifically specified. Such items are to be equal to hardware used in other similar locations or equal to the quality established by this Specification.
- C. Only one (1) manufacturer for each category of finish hardware shall be furnished throughout the project.
- D. See Door Schedule (Dwg. S-12) for door type, frame, hardware group, location and general notes.
- E. The pre-engineered building manufacturer shall supply all exterior doors and framing. Interior doors by others.

1.2 DEFINITIONS

- A. Finish hardware shall be heavy duty quality.

1.3 SUBMITTALS

- A. Prior to delivery of hardware, submit hardware shop drawings and a hardware schedule of all hardware required. The schedule shall follow the requirements of the Specifications and list type, manufacturer's name and number, finish, and location. In addition, furnish a schedule fully identifying all abbreviations and symbols used. Review of schedule will not relieve the Contractor of responsibility for furnishing all necessary hardware.
 - 1. Provide with each set of shop drawings one copy of the standard mounting heights for hardware published by the NBHA.

1.4 PACKING, MARKING AND DELIVERY

- A. Each unit of hardware shall be individually packaged, complete with proper fastenings and all appurtenances. Each package shall be clearly marked on the outside to show the contents and specific location in the work. Except where otherwise specified, deliver all hardware to the job site.

1.5 SAMPLES

- A. If so directed by the Architect or Engineer, a sample of each and every item of hardware proposed in the work may be requested for submittal and approval.

1.6 TEMPLATES

- A. In order to ensure proper placement and fit, all hardware in connection with doors and metal frames shall be made to template. Templates or physical hardware items shall be furnished to manufacturers concerned and shall be supplied sufficiently in advance to avoid delay in the work.

1.7 WARRANTY

- A. All hardware shall be warranted for a period of two years from date of acceptance of the work. Defects in materials and workmanship occurring during the warranty period shall be corrected to the complete satisfaction of the Contracting Officer.

1.8 CATALOG CUTS

- A. When so directed by the Architect or Engineer, provide two catalog cuts of every item furnished for this project. Show all finishes, sizes, catalog numbers and pictures. Explain fully all abbreviations.

1.9 ADJUSTMENTS AND INSPECTION

- A. During the installation of hardware, a periodic inspection in company with the Architect or Engineer will be made by the Architectural Hardware Supplier or his Agent. Any hardware improperly installed shall be removed and reinstalled at the Contractor's expense. At the completion of the work, a final inspection shall be made by the AHS or his Agent. Make any and all adjustments recommended by the AHS or his Agent.

2. PRODUCTS

2.1 FINISH OF HARDWARE

- A. Special care shall be taken to coordinate the finish of the various manufacturers to ensure a uniform acceptable finish. The finish of all hardware shall match the finish of the locksets unless otherwise specified.

2.2 LOCK UNIFORMITY

- A. Except where otherwise specified, all locksets, latchsets, cylinders, and component parts as specified hereinafter shall be by one manufacturer.

2.3 LOCK STRIKES

- A. All lock strikes shall have a curved lip of sufficient length to protect the trim and jamb and shall be furnished with wrought boxes.

2.4 KEYING AND MASTERKEYING

- A. Material: Nickel-silver, or approved.
- B. Keying Instructions: As directed by Owner.
- C. Construction Keying:
 - 1. Furnish locks with factory-keyed construction cylinders.
 - 2. Include 6 construction keys for contractor's use.
 - 3. Following construction, hardware supplier shall, in Owner's presence, convert locks to Owner's permanent keying system.
- D. Required Permanent Keys:
 - 1. Change Keys: 2 for each lock.
 - 2. Master Keys: 6 for each master key set.

2.5 DOOR CLOSERS

- A. All door closers attached to mineral core or particle filled doors shall be installed with hex bolts.
- B. Provide drop brackets, mortise shoes, and long arms as required.

- C. All door closers shall be adjusted for spring setting, latch and sweep speeds, and back check.
- D. Door closers shall meet handicap standards ADA and OR UBC.

2.6 DOOR HARDWARE

- A. All locksets shall be fully mortised with the function appropriate to use of connecting rooms. Hand of lock shall be as indicated on the Design Drawings.

2.7 DOOR BUTTS

- A. Hinges shall be full mortise, template type, unless half mortise hinges are required. Hinges shall have non-rising loose pins, ball or oilite bearings and flat button tips, except where otherwise specified. Where necessary to keep door leaf clear of walls, casings, jambs or reveals in door openings, wide throw hinges of an approved type shall be furnished. Exterior door butts shall be steel, sheradized. For outswinging doors, hinges shall have a set screw in the barrel to prevent removal of pin when door is closed.

2.8 MAINTENANCE-RELATED ITEMS

- A. The Contractor shall provide one (1) set of Adjusting Tools, one (1) set of Maintenance Manuals for Locksets, Door Closers, Floor Hinges and Panic Devices.

3. EXECUTION

3.1 PREPARATION

- A. Hardware for installation of doors/metal frames, or other work to be factory-prepared for hardware installation shall be made to standard templates to be furnished to the door fabricator by the hardware manufacturer. Doors and frames will be reinforced, drilled and tapped by the fabricator for mortised hardware. Reinforcement for surface-applied hardware will be by the door fabricator, with drilling and tapping to be done in the field by the hardware installer.

3.2 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

- A. Install hardware items in compliance with the manufacturer's instructions.
- B. Do not install surface-mounted items until finishing operations have been completed on the substrate.

3.3 FIELD QUALITY CONTROL

- A. Mount hardware items at heights indicated in "Recommended Locations for Builders Hardware" by the National Hardware Association unless otherwise indicated or required to comply with governing regulations.

3.4 ADJUSTMENT AND CLEANING

- A. Adjust and check each operation item of hardware to ensure proper operation or function of all units.
 - 1. Lubricate moving parts with type of lubrication recommended by manufacturer. (Utilize graphite-type as no other lubrication is recommended.)
 - 2. Replace units which cannot be adjusted or lubricated to operate freely and smoothly as intended for the application specified.

3.5 HARDWARE SCHEDULE

- A. Provide heavy duty commercial grade finish hardware schedule by group number for identification on Drawings. Hardware manufacturers shall be as follows or approved equal:
1. Locksets and Cylinders (mortised): (Lockset Schlage - D Series commercial extra heavy duty cylindrical locks)
 2. Door Butts: Hager
 3. Door Closers and Holders: Yale
 4. Thresholds and Weatherstripping: Pemko
(all exterior door locations)
 5. Flush Bolts: BBW
 6. Door Stops, Bumpers and Silencers: BBW
 7. Finish: 626 Satin chrome plated
 8. Knobs: Plymouth
 9. Levers: Sparta

3.6 HARDWARE GROUP

<u>Group #</u>	<u>Description</u>	<u>Door #'s</u>
H-1	Passage Locked Single Entry <u>Exterior</u> Doors (D-2, D-4 and D-10) by pre-engineered building manufacturer. 1-1/2 pair butts 1 lockset (master keyed) 1 closer 1 panic push bar 1 threshold	
H-2	Passage Unlocked <u>Interior</u> Doors (D-3 and D-9) 1-1/2 pair butts 1 latchset 1 closer 1 set silencers	
H-3	Toilet/Privacy (Doors 7 and 8) 1-1/2 pair butts 1 latchset/privacy 1 closer 1 set silencers	
H-4	Passage Locked (Office - Door No. D-6) 1-1/2 pair butts 1 lockset 1 closer	
H-4	Passage Locked (Special Integral Door Fitted Within Exterior Sliding Door) 1-1/2 pair butts 1 lockset	

* * * END OF SECTION * * *

SECTION 08805

GLASS AND GLAZING

1. GENERAL

1.1 DESCRIPTION

- A. Work includes, but is not necessarily limited to, the following:
 - 1. Submittals
 - 2. Glass and glazing for windows and entrance doors.
 - 3. Sealants as required for a watertight installation.
 - 4. Neoprene glazing beads for glazing windows and doors.
 - 5. Dwg. S-12 of the contract documents (door, window and finish schedule).

1.2 CODES AND STANDARDS

- A. In addition to complying with all pertinent codes and regulations, install all glass in accordance with the standards stated in the Glazing Manual of the Flat Glass Marketing Association.

1.3 FIELD CONDITIONS - JOB MEASUREMENTS

- A. Verify all field dimensions as pertain to this Section prior to fabrication and installation of materials. Correct any detrimental discrepancies.

2. PRODUCTS

2.1 GLASS

- A. All glass shall bear the label of its manufacturer, grade of quality, and shall conform in all respects with the pertinent requirements of Federal Specification DD-G-451C, Type 1, Class 1, quality Q3. All glass shall be relatively distortion free with all distortion waves in the horizontal direction.
- B. Float Glass: Type A glazing quality for all windows and related glazed openings not requiring safety glass.
- C. Tempered Glass (Float Herculite): Conforming to 1997 UBC Human Impact, Chapter 54, Section 5406(C) and Federal Safety Standard for Architectural Glazing Materials (16 CFR, Part 1201) Design Memo #17.
- D. Identification: Each lite shall bear the manufacturer's label designating the special characteristics (tempered), and thickness shall be etched or given other permanent identification that shall be visible after glass is glazed.

2.2 CODE REQUIREMENTS

- A. Area Limitation: Exterior glass and glazing shall be capable of safely withstanding wind load pressures as set forth in Chapter 54, Section 5403 of the 1997 Edition of the UBC, Graph No. 54-1, or as adjusted by Table No. 54-A.
- B. Safety Glazing: Glazing subject to human impact shall comply with Chapter 54, Section 5406(c) 7 of the 1997 UBC.

2.3 OTHER MATERIALS

- A. All other materials, including glazing compounds, anchors, clips, and accessories, shall be only those conforming with the practices specified in the referenced standard.

3. EXECUTION

3.1 SURFACE CONDITIONS

- A. Prior to all work of this Section, carefully inspect the installed work of other trades and verify that all such work is complete to the point where this installation may commence. Verify that glazing may be performed according with the referenced standards and the original design. In the event of discrepancy, immediately notify the Architect and proceed as he directs.

* * * END OF SECTION * * *

DIVISION 9 - FINISHES

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SECTION 09250

GYPSUM DRYWALL

1. GENERAL

1.1 DESCRIPTION

- A. Work includes, but is not necessarily limited to, the following:
 - 1. The work in this Section shall conform to the requirements of all state, county, and city laws, rules and regulations and shall pass all inspections by authorities.
 - 2. Submittals
 - 3. Gypsum board finish for walls and ceilings.
 - 4. Install access panels in gypsum board finish.
 - 5. Metal drywall accessories.
 - 6. Taping, spackling and sanding for gypsum board.
 - 7. Backing plates in stud walls provided under this Section.
 - 8. Acoustical sealant at floors, ceilings and walls, where required, to meet STC ratings.

2. PRODUCTS

2.1 GYPSUM DRYWALL

- A. All gypsum drywall used on the interior of this work shall be the product of U.S. Gypsum or approved equal with the thickness as shown on the drawings. Drywall shall be tapered at edge for finished surfaces.
- B. General:
 - 1. Provide gypsum sheetrock complying with ASTM C-36 and Federal Specification SS-L-30, Type III, Class 1, Style 3, tapered edge, or butt edge for concealed surfaces.
 - 2. Supply the gypsum panels in 48-in. widths and in such lengths as will result in a minimum of joints.
- C. Regular Gypsum Panels:
 - 1. Provide regular gypsum panels, 1/2-in. thick, for single-ply application unless otherwise noted.
- D. Recessed Items: Required by code to be protected; recessed openings shall be protected by rated protection as manufactured by gypsum board manufacturer.
- E. Control Joints: Two (2) pieces of USG #100A or #400 Metal Trim of proper thickness, back to back.
- F. Water-Resistant Gypsum Panels:
 - 1. All gypsum drywall used on exterior of building shall be exterior Gypsum Sheathing. Specifically recommended by manufacturer.
 - 2. All gypsum drywall used in toilet rooms and wet areas shall be water-resistant type.

2.2 SPRAY TEXTURE FINISH (as determined by Design)

- A. Materials
 - 1. Undercoat: Full coat of undiluted, high-solid, white latex flat wall paint over the entire surface. Allow to dry.
 - 2. Texture Finish: Paint - See Section 09900 for paint specifications.

2.3 METAL ACCESS DOORS

- A. Material: Primed steel flush panel as required by surrounding walls and ceiling finish. Fire-rated when required by code.
- B. Size and Location: As required by code or as shown on Drawings.
- C. Access doors for access to electrical or mechanical controls and valves which occur in drywall partitions or furring shall be furnished and installed by this Contractor. Doors shall be located where required and installed level and square with adjacent construction.

2.4 JOINT SYSTEM

- A. All joint systems, including reinforcement tape and compound, shall be a system recommended by manufacturer of the gypsum panels as compatible with the panels used. A single compound may be used for embedment of tape, skim coating, and finishing if the compound so used is recommended for that purpose by manufacturer of gypsum panels.

2.5 FASTENERS

- A. Nails shall be "Dry-Tight" acid-etched nails or GWB-54 annular ringed nails conforming with ASTM C-380-63 for fire-rated walls and ceilings. Screws shall be type recommended for use by wallboard manufacturer and the Engineer.

2.6 METAL CORNERBEAD AND TRIM

- A. All metal cornerbead and trim shall be recommended by the manufacturer of the gypsum panels and shall be compatible with the gypsum panels and the joint system.

2.7 OTHER PRODUCTS

- A. All other products not specifically described but required for proper and complete gypsum drywall installation shall be as selected by the Contractor, subject to the Architect's approval.
 - 1. Door Frames: Cooperate with the Contractor for steel doors in the location and installation of hollow steel door frames to be erected in conjunction with the drywall partition work of this Section.
 - 2. Electrical Wiring and Plumbing Work:
 - a. Cooperate with Electrical Contractor in proper location and installation of electrical conduit, switch, and outlet boxes and wiring. Do not close both faces of partition until electrical installations have been completed, inspected and approved.
 - b. Cooperate with Plumbing Contractor for proper location and installation of Plumbing work where indicated on Drawings. Do not close both faces of partitions until Plumbing work is complete, inspected and approved.

3. EXECUTION

3.1 SURFACE CONDITIONS

- A. Prior to all work in this Section, carefully inspect all surfaces to which gypsum drywall is to be attached and verify that all work of other trades is sufficiently complete to allow commencing the drywall installation, that all required backing is in place, and that all items which will be concealed by the application of gypsum drywall have been inspected and approved.

* * * END OF SECTION * * *

SECTION 09650

RESILIENT FLOORING

1. GENERAL

1.1 DESCRIPTION

- A. Work includes, but is not necessarily limited to, the following:
 - 1. Submittals
 - 2. Vinyl composition floor tile
 - 3. Vinyl edge reducing strips
 - 4. Topset base
 - 5. Metal edge
 - 6. Sample testing
 - 7. Moisture testing

2. PRODUCTS

2.1 RESILIENT FLOORING

- A. Armstrong "Commercial Carlon" vinyl flooring, Jacquard Weave Quilted Dots, Petite Point Field/Border, Segate.
 - 1. Tarkett: Emmet
 - 2. Mannington: Fields

2.2 VINYL COMPOSITION TILE (ASTM F 1066)

- A. Size: 12" x 12" x 1/8"
- B. Design as selected by Architect with allowance provided by Contractor for multiple colors and pattern.
- C. Manufacturers:
 - 1. Armstrong Companion Square, Stonetex, Imperial Texture
 - 2. AZROCK Custom Cortiva, Complement, Premium Architectural Series
 - 3. Kentile

2.3 TILE REDUCER (TRANSITION) STRIP

- A. Reducer strips as required by design.
- B. Material
 - 1. Vinyl reducer strip from vinyl tile to concrete floor.

2.4 RESILIENT BASE

- A. Provide base complying with Federal Specification SS-W-40a; Type I with matching end stop and preformed inside and outside corners.
 - 1. Height: 6" unless stated otherwise on drawings
 - 2. Thickness: 1/8" gauge
 - 3. Style: Use standard top-set cove.
 - 4. Resilient base manufacturers: Burke, Flexco, John Sonite, Roppe
 - 5. Provide molded corners.

2.5 METAL EDGING

- A. Metal edging under door where resilient ends or at exposed edges.

2.6 ADHESIVES

- A. All adhesives shall be only those recommended by the manufacturer for fast drying floors.

2.7 SEALERS

- A. All sealers for finishing resilient flooring shall be only those recommended for that use by the manufacturer of the resilient flooring.

3. EXECUTION

3.1 SURFACE CONDITIONS

- A. Prior to all work of this Section, carefully inspect installed work of other trades, and verify that all such work is complete to the point where this installation may commence. Verify that all surfaces to which resilient flooring material will be attached meets the minimum requirements established by the manufacturer of the resilient flooring materials. Verify that the completed installation will be in accordance with the original design.

3.2 PREPARATION

- A. For at least 24 hours prior to installation, maintain a temperature of not less than the temperature recommended by the resilient flooring materials manufacturer in the space in which resilient flooring is to be installed. If no such minimum temperature is specified by the manufacturer, maintain a minimum of 60°F.
- B. Fill all joints in substrate with a compound strictly conforming to the compound manufacturer's recommendations. Achieve a uniformly smooth, sound and level substrate by sandpapering as necessary.
- C. Thoroughly clean the substrate by sweeping, damp mopping (but not wet mopping), vacuuming, or other means to remove all loose particles and all dust, dirt, grease, and foreign material.
- D. Allow the substrate to dry thoroughly and prevent all unnecessary traffic across it.
- E. Sized and primed as recommended by manufacturer of resilient tile, if necessary, for proper bond.
- F. Check with concrete Contractor to determine whether curing compound used will prevent adhesion of resilient floors. Report to Architect, in writing, any and all conditions which, in his opinion, will affect the satisfactory execution of this work or endanger its permanency.
- G. Sample Test: Sample test preparatory to installation of vinyl-composition tile when concrete is new and damp, or where paint, oil and curing compounds have been removed. It is not applicable where other types of resilient floors are involved. Brush on adhesive (use adhesive required for this test) over several areas 3'0" x 3'0". If, after 24 hours, the primer can be scraped or peeled from the subfloor, the subfloor is unsuitable for installation of tile. In this event, the subfloor shall be allowed to dry further, or further steps should be taken to remove the residue of paint, oil or curing compounds. Then tests shall be repeated until the primer becomes well bonded to the surface, whereupon installation can proceed.
- H. Moisture Test: Required on concrete floors that receive resilient floors and as recommended by the manufacturer of the resilient floor. Before floors are laid, submit written proof to the Architect that tests are made, give methods of testing, and state whether the floors are satisfactory to receive the resilient floors.
- I. Space: Proper ventilation; smoking prohibited if solvent based solutions are used.
- J. Cracks shall be filled with plastic filler as recommended by manufacturer of resilient tile.

3.3 INSTALLATION

- A. Install vinyl flooring in toilet facilities only in strict accordance with manufacturer's installation manual and specifications, and AVATI "specifications for vinyl composition floor tile". Lay tile in one direction, so that the pattern continues in one direction, not turned 90° per tile. In areas where carpet is to be installed adjacent to tile, install base prior to carpet; use toeless base with carpet and cover base with tile.
- B. Accurately cut the material to fit the room and all projections, and to be tight against the side walls. Workmanship shall be best standard practice, with joints in straight lines.
- C. Apply the adhesive in strict accordance with the approved recommendations of the manufacturer, coating the surfaces evenly, and not exceeding the recommended working areas.
- D. Install the resilient flooring and base in strict accordance with the published recommendation of the manufacturer, and not until other trades, such as painting, have been completed.
- E. Install vinyl edge strips at edges of resilient flooring where it adjoins flooring material of a different type and elsewhere as indicated on the Drawings, anchoring firmly and snugly into place.
- F. Pattern to be square, all joints continuous and parallel to walls, no border, symmetrical about center lines of rooms.
- G. Application of tile bonded to subbase surfaces with adhesive.
- H. Application of base bonded to wall surface with adhesive.

* * * END OF SECTION * * *

SECTION 09900

PAINTING

1. GENERAL

1.1 SCOPE OF WORK

- A. The prime coating system for the pre-engineered building structural steel framing, etc., shall be shop-applied under controlled conditions.
- B. Shop coatings and/or factory finishes on fabricated roof and wall panels are specified in other divisions.
- C. The pre-engineered steel building manufacturer shall be responsible for the complete painting system of his product as described under this section and others.
- D. Final touch-up painting shall be accomplished after erection of the structural framing and prior to roof and wall panel installation.
- E. The items to be field painted under this contract shall include, but not necessarily be limited to, the following:
 - 1. Miscellaneous steel
 - 2. Steel door frames and panels
 - 3. Steel doors
 - 4. Handrails/ladders
 - 5. Steel pipe protective posts
 - 6. Duct work and ventilation support hangers for ventilation systems
 - 7. Interior dry wall gypsum board
- F. Coil doors shall be painted over factory applied prime coat. Frames and guides to be painted as specified.

1.2 STANDARDS

- A. Tnemec Company, Koppers Company and Ameron products have been used as a guide to establish generic material types and systems.
- B. Alternate Products:
 - 1. Coating to be same generic type.
 - 2. Coating thickness and number of coats comparable to guide product.
 - 3. Documented application, serviceability, performance, physical properties and composition equivalent to the guide product.
- C. Volume 2 of Steel Structures Painting Manual, by Steel Structures Painting Council (SSPC).

1.3 SUBMITTALS

- A. Submit complete product information including systems proposed, constituent ingredients for each coating, color charts, samples of coating material on chips of substrate steel for each prime and finish coat, manufacturer experience and additional information requested by the Engineer.
- B. Furnish certification statements with each delivery of materials including statement of compliance with material submittals reviewed by the Engineer.
- C. Provide measurements (wet or dry film thickness) on permanent record form for each coating application.
- D. Submit samples of tints proposed for identification of coating layers.
- E. Submit proportioning statement for inhibitive additives with product submittals.
- F. Certification of shop surface preparation.

1.4 STORAGE

- A. Maintain all products in locked room and comply with local fire and health regulations.

2. MATERIALS

2.1 ALTERNATE MANUFACTURERS

- A. Shall provide information on all materials to indicate their proposed products are equivalent.

2.2 PAINTING SYSTEMS

- A. Steel:

- 1. Miscellaneous steel, ladders, handrails
 - a. Surface Preparation: SSPC-SP 3
 - b. Prime: Tnemec 20-1211, Amercoat 71, 2.5-3.0 mils dry
 - c. Finish coat: Tnemec Series 73 Hi-Build Urethane, Koppers BRS, Amersshield, 3-5 mils dry. Color - Safety Yellow - Ladders and handrails. Miscellaneous steel color selection by Engineer.
- 2. Pre-engineered steel building rigid frame, primary and secondary framing, roof and wall bracing, etc.
 - a. Surface Preparation: SSPC-SP 3
 - b. Factory applied prime coats only. No finish coat required.
 - c. Prime: two coats red primer - Tnemec series 20-1211 or Amercoat 71 - each coat 2.5-3.0 mils dry.

- B. Office and Toilets:

- 1. Gypsum Board (Selected Areas):
 - a. First Coat: Alkyd Sealer } See Dwgs. S-09 & G-06
 - b. Second coat: Alkyd Prime Undercoat } for location and color
 - c. Third Coat: Alkyd Flat or as selected }

3. EXECUTION

3.1 SURFACE PREPARATION

- A. Ferrous Metal To Receive Coating Systems:

- 1. Power tool cleaned: SSPC-SP3.
- 2. Remove all rust and mill scale.

3.2 COMPATIBILITY OF COATINGS

- A. Contractor shall be responsible for compatibility of all paint products.
- B. Test coatings applied to an existing surface coating by patch test to determine suitability.
- C. Allow sufficient time to demonstrate compatibility.

3.3 INSPECTION AND CERTIFICATION OF SHOP SURFACE PREPARATION

- A. Immediately prior to application of prime coats have all surfaces to receive paint inspected by Engineer and paint supplier approved quality control agent.
- B. Reblast or provide additional preparation directed by agent if required to meet specified surface preparation specification.
- C. Submit to Engineer certification of conformance of finish surface preparation to standards referenced:
 - 1. Certification by quality control agent.

2. Include date of surface preparation and SSPC standard achieved.
3. Primer application: Type and manufacturer from labeled containers used for prime coat work.
4. Recorded dry film thickness.

3.4 INSPECTION PRIOR TO APPLICATION OF FIELD PRIMER AND FINISH COATINGS

- A. Clean all surfaces immediately prior to coating.
- B. Inspect all surfaces for conformance to specified preparation standards.
- C. Request and obtain Engineer inspection for each coating surface preparation prior to coating application.

3.5 PAINT SMOOTHNESS, COVER AND SHEEN TOLERANCE

- A. Finish coating surface smoothness equal to base surface preparation smoothness.
- B. Uniform lustre with even appearance free of lap marks.
- C. Thickness tolerance ± 10 percent in any given location, but average not to be less than specified mil coverage.

3.6 PAINT APPLICATION CONDITIONS

- A. Clean, dry environment and at temperatures recommended in manufacturer's preprinted instructions.
- B. Surface temperature: Minimum of 5°F. above wet bulb temperature.
- C. Maximum Humidity: 85 percent.
- D. Shield from hot sun with appropriate housing when applying paints.
- E. Do not apply coatings in areas where dust is being generated.
- F. Do not apply in fog, snow, rain or to wet or damp surfaces.

3.7 APPLICATION

- A. Add fungus or mildew inhibitive additives to all nonepoxy products.
- B. Apply coatings at specified rates and consistency per selected manufacturer's specific application instructions.
- C. Buildup in multiple or single finish coats as specified.
- D. Thin only with thinners specifically formulated for use by approved manufacturer.
- E. Tint primer, second and finish coats different shades to verify coverage.

3.8 RECOAT DRY TIME

- A. Permit adequate cure-drying interval between multiple coats as determined by manufacturer's recommended drying time at specified cure conditions.

3.9 SAFETY AND PROTECTION

- A. Provide safe working environment for paint applicators.
- B. Provide adequate heat and forced mechanical ventilation for health, safety and drying requirements.
- C. Use explosion proof equipment.
- D. Provide approved face masks.
- E. Protect adjacent surfaces with suitable masking and drop cloths as required.
- F. Dispose of paint rags, empty containers, clothes, worn applicators to avoid hazardous situations.
- G. Clean up daily.

3.10 FINISH AND COLOR SCHEDULE

- A. Painted surfaces shall be colored as directed by the Engineer, shown on the drawings or as required by Code.
- B. All handrails, ladders, concrete filled pipe, protective post, etc., shall be painted OSHA Safety Yellow.
- C. Submit for approval prior to any painting, color, manufacturer and color chips of all coatings listed herein in accordance with Section 01340.

* * * END OF SECTION * * *

DIVISION 10 - SPECIALTIES

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SECTION 10800

TOILET AND SHOWER ACCESSORIES

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Mirrors: Section 08800
- B. Toilet Compartments: Section 10160

1.2 HANDLING

- A. Protect against damage and discoloration.
- B. Do not remove protective covers until final project clean-up.
- C. Deliver keys to Owner.

2. PRODUCTS

2.1 GENERAL

- A. Verify type of paper to be used by Owner prior to ordering.
- B. Verify types and thicknesses of wall construction prior to ordering. Provide all required fasteners, clamps, adapters, etc., necessary for conditions encountered.

2.2 ACCESSORIES

- A. Toilet Paper Dispensers:
 - 1. Manufacturer & Model: Bobrick B-386 (dual sided partition mounted)--provide one men's toilet room, or approved.
 - 2. Type: Single roll with automatically positioned spare roll.
 - 3. Material: Stainless steel
 - 4. Mounting: Partition mounted and recessed
 - 5. Extent of Work: Provide as shown on the Drawings.
- B. Paper Towel Dispenser and Waste Receptacle:
 - 1. Manufacturer and Model: Bobrick B-3944. Dispenses C-fold or multi-fold towels with removable 12 gallon receptacle.
 - 2. Material: Stainless steel
 - 3. Mounting: Recessed
- C. Waste Disposals:
 - 1. Manufacturer & Model: Bobrick B-2260 open top waste receptacle, or approved.
 - 2. Lining: Removable plastic bag
 - 3. Material: Stainless steel
 - 4. Extent of Work: Provide two units in Office Building as shown on Drawings.
- D. Toilet Paper Dispenser:
 - 1. Manufacturer and Model: Bobrick B-3570, dual sided, 2 roll dispenser with clearance for grab bar.
 - 2. Material: Stainless steel
 - 3. Lining: Disposable
 - 4. Mounting: Partition mounted
 - 5. Extent of work: Provide one in Women's toilet.

- E. Grab Bars:
 - 1. Manufacturer & Model: Bobrick B-490 in toilet rooms and B-49616 in showers, or approved
 - 2. Material: Stainless steel
 - 3. Wall Clearance: 1-1/2 inches
 - 4. Mounting Height above Floor: 33-inches
 - 5. Lengths:
 - a. In toilet compartments intended for handicapped users: 48" and 36".
 - b. In shower compartments: 24" and 36"
 - 6. Extent of Work: Provide where shown on Drawings.
- F. Surface Mounted Retractable Shower Seat:
 - 1. Manufacturer and Model: A&J Washroom Accessories, A&J Model U933T-L.
 - 2. Extent of Work: Provide one at each shower as shown on drawings.
- G. Shower Curtain Rods and Hooks:
 - 1. Manufacturer: Bobrick, B-6047 Rod and B-204-1 Hooks, or approved equal.
 - 2. Material: Stainless Steel
 - 3. Minimum Rod Diameter: 1-inch
 - 4. Length: Fit opening
 - 5. Required Accessories: Mounting flanges and "T" connection provided.
 - 6. Extent of Work: Provide as shown on Drawings.
- H. Shower Curtains
 - 1. Manufacturer & Model: Bobrick 204-3, or approved equal. Women's shower, one required; Men's, one required.
 - 2. Material: 0.008-in. thick vinyl
 - 3. Color: Opaque matte white
 - 4. Width: 42 inches
 - 5. Height: 72 inches
 - 6. Required accessories: Nickel-plated brass grommets along top edge spaced at 6-in. o.c.
 - 7. Fabrication: Hem edges
- I. Shower Accessories
 - 1. Stainless Steel shelf: Bobrick B-683 or approved equal (18" length). Required: one (1) Women's.
 - 2. Single robe hook: Bobrick B-671 or approved equal. Quantity, Women's 1 required; Men's, 1 required.
 - 3. Soap Dish: Bobrick B-680. 2 required, 1 each shower.
 - 4. Soap Dispenser: Bobrick B-2113. 2 required, 1 each shower.
- J. Fasteners:
 - 1. Non-corrosive type recommended by accessory manufacturer.
- K. Blocking and Backing:
 - 1. Provide all necessary.
 - 2. Accessories are located on Drawings for Contractor's convenience.
 - 3. Verify location, type and quantity with Owner prior to proceeding with work.

2.3 FABRICATION

- A. Fabricate units with welded corners, one-piece seamless exposed flanges, and with no open miters.

3. EXECUTION

3.1 PREPARATION

- A. Existing Conditions:
 - 1. Do not proceed until blocking and surfaces to receive accessories are smooth, clean, dry, square, sound, accurately sized and located, painted, and otherwise properly prepared.

2. Prior to starting work, notify General Contractor about defects requiring correction.
 3. Do not start work until conditions are satisfactory.
- B. Protect against damage and discoloration caused by work of this Section.

3.2 INSTALLATION

- A. If mounting locations are not specified herein, or shown on Drawings, locate where directed by Architect.
- B. Follow manufacturer's installation instructions.
- C. Mount plumb, level, true and secure.
- D. Adjust moving parts to operate satisfactorily at time of Project Substantial Completion and during Warranty Period.

3.3 FIELD TOUCH-UP

- A. Clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this Section.

* * * END OF SECTION * * *

SECTION 10990

MISCELLANEOUS SPECIALTIES

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Finish Hardware: Section 08710
- B. Finish Painting, except where complete factory-finish is specified herein: Section 09900
- C. Toilet Compartments: Section 10160
- D. Signs: Section 10440
- E. Metal Lockers: Section 10500
- F. Toilet & Bath Accessories: Section 10800

1.2 SUBMITTALS

- A. Shop Drawings to show layout, dimensions, details of construction, methods of joining to other work, required clearances, finishes, accessories, and other pertinent items.

1.3 HANDLING

- A. Protect against damage and discoloration.
- B. Deliver in Manufacturer's original, unopened, protective wrapping with original, legible label intact.

2. PRODUCTS

2.1 SPECIALTY ITEMS

- A. Entry Mats
 - 1. Manufacturer: Futurus, AKRO Traffic Tile Runner, or approved equal.
 - 2. Pattern: Run tile pattern in same direction.
 - 3. Color: Selected by Architect after Contract award.
- B. Fire Extinguisher:
 - 1. Manufacturer: Contractor's choice
 - 2. Type: OSHA-approved and UL-rated for type A, B & C fires
 - 3. Color: Red
 - 4. Size: 10-lb.
 - 5. Fill and service extinguisher prior to Project Substantial Completion.
 - 6. Extent of Work:
 - a. Mount on wall brackets, standard with manufacturer, at eight locations specified by the Architect.
- C. Loose Walk-Off Mats:
 - 1. Manufacturer: Crown Mats
 - 2. Model: Needle Rib
 - 3. Size: 3-ft. x 5-ft.
 - 4. Color: As selected
 - 5. Quantity: Four (4)

3. EXECUTION

3.1 PREPARATION

- A. Existing Conditions:
 - 1. Verify that blocking, backing and surfaces to receive specialties are properly prepared, sized and located.
 - 2. prior to starting work, notify General Contractor about defects requiring correction.
 - 3. Do not start work until conditions are satisfactory.
- B. Protect other materials against damage and discoloration caused by work of this Section.

3.2 INSTALLATION

- A. General:
 - 1. Follow manufacturer's instructions and approved Shop Drawings.
 - 2. Secure Specialties plumb, level, square, and true as applicable.
- B. Entry Mats and Shower Floor Mats: Scribe to fit wall-to-wall.
- C. Fire Extinguisher: Mount on wall brackets; position extinguisher top at 5-ft. above floor.

3.3 FIELD TOUCH-UP

- A. Including work of other sections, clean, repair and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by work of this Section.
- B. Leave installation clean and defect-free.

* * * END OF SECTION * * *

DIVISION 13 - PRE-ENGINEERED STRUCTURES

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SECTION 13120

PRE-ENGINEERED STEEL BUILDING

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Metals: Division 5
- B. Flashing and Sheet Metal: Division 7
- C. Siding and Roof Decking: Division 7
- D. Painting: Division 9

1.2 DESCRIPTION

- A. The intent and scope of these specifications is to delineate the quality of material; design criteria required; and erection workmanship expected for the construction of this particular metal building. The specifications are intended to serve as a general outline of required performance.
- B. Specifically, the work shall include, but shall not necessarily be limited to, furnishing the design, detailing, obtaining of required permits, fabrication, delivery, unloading and erection of a pre-engineered steel building on a concrete foundation as per the Contract Documents.

1.3 DESIGN CRITERIA

- A. Building shall be designed in accordance with UBC, 1997 Edition, for Seismic Zone 3, basic windspeed 80 mph, Exposure C.
- B. The building structure frame shall be a clear span rigid frame solid web type with tapered sections designed in accordance with AISC Type I construction. Roof slopes shall be as indicated on drawings. Column bases shall be designed as pin connected. Building expansion joints shall be provided if required.

Design of structural steel sections and welded plate members shall be based upon the applicable specifications of AISC as determined by the manufacturer. Light-gauge, cold-formed structural members and exterior collarings shall be designed based upon the applicable sections of AISI (Specifications for the Design of Cold-Formed Steel Structural Members). Also as determined by the manufacturer.

The design of primary and secondary structural framing as well as roof and wall covering shall be designed for all applicable loads and combination of these loads as set forth in the latest edition of the MBMA Recommended Design Practices Manual.

Bracing in the plane of the roof and vertical wall bracing shall be round rods or angle bracing as determined by the building manufacturer. Bracing shall be located such that it does not interfere with door openings.

- C. The building shall be designed to carry the following roof loads in addition to loads prescribed by Code:
 - Sprinkler system 2 psf
 - Duct work and miscellaneous items 2 psf
 - Power ventilation fans 1000 lbs. ea. (locations to be determined)

The building occupancy design criteria includes the following:

1. Latex Recycling Building B-2 occupancy
Type II N construction
- D. Design calculations for the specified structure shall be performed by the manufacturer's engineer experienced in pre-engineered steel buildings. These design calculations shall be made available as per Specifications. The manufacturer's engineer shall be registered in Oregon where the project is located.

1.4 QUALITY CONTROL

- A. The pre-engineered steel building and related products shall be as manufactured by a nationally-known company that has specialized in the design, fabrication and erection of pre-engineered metal buildings for a minimum of ten (10) years.

The manufacturer shall comply with the requirements of the Uniform Building Code, 1997 Edition. In addition, the building design and fabrication shall conform to recommended standards and design criteria as set forth by the following engineering societies and institutes:

1. American Institute of Steel Construction - "Specifications for Design, Fabrication and Erection of Structural Steel Buildings".
 2. American Welding Society - "Code for Welding in Building Construction".
 3. American Institute of Steel Construction - "Code of Standard Practice for Steel Buildings and Bridges".
 4. "Metal Building Systems Manual" prepared by the Metal Building Manufacturer's Association.
 5. Latest UBC, UMC, UPC and NEC standards and other codes as outlined in the General and Technical Specifications which are hereby incorporated by reference.
 6. Plans and specifications for the "Latex Recycling Building".
- B. The manufacturer shall coordinate anchor bolt design and location with the foundation contractor.

All welding shall be performed by operators who have been recently qualified as prescribed in "Qualifications Procedure" of the American Welding Society (except for welds which do not carry calculated stress).

1.5 SUBMITTALS

- A. Within three (3) weeks following Notice to Proceed, the successful manufacturer shall submit calculations showing vertical and horizontal loads at each column footing, together with drawings showing base plate and anchor bolt layout, sufficient for the Engineer to complete foundation design.
- B. Within six (6) weeks following Notice to Proceed, submit six (6) sets of drawings and calculations, sufficient for plan check by Metro Regional Environmental Management.
- C. Manufacturer shall supply shop and erection drawings for items fabricated in this contract in accordance with Section 01340. Shop and erection drawings shall comply with the practice outlined in AISC "Structural Detailing Manual".
- D. Certification of welders employed on the project shall be per procedures of the American Welding Society.

1.6 PRODUCT HANDLING

- A. Touch-up of damages to galvanized finishes and other coatings resulting from transportation to the site or unloading shall be performed by the manufacturer.

2. PRODUCTS

2.1 STEEL PRODUCTS

- A. All structural steel shall conform to ASTM A529, ASTM A572 and/or ASTM A36 in accordance with Section 05120.

2.2 SIDING AND ROOF DECKING

- A. Siding, roof decking, flashing and other sheet metal shall be as specified under Division 7, Sections 07600 and 07610.

2.3 DOOR FRAMES AND WINDOWS (Shall be as specified under Division 8)

NOTE: All exterior doors, frames and windows shall be provided by the pre-engineered building manufacturer.

3. EXECUTION

3.1 CONNECTIONS

- A. Field connections shall be bolted with 3/4-inch diameter high strength bolts designed as friction type connections. All bolted connections shall conform to AISC Specifications for Structural Joints using ASTM A325 bolts. A minimum of two bolts shall be used in each connection. The properties of the inorganic zinc coating permit its use under this connection type so all bearing surfaces and bolt holes are coated.
- B. Welded connections shall include column splices and moment connections using E70XX Series ASTM A233 electrodes. All welding shall be as shown on the drawings and shall conform to the Structural Welding Code of the American Welding Society. Welds shall be made by welders or welding operators who have been previously qualified by tests prescribed in this standard code. All areas to be welded shall be cleaned to bare metal with no zinc primer applied within 2-inches of the weld area.

* * * END OF SECTION * * *

DIVISION 16 - ELECTRICAL

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SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Basic Electrical Materials and Methods: Section 16050
- B. Feeder and Branch Circuits: Section 16400
- C. Equipment Connections: Section 16405
- D. Panelboard: Section 16426
- E. Grounding: Section 16450
- F. Dry-Type Transformers: Section 16455
- G. Lighting: Section 16500
- H. Telephone: Section 16710
- I. Fire Alarm and Detection System: Section 16720

1.2 WORK INCLUDED

- A. The requirements of this section apply to all the sections within Division 16. Applicable requirements of all of these Specifications shall apply to electrical work.

1.3 SYSTEM DESCRIPTION

- A. General:
 - 1. Complete functional and operable systems:
 - a. All specified parts, materials and functions.
 - b. All detailed systems, equipment, power and controls.
 - c. Ready for use.
 - d. Final sizing is dependent on equipment selected by the Contractor.
 - e. Ratings indicated on the electrical drawings are for guidance only and do not limit the equipment size.
 - 2. Electrical Systems to be installed:
 - a. 15kv empty conduit system.
 - b. 480 volt, 3-phase, 3-wire, 60 hz, distribution.
 - c. 208/120 volt, 3-phase, 4-wire, 60 hz, distribution.
 - d. 120 volt, 208 volt lighting systems.
 - e. 120 volt receptacle system.
 - f. Empty telephone conduit system.
 - g. Grounding system.
 - h. Temporary lighting, power and telephone facilities during construction.
- B. Labor, Services and Skilled Supervision:
 - 1. Complete Electrical Construction, Erection, Installation and Connection:
 - a. Materials and equipment specified in this section.
 - b. Related materials and equipment necessary to complete a system.
 - c. Wiring equipment specified in other divisions.
 - 2. Adjustment and Testing:
 - a. Simulate system operation.
 - b. Proper system operation.
 - c. Proper limit switch, timer and control settings.
 - d. System electrical integrity.
 - (1) Continuity
 - (2) Insulation resistance

- (3) Ground
- C. Materials and Equipment
 - 1. Specified in this Division.
 - 2. Necessary to complete the Systems.
 - 3. For equipment specified in other Divisions.
- D. Costs Billed by Private or Public Utilities as Service Charges included in Contract price.
 - 1. To extend or connect, the electric or communication supply system.
 - 2. Extend service to site.
 - 3. Temporary power used during construction.
 - 4. Metering installation.
- E. Permits and Inspection Certificates:
 - 1. State electrical.
 - 2. Municipal electrical.

1.4 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- A. Shop Drawings and Data: In accordance with procedures set forth in Section 01340, submit complete assembly, foundation, and installation drawings together with detailed specifications and data covering materials used, parts, devices, and other accessories forming part of equipment, including, but not limited to:
 - 1. Motor controls
 - 2. Panelboards
 - 3. Controllers and control devices
 - 4. Dry-type transformers
 - 5. Fused disconnects
 - 6. Lighting fixtures
 - 7. Ground conductors, rods
 - 8. Conductors, 600 volt
 - 9. Receptacles, 20A and 30A, 125 VAC
 - 10. Junction boxes, one cubic foot and larger
 - 11. Electric heat trace cable

1.5 WARRANTY

- A. Except lamps
- B. Free of defects
- C. Function properly

2. PRODUCTS

2.1 CODES, ORDINANCES, STANDARDS AND PERMITS

- A. Comply With All Codes Applicable to the Work:
 - 1. Bidders inform themselves of all local and state codes and regulations.
 - 2. In case of conflict between Contract documents and governing codes, the most stringent shall take precedence.
 - 3. Where Contract documents exceed minimum code requirements, Contract documents take precedence.
 - 4. No extra payment will be allowed for work or changes required by local code enforcement authorities.
- B. Apply for, Obtain and Pay For All Required Permits and Inspection Certificates.
 - 1. Arrange for all inspection by permit enforcing agencies.
 - 2. Deliver all permit compliance documents to Owner.

- C. Underwriters Laboratories Labels Shall Apply To:
 - 1. All materials and devices, etc.
 - 2. Except specified items not covered by existing UL standards.
- D. Conflicts With Applicable Regulations
 - 1. Resolve at Contractor's expense.
 - 2. Prepare and submit details of alternate construction:
 - a. Acceptable solution of conflict.
 - b. List of substitute materials:
 - (1) For approval of inspecting authorities.
 - (2) For approval of Engineer.

2.2 IDENTIFICATION

- A. Conductors:
 - 1. Color code:
 - a. Continuous jacket color.
 - b. Colored tape wrap at each end and each intermediate junction box.
 - c. Plastic adhesive tape at each end and each intermediate junction box.
 - 2. Conductor numbers or letters and numbers:
 - a. Laminated composition or plastic disc (floater) with string loops. Hot stamped sleeves. Identify same at each end and each intermediate junction box.
 - b. Correspond to design drawing. Prepare as-built record drawing identifying conductor numbers as installed.
 - 3. Phase color code:
 - a. NEC as applicable.
 - b. Each phase separate color or color taped.
 - c. Each circuit voltage separate color.
- B. Terminal Strips:
 - 1. Identify each conductor:
 - a. Conductor number, or,
 - b. Function, or,
 - c. Serial number.
 - 2. Provide terminal strips in all junction boxes terminating four or more conduits with #10 and smaller wire.
- C. Equipment Without Terminal Strips:
 - 1. Identify each connection point:
 - a. Tape on equipment body beside terminal screw.
 - b. Tape or tag on conductor.
 - c. Correspondence with conductor number.
 - d. Do not cover manufacturer's contact numbers on equipment.
- D. Panelboards and Control Centers, Disconnects and Circuit Breakers:
 - 1. Phenolic Name Plates:
 - a. Black lettering scribed on white background.
 - b. Identify purpose, use, pertinent characteristic (volts, phase, etc.)
 - c. Motor or equipment being controlled.
 - 2. Breaker Panel Circuit Schedule:
 - a. Remove or furnish directory card.
 - b. Type neatly assigned circuit use.
 - c. Replace in panel.
 - 3. Auxiliary Relays and Components:
 - a. Identify corresponding to drawings.
 - b. Typed data adhesive tape.
 - 4. Control and Visual Indicating Devices:
 - a. Identify corresponding to drawings.

- b. Use standard nameplate or engraved legend as required.
- E. Equipment Identification:
 - 1. Name and number if more than one similar unit:
 - a. Phenolic engraved nameplate or etched or engraved anodized aluminum.

3. EXECUTION

3.1 INSPECTION OF SITE

- A. Each bidder shall thoroughly inspect the site and existing conditions affecting the work prior to bidding.

3.2 CONTRACT DRAWINGS ESSENTIALLY DIAGRAMMATIC FOR CLEARNESS AND LEGIBILITY

- A. Equipment shown in desired location.
- B. Size and location shown to scale wherever possible, but is approximate unless dimensioned.
- C. Contractor compare all available data to refine location.
- D. Verify information and dimensions at building site.
- E. Install all work to conform to structure and equipment.
- F. Avoid obstructions.
- G. Preserve headroom and working clearances.
- H. Keep openings and passageways clear.
- I. Make accessible all equipment requiring inspection and maintenance.

3.3 PROTECTION, CARE AND CLEANING

- A. Protect materials before and after installation against moisture, dirt and damage.
- B. At all times, keep the premises clear of undue accumulation of rubbish.
- C. On completion of the work, remove all rubbish and debris resulting from this Contract and dispose of same.
- D. Equipment and fixtures shall be thoroughly cleaned and left in a satisfactory condition for use.
- E. Provide temporary heat in motors and electrical panels, control centers and enclosures to eliminate condensation until installations are placed in normal service.
- F. All electrical equipment and fixtures shall be installed in a manner to meet the requirements of a Seismic Zone 3 area.

3.4 DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEM

- A. Contractor to provide assistance for inspection:
 - 1. To Engineer.
 - 2. To state or local permit inspectors.
 - 3. To utility company inspectors.
 - 4. At all times as requested:
 - a. Remove covers.
 - b. Operate machinery.
 - c. Continuity tests.
 - d. As necessary to demonstrate quality and adequacy.
- B. Operate each:
 - 1. Service entrance unit.
 - 2. Branch feeders.
 - 3. Panelboard circuits.
 - 4. Motor controls and motors.
 - 5. Control systems.
 - 6. Electric controls on installed mechanical equipment.

3.5 TESTS

- A. General:
 - 1. Perform all tests as outlined.
 - 2. Additional tests as may be necessary to establish:
 - a. Adequacy to perform function.
 - b. Quality of workmanship.
 - c. Safety.
 - d. Completeness.
 - e. Suitability.
 - 3. Provide test labor materials and tools.
 - 4. Advance timely notification of test schedules.
 - 5. Correct promptly any failure or defects revealed by test.
 - 6. Retest or transient conditions test may be required in critical cases as required by Engineer.
- B. Driven Ground Rod Resistance Test:
 - 1. Immediately after installation.
 - a. Each rod individually.
 - b. Combined resistance when 2 or more in group.
 - 2. Maximum 25 ohms at point of system connection.
 - 3. Report contain:
 - a. Date of test.
 - b. Soil conditions.
 - c. Measured resistance.
 - d. Submit at once.
- C. Wiring Tests:
 - 1. Continuity.
 - 2. Proper wire size:
 - a. Insulation resistance measured by DC 2000 volt megger:
 - (1) All circuits including services.
 - b. Circuits 600 volts or less:
 - (1) 1,000,000 ohms to ground minimum.
 - (2) Except circuits over 50 amperes with:
 - (a) All served devices except fluorescent fixtures connected,
 - (b) All incandescent lamps removed, motor terminals disconnected,
 - (c) Panelboards and switchboards with switches closed,
 - (d) 300,000 ohm to ground minimum.
 - (3) Insulation between ungrounded conductors not less than 1.5 times minimum insulation to ground.
- D. Equipment Tests:
 - 1. Operating amperes:
 - a. Each motor and heater:
 - (1) Measure and record each phase.
 - (2) Equal or less than name plate rated current at 1.0 service factor.
 - b. Each panel, load center and switchboard:
 - (1) Measure and record input each phase.
 - (2) Balance phases by reconnection.
 - (3) Maximum variation ± 10 percent between phase current and average.
 - c. Power transformers:
 - (1) Measure and record each phase.
 - d. Dry type lighting supply transformers:
 - (1) Measure and record each phase.
 - 2. Support tests:
 - a. Lighting fixture support, 200 pounds minimum.

- E. System Tests:
1. Service voltage: Measure voltage at the service entrance. Voltage shall be within service range A as defined by ANSI C84.1: Electric Power systems and Equipment - Voltage Ratings.
 2. Utilization Voltage: Measure voltage at each load of 5 KVA or greater. Other voltage measurements shall be taken as required by the Engineer. Voltage shall be within utilization range A as defined by ANSI C84.1: Electric Power Systems and Equipment - Voltage Ratings.
 3. Voltage balance:
 - a. Maximum 1 percent unbalance at full load.
 - b. Cooperate with utility to achieve balance within limits.
 - c. Rearrange single phase loads.
 - d. Unbalance definition for 1 percent:
 - (1) 100 times the sum of the deviation of the three voltages from the average voltage divided by the average voltage.
 4. Transient Conditions:

Where there is reason to believe that transient conditions may from time to time cause the system operating parameters to exceed the observed limits specified in the above performance criteria, perform tests utilizing recording instruments to establish the existence and character of the transient conditions and effectiveness of corrective action taken.
- F. Electrical System Test Reports:
1. Indicate all tests performed.
 2. Demonstrate conformance with performance criteria.
 3. Note corrections made to meet performance.
 4. Consult Engineer on report format.
- G. Motor Test Reports:
1. Consult Engineer on report format.
 2. Provide information on each motor 1/3 horsepower and larger:
 - a. Motor use.
 - b. Location.
 - c. Duplicate of motor nameplate, or tabulation of complete name plate data.
 - d. Measured full load current phase A, B, C.
 - e. No-load voltage phase AB-BC-CA.
 - f. Full-load voltage phase AB-BC-CA.
 - g. Feeder conductor insulation resistance phase-to-phase and phase-ground.
 - h. Control circuit function.
 - i. Rotation direction from drive end.

3.6 RECORD DRAWINGS

- A. One Complete Set Blue Line Prints Provided:
1. Keep separate and clean.
 2. Reserve for complete picture of work actually installed.
 3. Serve as work progress report sheets.
 4. Notations made neat and legible.
 5. Available all times at job site.
- B. Record Layout Actual Routing
- C. Completion of Work and Record:
1. Signed by Contractor.
 2. Dated.
 3. Delivered to Engineer.

* * * END OF SECTION * * *

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Shop Drawings, Project Data and Samples: Section 01340
- B. Basic Electrical Requirements: Section 16010
- C. Panelboard: Section 16426
- D. Grounding: Section 16450
- E. Dry-Type Transformers: Section 16455
- F. Lighting: Section 16500
- G. Telephone: Section 16710
- H. Fire Alarm and Detection System: Section 16720

1.2 QUALITY ASSURANCE

- A. General Requirements:
 - 1. New, free from defects, quality as specified.
 - 2. Standard product of known manufacturer.
 - 3. Same manufacturer:
 - a. Material of the same type or classification.
 - b. Used for the same purpose.
 - 4. Labeled or listed by approved testing laboratories.
 - 5. Suitable for the intended application.
 - 6. Approved by inspection authorities.
- B. Applicable Codes and Standards: Shall be the latest revisions, supplements and amendments to the following:
 - 1. ANSI/NFPA 70: National Electrical Code (NEC).
 - 2. NEMA Standard ICS-2: Industrial Control Devices, Controllers and Assemblies.
 - 3. NEMA Standard KS-1: Enclosed and Miscellaneous Distribution Equipment Switches.
 - 4. NEMA Standard MG-1: Motors and Generators
 - 5. NEMA Standard PB-1: Panelboards
 - 6. NEMA Standard WD-1: General Requirements for Wiring Devices
 - 7. UL Standard 67: Panelboards
 - 8. UL Standard 98: Enclosed and Dead-Front Switches
 - 9. UL Standard 845: Motor Control Centers
 - 10. UL Standard 1004: Electric Motors
 - 11. UL Standard 1673: Electric Heating Cables

1.3 SUBMITTALS

- A. Shop Drawings and Data: In accordance with procedures set forth in Section 01340, submit pictorial, assembly and installation drawings together with detailed specifications and data for the material and equipment listed in Section 16010, Par. 1.4.
- B. In addition to the requirements above, submit two copies of Operation and Maintenance manuals for the following:
 - 1. Motor controls
 - 2. Fused disconnect switches
 - 3. Panelboards
 - 4. Motors

- C. Operation and maintenance manuals shall be in addition to any instructions or parts lists shipped with the equipment.
- D. Wiring and Connection Diagrams: Submit wiring and connection diagrams for motor controllers and for motor control centers. Extent and detail of wiring diagrams shall comply with NEMA standards for the equipment.

2. PRODUCTS

2.1 RACEWAYS

- A. Rigid steel threaded galvanized or sheradized. (EMT acceptable in office area and lunch area lighting and receptacle branch circuits only.)
- B. PVC schedule 40 for all underground runs, except in hazardous areas.
- C. Long radius bend for underground runs.
- D. Locknuts and insulating bushing on terminations.
- E. Flexible metallic conduit.
 - 1. Liquidtight flexible conduit.
 - 2. Zinc-coated steel core.
 - 3. Extruded gray PVC cover.
 - 4. Sealtite Type "UA".
- F. Minimum size conduit shall be 3/4-inch.

2.2 CONDUCTORS

- A. Copper Conductor:
 - 1. 600 volt minimum insulation.
 - 2. Type THW or higher temperature rating.
 - 3. Minimum Wire Size:
 - a. Power carrying conductors, No. 12 AWG.
 - b. Control wiring to PB sta., pressure sensors, limit SW. etc., No. 14 AWG stranded.
 - c. Fixture wire, No. 16 AWG stranded.
 - 4. Insulation colors consistent each phase.
 - 5. Stranded power conductors No. 8 AWG and larger sizes.
 - 6. Terminal lugs and connectors for power and lighting circuits shall be copper alloy pressure type.
- B. Aluminum Conductors or Copper Clad Aluminum Conductors:
 - 1. Sized for equivalent ampacity as copper wire size.
 - 2. Same insulation as specified for copper conductors.
 - 3. Bolted pressure and high compression type connectors specially designed for use with aluminum conductors.
 - 4. Connectors to join aluminum and copper conductors approved for dissimilar metals.
 - 5. No. 1/0 AWG and larger sizes.
 - 6. Stranded conductors.

2.3 CONDUIT FITTINGS

- A. Cast malleable iron condulets or unilets.
- B. Threaded with watertight gasket.
- C. Watertight seals on conduit entering underground structures, Type EYS, located inside structure wall.
- D. Non-metallic, compatible with PVC schedule 40 raceway.

2.4 JUNCTION BOXES

- A. Size as required by code or as shown on the plans. Allow extra space when splicing.
- B. Full access screwed covers mounted with corrosion resistant machine screws.
- C. Fabricated from code gauge galvanized sheet steel:
 - 1. Interior and dry locations shown on drawings.
 - 2. Paint with rust-inhibiting primer.
- D. Cast metal with threaded hubs FS or FD or type RS with cast plates with threaded hubs:
 - 1. Exterior, damp or underground locations unless otherwise shown on the drawing.
 - 2. Fully gasketed.
 - 3. Size for outlets including gang requirements.
 - 4. Size for conduits, conductors and volume fill by Code.
 - 5. Stainless machine screws for covers and side plates.

2.5 UTILITY VAULT

- A. Precast concrete underground vaults for electrical and telephone utilities per their requirements.
- B. Vault with floors sloped not less than 1/4-inch per foot.
- C. Frames and covers made of cast iron.
 - 1. Each unit (frame and cover) heavy-duty type, suitable for street loading, with machined bearing surfaces.
 - 2. Covers indented, solid-top design, with 2 drop handles each and lock.
 - 3. The words "ELECTRIC", "ELECTRIC H.V.", or "TELEPHONE", as appropriate, cast in integral letters no less than 2 inches high on the upper side of each cover.
- D. Standard heavy weight cable racks and adjustable inserts set on 3-foot centers around inside perimeter of handhole and arranged so that spare conduit ends are clear for future installation of cables.
 - 1. Provide adequate number of adjustable arms and insulators to accommodate one cable for each conduit entering or leaving handhole.
- E. Pulling-in irons fabricated from 3/4-inch round stock.
- F. All hardware made of steel and hot-dip galvanized after fabrication.

2.6 WIRING DEVICES

- A. General:
 - 1. Specification grade, NEMA standard.
- B. Switches:
 - 1. 20 ampere 125 volts.
 - 2. Totally enclosed in a molded phenolic case.
 - 3. Flush tumbler type heavy duty.
 - 4. Group under a gang plate where two or more switches in same location.
 - 5. Motor horsepower rated trip-free with overload device for use with fractional HP or more motor loads.
- C. Receptacles:
 - 1. 20 amperes, 125 volts, 2 pole, 3 wire NEMA 5-20R unless otherwise noted:
 - a. Totally enclosed grounding type.
 - 2. 30 ampere, 125 volts, 2 pole, 3 wire NEMA 5-30R for special loads:
 - a. Totally enclosed grounding type.
 - b. Provide matching plug for all NEMA 5-30R receptacles.
- D. Cover Plates:
 - 1. Appropriate size and type.
 - 2. Gasketed weatherproof type of corrosion resistant or galvanized steel or galvanized malleable iron for exterior or damp locations.
 - 3. Gang plates for multiple switches or multiple outlets at one location.

4. Fastening screws corrosion resistant or stainless.
5. Hazardous receptacle cover, spring door and body shall be die cast copper free aluminum.
6. All cover plates at finished walls shall be insulated between the plate and box to prevent air drafts into wall cavities.
7. In office and staff facilities, all cover plates shall be brushed stainless steel.

2.7 LOCAL CONTROL STATIONS

- A. Type and functions as shown on the plans.
- B. Heavy duty, fully gasketed.
- C. NEMA 12 for indoor locations.
- D. NEMA 4 stainless steel for outdoor or damp locations.
- E. Heavy duty contact blocks and operators.
- F. Lock out stop provisions.

2.8 MOTOR CONTROLS

- A. NEMA Standard:
 1. Individual wall mounted units.
 2. Control center group mounted units.
- B. Combination circuit breaker and magnetic starter unless otherwise specified.
- C. Switch and fuse units:
 1. Heavy duty loadbreak with quick make, quick break operation.
 2. Common operator for 3 phases.
 3. High pressure switch contacts.
 4. Current limiting fuses rated as shown on the drawings.
- D. Circuit breaker units.
 1. Thermal magnetic circuit breakers.
 2. Interchangeable trip type.
 3. Adjustable magnetic trip elements.
 4. Magnetic-only (MCP) type acceptable only if shown on the drawings and if part of an UL listed assembly.
- E. Type, size and functions as indicated on the drawings.
 1. Across-the-line start.
 2. Part winding start.
 3. Contacts self cleaning type designed for easy inspection and replacement.
 4. Manual toggle switch, quick make, quick break trip-free type.
 - a. Single phase less than one horsepower.
 5. Variable speed drive.
- F. Modular construction suitable for motor control center installations unless otherwise indicated on the plans.
- G. Pilot devices on controller door unless otherwise indicated on the Plans.
 1. Start-stop buttons or selector switch (see schematic diagrams).
 2. Reset buttons.
 3. Running time meter, hours and tenths, non resettable.
- H. Pilot lights shall be transformer push-to-test type with color and functions shown below unless otherwise noted on the drawings.
 1. Motor running - green light.
 2. Motor stopped - red light.
 3. Circuit energized - white light.
- I. Overload trips in each phase.
 1. Sized for actual motor running current.
- J. All disconnect or circuit breaker operators shall have padlocking provisions in open position with field knockout or drill position for closed position.

- K. 120 volts control power through an integral control transformer with 125 VA spare capacity unless otherwise indicated on the drawings.
- L. Protective fuse for each control circuit.
- M. Terminal strip for all external connections.

2.9 MOTOR CONTROL CENTERS (IF REQUIRED)

- A. NEMA, AIEE and ANSI Standards. NEMA enclosure type 12.
 - 1. Sections 20-inches, 24-inches, or 30-inches wide by 20-inches or 24-inches deep and 90-inches high.
 - 2. Short circuit bracing to 42,000 RMS amperes or as otherwise shown on the drawings.
 - 3. Back access prohibited.
- B. Completely wired NEMA Class II, Type B wiring.
- C. 480 volts, three phase, 60 hertz alternating current, ampere ratings as indicated on the plan drawings.
- D. Motor controllers as described in 2.8 of this section.
- E. Comprised of individual vertical units of same depth and height.
- F. Common power bus arranged for easy section additions.
- G. Six size 1 starters per vertical section.
- H. Main horizontal bus (800 A) with vertical busses (300 A) to feed each section.
- I. Busses shall be tin plated aluminum or copper.
- J. Ground bus across the bottom.
- K. Top and bottom wiring space for each vertical section wiring.
- L. Vertical wiring space for unit wiring.
- M. All wiring neatly grouped, tied and supported to hold in place.
- N. All units to be modular construction of interchangeable type, front accessible held by machine screws.
- O. Each unit completely isolated and barriered from other units.
- P. Unit door hinged on the left side when facing the panel.
 - 1. Three hinges for doors over 1/3 height.
 - 2. Four hinges for full height doors.
- Q. Spare sections to be complete with all facilities except interior unit.
- R. Hinged door for spare sections to be furnished with covered cutouts.
- S. Blank area shall be covered.
- T. Zinc phosphate treated inside and out or rust preventive treatment.
- U. Tough epoxy resin primer, durable baked enamel, light grey finish.
- V. Auxiliary controls mounted in MCC:
 - 1. Auxiliary pan for equipment mounting.
 - 2. Relays, timers, meters, metering transformers, auxiliary power transformers mounted in separate compartments from starter.
 - 3. Limit two auxiliary relays in starter compartment:
 - a. Locking provision in extended position.
 - b. Roller or ball bearing slide.
- W. Space Heaters to prevent condensation:
 - 1. Separate unit each section or pair of sections.
 - 2. Size by manufacturer for 4°C. above room ambient temperature.
 - 3. Separate breaker or fused feed.
 - 4. Continuous operation control.

2.10 PANELBOARDS

- A. Type, size and functions as indicated on the drawings.
- B. Dead front, flush, surface or motor control center mounting.

- C. Tin plated aluminum busses, or copper busses, full panel height, rigidly supported with bus supports.
- D. Minimum bus rating not to be smaller than feeder protective device setting.
- E. Complete with main breaker or main lugs and sub-breakers as shown on the drawings.
- F. Circuit breakers:
 - 1. Molded case thermal magnetic trip units.
 - 2. Common trip bar for two or three pole breakers.
 - 3. Trip-free and trip-indicating plug-in type.
 - 4. Quick-make, quick-break contacts.
 - 5. Single, two or three pole breaker interchangeability.
 - 6. Ground fault circuit interrupter (GFCI) where indicated.
- G. Zinc-coated sheet steel cabinets, Underwriters' Laboratories, Inc. label. Heavy gauge for embedded installation.
- H. NEMA Type 1 enclosures unless otherwise noted.
- I. Typewritten directory properly identifying each circuit under the clear plastic cover.
- J. Panel bus arrangement:
 - 1. Three phase, 3-wire, 480 volts with ground bus.
 - 2. Three phase, 4 wire, 120/208 volts with solid neutral bar and lug.
- K. Gutter space:
 - 1. 5-inch minimum at top and bottom in addition to ground and bus space.
 - 2. 4-inch minimum on sides.
 - 3. Meet NEC requirements.
- L. Breaker interrupting rating not less than the following unless indicated differently on the drawings:

Breaker Ampere Rating	Interrupting Capacity	RMS Symmetrical Amperes
	240 V AC	480 V AC
20 - 60	10,000	14,000
70 - 125	10,000	14,000
150 - 400	40,000	30,000

2.11 OVERLOAD PROTECTION

- A. Size to fit motors.
- B. Verify from motor nameplate and measure amp load.
- C. Special consideration for submersible motors. Check manufacturer's recommendations.

2.12 MOTORS

- A. All motors shall be of the horsepower and speed appropriate for the equipment drive, of squirrel cage design, 40° C ambient, and shall be of nationally known manufacture, and shall conform to the applicable standards of the National Electrical Manufacturer's Association.
- B. Motors 1 horsepower and over shall be 3-phase. Fractional horsepower motors may be single phase.
- C. Insulation shall be not less than Class B and include an epoxy dip coating for protection against accidental submergence. Ambient temperature will be approximately 32°C and under these conditions the service factor shall be 1.0 minimum.
- D. The frame shall be suitably protected against corrosion inside and out considering operation in a moist corrosive atmosphere. Bug screens shall be provided on all ventilation openings. Grease fittings shall be provided on all thrust and radial ball bearings.
- E. Motors to be used with variable speed drives shall be compatible for operations with the drive chosen from a maximum full load speed down to zero without exceeding design temperature limits.

They shall be rated for continuous duty with the service factor of 1.15. Maximum full load speed is defined as the highest speed the motor may attain at maximum output of its power supply.

3. EXECUTION

3.1 ERECTION

- A. The wiring and materials shall be installed by the Contractor by tradesmen skilled in the installation of this type of work and in accordance with the manufacturer's instructions. All electrical work shall be in accordance with applicable electrical codes.

3.2 RACEWAYS AND CONDUIT

- A. Rigid conduit support intervals not greater than:
 - 1. 1-1/2-inches and smaller - 6 foot intervals
 - 2. 2-inch to 6-inch - 10-foot intervals
- B. Flexible conduit support intervals not greater than 4-1/2 foot intervals.

3.3 CONDUCTORS

- A. Pulling lubricant soapstone or NEC approved materials.
- B. No splices between outlet boxes or fittings.
- C. Color identify or tag as specified in Section 16010.
- D. Conductor ends stripped of insulation without nicking metal.
- E. Aluminum conductor terminations shall be made using an approved joint compound over wire and between strands.
- F. Aluminum compression terminals installed using approved hydraulic tools.
- G. Assure high conductive permanent connections.

3.4 JUNCTION BOXES

- A. Mount and support per good standard practice using brackets, rod hangers, bolts, expansion bolts.
- B. Support independent of attached conduit.
- C. Replace covers and screws when wiring is complete.
- D. Install underground junction boxes in accordance to manufacturer's recommendations.

3.5 UTILITY VAULTS

- A. Service vaults shall be sized per Portland General Electric Co. and U.S. West Telephone Co. requirements if not indicated on the drawings.
- B. Install per manufacturer's requirements.

3.6 WIRING DEVICES

- A. Wall switch outlet 4 feet 0 inches above finish floor.
- B. Receptacle outlet 4-ft. 0-in. above finish floor in process area.
- C. Receptacle outlet 18 inches above finish floor in office area.
- D. Receptacle outlet 10 inches above counter.
- E. Height as noted on drawings.
- F. Lighting switch on lock side of entrance door.

3.7 LOCAL CONTROL STATIONS

- A. Secure to adjacent wall.

- B. Secure to controlled equipment in convenient location.

3.8 MOTOR CONTROLS

- A. Separately enclosed starter units:
 - 1. Fasten securely to supporting structure:
 - a. Wood screws or lag screws to wood boards or timbers.
 - b. Machine bolts to metal framing or plates.
 - c. Expansion anchors to concrete walls.
 - d. Expansion toggle wing bolts or sleeve anchors to hollow block.
 - e. Provide 1-inch spaces to set panel out from concrete or block wall.
 - 2. Arrange for driven equipment use or function.
 - a. Similar units adjacent.
 - b. Multiple units:
 - (1) In horizontal line uniform to top height.
 - (2) In groups symmetrical arrangement. Top of highest enclosure not exceeding 6-feet-9-inches above floor and bottom lowest enclosure not less than 1-foot-3-inch above floor.
- B. Motor control centers:
 - 1. Fasten brace from adjacent wall or support structure to enclosure frame.
 - a. Support enclosure as required for Seismic Zone 3.
 - 2. Fasten securely at base.
 - a. Anchor bolts in concrete.
 - b. Lag bolts or through bolts in timber.
 - 3. Assemble units and make-up field connections.
 - a. Follow manufacturer's instructions.
 - b. Special care for joints in electrical busses.
 - 4. Connect all wiring to power source, loads and controls.

3.9 PANELBOARDS AND CABINETS

- A. Fasten securely to wall:
 - 1. Wood screws or lag screws to wood boards or timbers.
 - 2. Machine bolts to metal framing or plates.
 - 3. Expansion anchors to concrete walls.
 - 4. Expansion toggle wing bolts or sleeve anchors to hollow block.
 - 5. Provide 1-inch space to set panel out from concrete or block wall.
- B. Outdoor post mounted:
 - 1. Provide wood or galvanized angle brackets.
 - a. Galvanized 1/2 inch lag screw or through bolt fastening to pole.
 - b. Galvanized lag screw or through bolt fastening box to bracket.
 - 2. Brackets top and bottom if enclosure more than 15 inches high.
 - 3. Support post not less than 6-inch x 6-inch treated timber or 4-inch Schedule 40 galvanized pipe set in concrete.
- C. Mounting height:
 - 1. Single unit - 5 feet centerline above floor or ground.
 - 2. Multiple units - uniform top height.

* * * END OF SECTION * * *

SECTION 16400

FEEDER AND BRANCH CIRCUITS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Shop Drawings, Product Data and Samples: Section 01340
- B. Basic Electrical Requirements: Section 16010

1.2 DESCRIPTION

- A. Provide all feeders shown on the Drawings.
- B. Provide branch circuits to all outlets, devices, motors, appliances and electrical equipment unless otherwise noted.

2. PRODUCTS (Not Applicable)

3. EXECUTION

3.1 INSTALLATION

- A. All feeder conductors to be continuous from origin to panel or equipment without splice in intermediate pull or splice box. Unless otherwise indicated each feeder raceway to contain only those conductors constituting a single feeder.
- B. Feeder raceways to enter directly opposite terminal lugs where possible.
- C. Provide feeder conductor identification in accordance with Section 16010: Basic Electrical Requirements.
- D. Install branch circuit wiring in raceways throughout project unless otherwise indicated.
- E. Verify roughing-in requirements prior to installation of branch circuits. See equipment schedules, architectural, mechanical and structural Drawings for equipment locations.
- F. See Section 16050; Basic Electrical Materials and Methods, for general installation requirements.

* * * END OF SECTION * * *

SECTION 16405

EQUIPMENT CONNECTIONS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Shop Drawings, Product Data and Samples: Section 01340
- B. Basic Electrical Requirements: Section 16010

1.2 DESCRIPTION

- A. Connect to all equipment noted or as scheduled on the Drawings, and provide all cords, cord caps, circuit protection, disconnect switches and necessary devices required for proper connection of equipment.
- B. All control devices furnished by subcontractor are to be set in place by him unless otherwise noted. Control wiring between starters, pneumatic electric switches, electrically operated control components, etc. provided by electrical contractor unless indicated otherwise.

2. PRODUCTS

2.1 MATERIALS

- A. Disconnect switches: Heavy duty unfused unless otherwise noted. Disconnect switches for fractional horsepower, single phase motors may be motor rated toggle switches. Enclosures for disconnect switches as shown or required for conditions encountered.

3. EXECUTION

3.1 INSPECTION

- A. Verify exact location and method of connection to each piece of equipment prior to roughing-in. Where roughing-in requirements is different from that shown on the Drawings, Verify with Engineer before proceeding.
- B. Determine voltage and phase of each item before connecting, and if characteristics are not proper for energy available immediately notify Engineer.
- C. Verify location of all control devices with subcontractor.
- D. Examine location of all equipment to assure adequate clearance for operation and connection.
- E. Obtain drawings from subcontractor and equipment suppliers to insure proper connections.

3.2 INSTALLATION

- A. Connect motors to provide proper direction of rotation.
- B. Make connections to equipment in accordance with manufacturer's instructions and NEC requirements.
- C. Install raceway entrances to roof mounted equipment inside equipment bases wherever possible to eliminate penetrating roofs.
- D. Test all circuits for fusing, continuity and control.
- E. Coordinate work with other subcontractors.

* * * END OF SECTION * * *

SECTION 16426

PANELBOARDS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Shop Drawings, Product Data and Samples: Section 01340
- B. Basic Electrical Requirements: Section 16010
- C. Basic Electrical Materials and Methods: Section 16050

1.2 DESCRIPTION

- A. The Contractor shall furnish and install the panelboards as specified and as shown on the contract drawings.

1.3 QUALITY ASSURANCE

- A. General Requirements:
 - 1. New, free from defects, quality as specified.
 - 2. Standard product of known manufacturer.
 - 3. Labeled or listed by approved testing laboratories.
 - 4. Suitable for the intended application.
 - 5. Approved by inspection authorities.
 - 6. Conforming to applicable standards of NEMA, ANSI and IEEE.
 - 7. Service entrance products shall meet EUSERC Standards.
- B. Acceptable Manufacturers:
 - 1. General Electric
 - 2. Square D
 - 3. I-T-E (Siemens)
 - 4. Cutler-Hammer
- C. The panelboards and all components shall be designed, manufactured and tested in accordance with the latest applicable standards, supplements and amendments to the following:
 - 1. ANSI/NFPA 70: National Electrical Code (NEC)
 - 2. UL 67: Panelboards
 - 3. UL 50: Cabinets and Boxes
 - 4. NEMA PB1
 - 5. Circuit Breaker: Type I Class I
 - 6. EUSERC: Electric Utility Service Equipment Requirements Committee

1.4 SUBMITTALS

- A. Shop Drawings and Data: In accordance with procedures set forth in Section 01340, submit the following:
 - 1. Breaker layout drawing with dimensions indicated and nameplate designation.
 - 2. Component list
 - 3. Conduit entry/exit locations
 - 4. Assembly ratings including:
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current
 - 5. Cable terminal sizes

1.5 QUALIFICATIONS

- A. The manufacturer of the panelboard shall be the manufacturer of the major components within the assembly, including circuit breakers.
- B. For the equipment specified herein, the manufacturer shall be ISO 9000, 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- D. The panelboards shall be suitable for and certified to meet all applicable seismic requirements of Uniform Building Code (UBC) for Zone 3 application. Guidelines for the installation consistent with these requirements shall be provided by the switchgear manufacturer and be based upon testing of representative equipment.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

2. PRODUCTS

2.1 RATINGS

- A. Panelboards rated 240 Vac or less shall have short-circuit ratings as shown on the drawings, but not less than 10,000 amperes RMS symmetrical.
- B. Panelboards rated 480 Vac shall have short-circuit ratings as shown on the drawings, but not less than 14,000 amperes RMS symmetrical.
- C. Panelboards shall be labeled with a UL short-circuit rating. When series ratings are applied with integral or remote upstream devices, a label or manual shall be provided. It shall state the conditions of the UL series ratings including:
 - 1. Size and type of upstream device
 - 2. Branch devices that can be used
 - 3. UL series short-circuit rating

2.2 ENCLOSURE CONSTRUCTION

- A. Interiors shall be completely factory assembled devices. They shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors.
- B. Trims for lighting and appliance panelboards shall be supplied with a hinged door over all circuit breaker handles. Doors in panelboard trims shall not uncover any live parts. Doors shall have a semiflush cylinder lock and catch assembly. Doors over 48-inches in height shall have auxiliary fasteners.
- C. Distribution panelboard trims shall cover all live parts. Switching device handles shall be accessible.
- D. Surface trims shall be same height and width as box. Flush trims shall overlap the box by 3/4-inch on all sides.
- E. A directory card with a clear plastic cover shall be supplied and mounted on the inside of each door.
- F. All locks shall be keyed alike.
- G. Enclosures shall be at least 20-inches wide made from galvanized steel. Provide minimum gutter space in accordance with the National Electric Code. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include the additional required wiring space. At least four (4) interior mounting studs with adjustable nuts shall be provided.
- H. Enclosures shall be provided with blank ends.

2.3 BUS

- A. Main bus bars shall be plated aluminum or copper sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum.
- B. A bolted ground bus shall be included in all panels.
- C. Full-size (100%-rated) insulated neutral bars shall be included for panelboards as shown with neutral. Bus bar taps for panels with single-pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection. 200%-rated neutrals shall be supplied for panels designated on drawings with oversized neutral conductors.

2.4 WIRING/TERMINATIONS

2.5 DISTRIBUTION PANELBOARDS: CIRCUIT BREAKER TYPE

- A. Distribution panelboards with bolt-on devices contained therein shall have series or integrated rated interrupting ratings as indicated on the drawings. Panelboards shall have molded case circuit breakers as indicated below.
- B. Molded case circuit breakers shall provide circuit overcurrent protection with inverse time and instantaneous tripping characteristics. Ground fault protection shall be provided where indicated.
- C. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be non-welding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.
- D. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the drawings.
- E. Where indicated, circuit breakers shall be UL listed for series application.
- F. Provide main circuit breakers UL listed for application at 100% of their continuous ampere rating in their intended enclosure.
- G. Provide shunt trips, bell alarms, and auxiliary switches as shown on the contract drawings.

2.6 BRANCH CIRCUIT PANELBOARDS

- A. The minimum integrated short-circuit rating for branch circuit panelboards shall be indicated on the drawings.
- B. Bolt-in type, heavy-duty, quick-make, quick-break, single- and multi-pole circuit breakers of the types specified herein, shall be provided for each circuit with toggle handles that indicate when unit has tripped.
- C. Circuit breakers shall be thermal magnetic type with common type handle for all multiple pole circuit breakers. Circuit breakers shall be minimum 100-ampere frame and through 100-ampere trip sizes shall take up the same pole spacing.
 - 1. Circuit breaker handle locks shall be provided for all circuits that supply exit signs, emergency lights, and fire alarm panels.
- D. Circuit breakers shall have a minimum interrupting rating of 10,000-amperes symmetrical at 240 volts, and 14,000-amperes symmetrical at 480 volts.

2.7 FINISH

- A. Surfaces of the trim assembly shall be properly cleaned, primed, and a finish coat of gray ANSI 61 paint applied.

3. EXECUTION

3.1 INSPECTION

- A. Verify location and mounting requirements for the equipment.
- B. Verify voltage prior to installation
- C. Examine switchboard equipment for damage and replace prior to installation.

3.2 INSTALLATION

- A. General
 - 1. Install panelboard in accordance with manufacturer's instructions, the drawings, and NEC.
 - 2. Properly ground to building ground system.
 - 3. Properly support and align and provide all necessary accessories and steel shapes for support and alignment.
 - 4. Installation to meet requirements for a Seismic Zone 3 area.
 - 5. Coordinate switchboard installation with the facility construction.

3.3 TESTING

- A. Refer to Section 16010, this Division, for general testing criteria.
- B. Test the switchboard for proper operation and correct phasing.
- C. Perform all tests as recommended by the manufacturer and/or requested by the Engineer.

* * * END OF SECTION * * *

SECTION 16450

GROUNDING

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Shop Drawings, Product Data and Samples: Section 01340
- B. Basic Electrical Requirements: Section 16010
- C. Basic Electrical Materials and Methods: Section 16050

1.2 DESCRIPTION

- A. Furnish all labor, material, equipment, instruments, supervision, and accessories as required to install the grounding system required. Equipment grounds, including conduits, shall have separate grounding conductors above grade. Grounds at various equipment locations may be combined into single conductors connecting to below grade grids.
- B. Provide grounding of all electrical equipment per code rules and established safety practices.
- C. Provide grounding stations for system neutrals.
- D. Provide grounding system as indicated on the Drawings. Coordinate with the Vendors equipment grounding system components which they will furnish.

1.3 QUALITY ASSURANCE

- A. Applicable Codes and Standards: Shall be the latest revisions, supplements and amendments to the following:
 - 1. ANSI C2: National Electrical Safety Code (NESC).
 - 2. ANSI/NFPA 70: National Electrical Code (NEC).
 - 3. UL Standard 467: Grounding and Bonding Equipment.
- B. Acceptable Manufacturers:
 - 1. Ground Rods:
 - a. A.B. Chance Co.
 - b. Copperweld Corporation
 - c. Porcelain Products
 - d. Willard Industries
 - e. American Electric
 - 2. Cable-to-Equipment Ground Lugs:
 - a. Burndy Corporation (Burndy)
 - b. Erico Products
 - c. O.Z. Gedney Company
 - 3. Coatings:
 - a. Kop-coat, Carboline Company

1.4 SUBMITTALS

- A. Submittals: In accord with Section 01340.
- B. Includes, but not limited to, catalog cuts for the following:
 - 1. Ground Rods
 - 2. Connectors

2. PRODUCTS

2.1 MATERIALS

- A. All materials shall be in accordance with the requirements as specified on the drawings and the referenced specification details.
- B. Wire and Cable:
 - 1. In general, ground cables shall be bare, or insulated soft or medium hard drawn, Class A or Class B stranded copper, of sizes shown on the drawings.
 - 2. Conductor Sizes:
 - a. As indicated for specific connections or as required by NEC.
 - b. For required connections not indicated, use conductor size not less than No. 2/0 AWG if buried in earth or cast in concrete, or No. 6 AWG at other locations.
- C. Ground Rods:
 - 1. Copper-clad steel or copper-alloy sectional-type rods. Copperweld 9400 Series or equivalent.
 - 2. One end pointed to facilitate driving.
 - 3. 3/4-inch diameter and 10-feet long with diameter and length stamped near top of rod.
- D. Connection Materials:
 - 1. Below Ground
 - a. Cable-to-cable, cable-to-rod, and cable-to-connector connections of exothermic-welding-type process.
 - 2. Above Ground
 - a. Compression type unless otherwise indicated on the drawings.
 - b. Bolted to equipment housing with silicon bronze bolts and lock washers.
 - 3. Cable to building column connections by exothermic-welding type process.
 - 4. Ground Rod Clamps: One piece cast bronze with safety set screw. Copperweld 6500 Series or equivalent.
- E. Coatings
 - 1. Kop-coat Bitumastic No. 50 asphaltic coating.

3. EXECUTION

3.1 INSPECTION

- A. Do not cover connections before they are inspected by Engineer.

3.2 INSTALLATION

- A. General
 - 1. Copper ground wire shall be used on interior and exterior installations and in conduit runs for equipment grounding.
 - 2. All electrical equipment and conduit installed under this contract shall be grounded as required by NEC, indicated on the contract drawings and as specified herein.
- B. Wire and Cable
 - 1. Install using as few joints as possible.
 - 2. Suitably protect cable against damage during construction.
 - 3. Replace or suitably repair cable if damaged by anyone before final acceptance.
 - 4. Route runs as indicated or required by NEC.
 - 5. Route where possible for maximum physical protection.
- C. Ground Rods
 - 1. Install rods as indicated by driving and not by drilling or jetting.
 - 2. Drive rods into unexcavated portion of the earth where possible.

3. Where rods must be installed in excavated areas, drive rods into earth after compaction of backfill is completed.
 4. Drive to a depth such that top of rods will be approximately 24 inches below final grade, or subgrade, and connect main grid ground cable thereto.
- D. Connections
1. Conform to manufacturer's instructions.
 2. Chemically degrease and dry completely before welding connections.
 3. Apply one coat of asphaltic coating to all exothermic-welded connections to be buried.
 4. Make connections to equipment as follows:
 - a. Make up clean and tight to assure a low-resistance connection with resistance drop not exceeding 1 Ohm.
 - b. Install so as not to be susceptible to mechanical damage during operation or maintenance of equipment.
- E. Metallic Conduit Ground
1. Adequately and properly ground at all terminal points and wherever isolated from equipment or grounded steel.
 2. Where extending into floor-mounted equipment from below, connect to equipment ground bus or frame.
 3. All conduit shall be grounded directly or through equipment frames and ground busses to the ground system conductor which shall be minimum of No. 6 bare copper.
- F. Box Grounds
1. Unless grounded by conduit system, ground all boxes by direct copper connection.

3.3 FIELD TESTING

- A. Measure resistance of ground system to each ground riser.
- B. Record results and notify Engineer if any reading exceeds 25 ohms. If the resistance exceeds 25 ohms, then ground rod(s) shall be added. Additional rods shall be driven at least 6 feet away from any existing rods and shall be tied to the existing ground system.
- C. Test at least three of each type of ground connections and not less than 25 percent of all ground connections.
- D. Test by one of the following methods for resistance measurement:
1. Three-point method, using an ammeter and voltmeter and a-c- or d-c power supply.
 2. Commercial instrument method approved for such type testing.

* * * END OF SECTION * * *

SECTION 16455

DRY-TYPE TRANSFORMERS

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Shop Drawings, Product Data and Samples: Section 01340
- B. Basic Electrical Requirements: Section 16010

1.2 DESCRIPTION

- A. Furnish all labor, material, equipment, instruments, supervision, and accessories as required to install the dry-type transformers.
- B. All transformers shall be properly grounded as indicated on the drawings or as required by the NEC and established safety practices.

1.3 QUALITY ASSURANCE

- A. Applicable Codes and Standards: Shall be the latest revisions, supplements and amendments to the following:
 - 1. ANSI C2: National Electrical Safety Code (NESC).
 - 2. ANSI/NFPA 70: National Electrical Code (NEC).
 - 3. ANSI Standard C57.12.50: Ventilated Dry-Type Distribution Transformers.
 - 4. NEMA Standard ST20: Dry-Type Transformers for General Applications.
 - 5. UL Standard 1561: Dry-Type General Purpose and Power Transformers.
- B. Acceptable Manufacturers:
 - 1. General Electric
 - 2. Westinghouse
 - 3. Square D
 - 4. I-T-E (Siemens)

1.4 SUBMITTALS

- A. Submittals: In accord with Section 01340.
- B. Includes, but not limited to, catalog cuts for the following:
 - 1. Transformer, 3-phase, 480 volts delta primary, 120/208 volts secondary, 60 hertz.

2. PRODUCTS

2.1 MATERIALS

- A. Design Requirements:
 - 1. Transformer sizes shall be as indicated.
 - 2. Transformer construction and testing shall meet or surpass all applicable requirements of "Applicable Codes and Standards".
 - 3. All transformers shall bear the UL label and shall be acceptable for installation in the locations indicated.
 - 4. All transformers shall be supplied from the same manufacturer.

2.2 DRY-TYPE TRANSFORMERS

- A. Three phase transformers shall be 480 volt delta primary. Transformers shall have a minimum of 4-2 1/2 % full capacity primary taps.
- B. Transformers shall be 150°C temperature rise above 40°C ambient. All insulating materials to be in accordance with NEMA ST20 Standard for a 220°C UL component recognized insulation system.
- C. Transformer coils shall be of the continuous wound construction and shall be impregnated with nonhygroscopic, thermosetting varnish.
- D. All cores to be constructed of high grade, non-aging silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point. The core laminations shall be clamped together with structural steel angles. The completed core and coil shall then be bolted to the base of the enclosure but isolated therefrom by means of rubber, vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure. The vibration isolating system shall be designed to provide a permanent fastening of the core and coil to the enclosure. Sound isolating systems requiring the complete removal of all fastening devices will not be acceptable.
- E. Transformers shall be in a heavy gauge, sheet steel, ventilated enclosure. The ventilating openings shall be designed to prevent accidental access to live parts in accordance with UL, NEMA, and National Electrical Code standards for ventilated enclosures. Transformers through 112.5 KVA shall be designed so they can be either floor or wall mounted. Above 112.5 KVA they shall be floor mounted design.
- F. The entire transformer enclosure shall be degreased, cleaned, phosphatized, primed, and finished with a grey, baked enamel.
- G. The maximum temperature of the top of the enclosure shall not exceed 50°C rise above a 40°C ambient.
- H. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE, and ANSI standards.
- I. Sound levels shall be guaranteed by the manufacturer not to exceed 50 db.

3. EXECUTION

3.1 INSPECTION

- A. Verify location and mounting requirements for each transformer.
- B. Verify voltage at each transformer prior to installation.
- C. Examine transformers for damage and replace prior to installation.

3.2 INSTALLATION

- A. Install transformers in accordance with manufacturer's instructions, the drawings, and NEC.
- B. Properly ground transformers to building ground system.
- C. Properly support and align transformers and provide all necessary accessories and steel shapes for support of the transformers.
- D. Coordinate complete transformer installation with the facility construction.

3.3 TESTING

- A. Refer to Section 16010, this Division, for general testing criteria.
- B. Test all transformers for proper operation and correct phasing.
- C. Perform all tests as recommend by the transformer manufacturer and requested by the Engineer.

* * * END OF SECTION * * *

SECTION 16500

LIGHTING

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Shop Drawings, Project Data and Samples: Section 01340
- B. Basic Electrical Requirements: Section 16010
- C. Basic Electrical Materials and Methods: Section 16050

1.2 ADAPTATION OF EQUIPMENT

- A. Furnish equipment readily adaptable for installation and operation in the structure in the manner shown on the drawings.
- B. Assume full responsibility for alterations of planned structure to accommodate actual equipment furnished.
- C. Make and coordinate all required changes, including structural redesign if required to accommodate actual equipment furnished.
- D. Provide all such alterations free of extra cost to the Owner or his representatives.
- E. Provide fixtures complete with lamps, ballasts, reflectors, diffuser, lenses, louvers, shielding, hangers, accessories and fittings.

1.3 SUBMITTALS

- A. Shop Drawings and Data: In accordance with procedures set forth in Section 01340, submit picture, complete assembly, and installation drawings together with detailed specifications and data covering materials used, parts, devices, and other accessories forming part of the lighting equipment, including, but not limited to:
 - 1. Foot candle distribution pattern, each axis if unsymmetrical.
 - 2. Maintenance factors.
 - 3. Coefficient of utilization.
 - 4. Lamp rated lumens and wattage.
 - 5. Ballast type and protection.
- B. Consideration of fixtures submitted will be based on:
 - 1. Comparison with the catalogue data for the fixtures specified.
 - 2. Must be UL listed and approved for locations indicated.
 - 3. All fixtures submitted at one time.
 - 4. Sample fixture when specifically requested by Engineer.
- C. Operation and Maintenance Manuals:
 - 1. Supply operation and maintenance manuals prepared by the equipment supplier and covering:
 - a. Assembly, installation, adjustment and checking instructions.
 - b. Parts list.
 - c. Outline, cross sections, and assembly drawings, illuminating engineering data; and wiring diagrams.
 - 2. Operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

1.4 PROTECTION

- A. Box, crate, or otherwise completely enclose and protect all equipment during shipment, handling, and storage.
- B. Protect equipment from exposure to elements and keep thoroughly dry at all times.
- C. Painted Surfaces:
 - 1. Protect against impact, abrasion, discoloration, and other damage.
 - 2. Repaint, to satisfaction of Engineer, all painted surfaces which are damaged prior to final acceptance.
 - 3. Protect electrical equipment, controls, insulation, etc. against moisture and water damage.

1.5 EQUIPMENT GUARANTEE

- A. Guarantee all equipment against:
 - 1. Faulty or inadequate design.
 - 2. Improper assembly, erection, or handling.
 - 3. Defective workmanship or materials.
 - 4. Leakage, breakage, or other failure.
- B. Provide guarantee as specified in General Conditions.

1.6 QUALITY ASSURANCE

- A. Applicable Standards: Shall be the latest revisions, supplements and amendments to the following:
 - 1. Certified Ballast Manufacturers (CBM) - Ballasts
 - 2. Illuminating Engineering Society (IES)
 - 3. Reflector and Lamp Manufacturers (RLM) Standards Institute
 - 4. Underwriters' Laboratories, Inc. (UL)
 - a. UL Standard 935: Fluorescent Lamp Ballasts
 - b. UL Standard 1029: High Intensity Discharge Lamp Ballasts
 - c. UL Standard 1570: Fluorescent Lighting Fixtures
 - d. UL Standard 1571: Incandescent Lighting Fixtures
 - e. UL Standard 1572: High Intensity Discharge Lighting Fixtures
 - 5. American National Standards Institute (ANSI):
 - a. Applicable codes under C78 (Electric Lamps) for:
 - (1) High Intensity Discharge
 - (2) Incandescent
 - (3) Fluorescent
 - b. Applicable codes under C81: Electric Lamp Bases and Holders
 - c. Applicable codes under C82: Lamp Ballasts and Transformers
 - 6. ANSI/NFPA 70: National Electrical Code (NEC)
 - 7. ASTM D523: Standard Test Method for Specular Gloss
 - 8. Federal Specification W-L-101: Incandescent Lamps
 - 9. Federal Specification W-L-00116: Fluorescent Lamps
- B. Acceptable Manufacturers:
 - 1. Lighting Fixtures: As listed on the Lighting Schedule or approved equivalent.
 - 2. High Intensity Discharge and Fluorescent Ballasts:
 - a. Jefferson Electric
 - b. Advance Transformer
 - c. Magnetek Lighting Products
 - 3. High Intensity Discharge and Fluorescent Lamps:
 - a. General Electric Co.
 - b. Philips Lighting
 - c. Sylvania (GTE Products)

2. PRODUCTS

2.1 DESIGN REQUIREMENTS

- A. Furnish and install a complete and operable lighting system.
- B. Provide interior and exterior lighting systems as indicated:
 - 1. 120 volt, 1-phase, 60 hertz.
 - 2. 208 volt, 1-phase, 60 hertz.
- C. The fixture catalog numbers listed on the "luminaire schedule" indicate manufacturer, fixture design, appearance, etc., desired. These fixtures shall be modified if necessary to comply with the corresponding ceiling systems and application.
- D. All lighting fixtures shall bear the Underwriter's Laboratories, Inc., label and shall be acceptable for installation in the locations indicated.
- E. All fixture component parts shall be manufactured and/or assembled at the manufacturing plant for shipment in one or more packages. The shipment from the fixture manufacturer shall include integrally-mounted ballasts where ballasts are required for the proper operation of the fixture lamps.
- F. If fixtures specified herein are discontinued at the time the work is executed, provide suitable substitute fixtures, without additional cost, as directed by the Engineer.
- G. Provide accessories such as wire guards, fusing, stem, canopies, cords, toggle bolts, etc., necessary to mount fixtures in a proper and approved method.
- H. Voltage: Provide ballast for operation of fixtures at voltage shown by circuiting on Drawings, or otherwise indicated.

2.2 FLUORESCENT FIXTURES

- A. Construction:
 - 1. Rust-protected highest quality steel
 - 2. Aluminum
- B. Finish on entire Fixture:
 - 1. Baked white enamel of non-modified acrylic on alkyd base type.
 - 2. Gloss 80% minimum measured by ASTM Method D523 (60 degrees).
 - 3. Reflectance all fixture parts shall be 85 percent of minimum measured with integrating sphere type reflectometer.
 - 4. Trim finish, louver surfaces, nonferrous reflecting surfaces exception to above requirement shall be manufacturer's standard finish.
- C. Design for maximum heat dissipation:
 - 1. Ballast case not exceed 90°C (194°F.).
 - a. Ambient room temperature 24°C (75°F).
- D. Ballast Type:
 - 1. Ballast for high output lamps shall be high power factor type, UL labeled.
 - 2. Ballast for T-8 lamps shall be energy efficient solid state electronic type, UL labeled.
- E. Ballast Thermal Protection:
 - 1. Automatic resetting protection per UL requirements.
- F. Ballast Mounting:
 - 1. Eliminate vibration and noise.
 - 2. Adequate heat transfer.
 - 3. Captive bolts and nuts for easy replacement.
- G. Sound rating Class B or better.
- H. Parabolic Louver:
 - 1. Pre-anodized aluminum, mitered corners and interlocking corners for precise parabolic shape.
 - 2. Louver secured by T-hinges and spring loaded cam latches so louver assembly can hinge or latch from either side.
 - 3. Number of louver cells shall be indicated on the drawing luminaire schedule.

2.3 INCANDESCENT FIXTURES

- A. Maximum temperature 90°C (194°F) at point of contact with ceiling or wall.
- B. Light pattern similar to specified unit.

2.4 HIGH INTENSITY DISCHARGE (HID) FIXTURES

- A. As listed on the drawing "luminaire schedule".
- B. High Intensity Discharge Lamp Ballasts shall conform to UL-1029 and bear the CBM and UL labels.

2.5 LAMPS

- A. Provide lamps manufactured by Philips or equal unless otherwise indicated.
- B. Fluorescent:
 - 1. Lamps as indicated on the drawing "Luminaire Schedule".
 - 2. 32 watt, T-8 rapid start energy efficient, color rendering, 48 inches. Initial rating not less than 2,900 lumens.
- C. Incandescent:
 - 1. 120 volt inside frosted per Fed. Spec. W-L-101.
 - 2. Bulb shape A-19, A-23 etc. per manufacturer's recommendation.
- D. High Intensity Discharge (HID):
 - 1. Provide lamps as indicated and as recommended by the fixture manufacturer.
 - 2. Metal Halide (MH) lamps shall be in the wattage size indicated on the "luminaire schedule".

2.6 SPECIAL ACCESSORIES

- A. Provide as necessary to mount fixture:
 - 1. Suspended ceiling frames
 - 2. Stems
 - 3. Canopies
 - 4. Toggle bolts
 - 5. Cords, etc.

3. EXECUTION

3.1 INSPECTION

- A. Verify location and mounting requirements for each fixture.
- B. Verify voltage at each fixture outlet prior to installation.
- C. Examine fixtures for damage or broken parts and replace prior to installation.

3.2 INSTALLATION

- A. General:
 - 1. Install lighting fixtures at locations indicated on contract drawings.
 - 2. Coordinate installation of fixtures with other subcontractors, and verify methods of hanging and supporting required.
 - 3. Install after pipe, duct, conduit, etc., that will be installed above light fixtures have been installed unless otherwise directed by the Engineer.
 - 4. Fixtures to be coordinated with ductwork, piping and structural members. Adjust stems as required for proper illumination of the area.

5. Properly support and align fixtures and provide all necessary accessories and steel shapes for support of the fixtures. Coordinate complete fixture installation with the facility construction.
6. All fixtures to be illuminated at time of acceptance.
7. All fixtures to be supported in a manner to meet the requirements in a Seismic Zone 3 area.

3.3 SUPPORTS AND ALIGNMENT

- A. Provide proper supports for all fixtures:
 1. Rods, hangers, swivel plates to suit conditions and slopes.
 2. Steel angles and shapes, unistrut, spacers as required by conditions.
 3. Fixture supports independent from conduit.
- B. Alignment:
 1. Parallel to building lines.
 2. Uniform and symmetrical spacing within rooms.
 3. Uniform level when suspended from sloping surfaces.

3.4 CLEANING AND RELAMPING

- A. All lighting fixtures shall be cleaned immediately prior to final inspection.
- B. Touch-up scratched or marred surfaces to match original finish.

3.5 TESTING

- A. Refer to Section 16010, this Division, for general testing criteria.
- B. Test all systems for proper operation and correct phasing.
- C. Test all lighting circuits and systems upon completion of installation to assure that the lighting loads operate satisfactorily and conform to Contract Documents.
- D. Perform all tests as recommended by the system manufacturers or requested by the Engineer.

* * * END OF SECTION * * *

SECTION 16710

TELEPHONE

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Shop Drawings, Product Data and Samples: Section 01340.
- B. Basic Electrical Requirements: Section 16010.
- C. Basic Electrical Materials and Methods: Section 16050.

1.2 DESCRIPTION

- A. Provide underground telephone system to telephone terminal location in building as indicated.
- B. Provide system of empty raceways, boxes, terminal cabinets, etc., as indicated on Drawings for installation of telephone wiring and equipment by Owner.

1.3 QUALITY ASSURANCE:

- A. Conform to requirements of serving utility and National Electrical Code (NEC).

2. PRODUCTS

2.1 MATERIALS

- A. Raceways, Fittings, Boxes, Cabinets and Finish Plates: Section 16050, Basic Electrical Materials and Methods.

3. EXECUTION

3.1 INSPECTION

- A. Verify location of all telephone outlets with architectural Drawings prior to roughing-in. Where outlets occur at built-in counters or desks, coordinate with other trades.
- B. Examine area to receive terminals and equipment to assure adequate clearance.

3.2 INSTALLATION

- A. Verify installation requirement with serving utility. Stub conduit up nominally six inch above floor or below ceiling at terminal facilities provided by telephone company and lock into metal template with locknuts and insulating bushings.
- B. Underground Service: Conduit from terminal location inside building to telephone conduit beyond building. Other exterior raceways as indicated on Drawings.
- C. Conduit bends to be large radius field bends or factory ells. For wall outlets at frame or metal studs, place telephone connector inside wall cavity and not in surface mounted box located over telephone outlet. Through wall box and conduits at these locations to be properly supported.
- D. Wall Outlets:
 - 1. For concrete or masonry walls, minimum of four inch square with two gang device cover finish plate.
 - 2. For frame or metal stud partitions or where outlets are located in blank panels of casework, provide four inch square through wall box 1-1/2 inch deep with open back and two gang device cover finish plates.

3. Provide and install minimum 3/4" conduit from outlet boxes to ceiling cavity. Stub-up, label and cap for future extension of phone conductors.
- E. Provide pull-in line in all empty raceways.

* * * END OF SECTION * * *

SECTION 16720

FIRE ALARM AND DETECTION SYSTEM

1. GENERAL

1.1 RELATED SECTIONS

- A. Basic Electrical Requirements: Section 16010.
- B. Basic Electrical Materials and Methods: Section 16050.
- C. Fire Protection: Section 15300.

1.2 DESCRIPTION

- A. Design, provide and install a central station fire detection system which shall provide zoned, noncoded, automatic fire and smoke detection for buildings and structures.

1.3 REFERENCES, CODES AND STANDARDS

- A. Equipment utilized in the design and execution of this work shall be listed by Underwriters' Laboratories.
- B. Applicable Codes and Standards: Shall be the latest revisions, supplements and amendments to the following:
 - 1. ANSI/NFPA 70: National Electrical Code (NEC).
 - 2. UL Standard 268: Smoke Detectors for Fire Protective Signaling Systems.
 - 3. ANSI/NFPA 72: National Fire Alarm Code.
 - 4. ANSI Standard A117.1: Providing Accessibility and Usability for Physically Handicapped People.
 - 5. Uniform Fire Code (UFC).
 - 6. Uniform Building Code (1991).

1.4 SUBMITTALS

- A. Test Reports: Obtain approval from office of the City of Oregon City Fire Prevention District authority and jurisdiction for fire alarm system installations.
 - 1. Submit two sets of design plans and specifications for approval from authority having jurisdiction. Submit to the Engineer for reference in accordance with Section 16010.
 - 2. Arrange for and perform tests required by authority having jurisdiction for final acceptance testing.
 - 3. Notify the Owner and Engineer in writing upon completion of installation and three days prior to final acceptance testing.

1.5 QUALITY ASSURANCE

- A. Design and Installer Qualifications: Fire alarm and detection system contractor shall represent nationally-known manufacturers and shall be experienced and licensed to do such work (experienced shall mean having a minimum of five (5) previous projects similar in size and scope to this project), be familiar with all regulating codes and requirements, and has complied with all of the requirements of the authority having jurisdiction. Upon request, submit evidence of such qualifications to the Engineer and Owner.
- B. Supervision: Provide services of fire alarm system manufacturer's representative to supervise installation of system, wiring, and equipment.

1. Representative: Instruct Owner in proper operation and maintenance of system and assist in final inspection of system by authority having jurisdiction.
- C. Fire Alarm Equipment, Material, Devices, and Assemblies Used on Project: All new components, listed and labeled by accepted testing laboratory for specific purpose for which they are used. Do not alter, install, or modify equipment in any way that may alter or void label or listing. In addition, equipment shall be listed by local code enforcing authority, as applicable.
- D. Manufacturers:
 1. Pyrotronics, Inc.
 2. Notifier Corporation.
 3. Minneapolis Honeywell.
 4. Edwards Company Inc.
 5. American District Telegraph Company.
 6. Simplex Time Recorder Company.
 7. Accepted substitute in accordance with Section 16010.

2. PRODUCTS

2.1 MATERIALS

- A. Central Station Supervision for Automatic Fire and Smoke Detection Systems:
 1. General: Provide central station supervision for emergency alarm, smoke detection and automatic fire extinguishing systems per UFC requirements. It shall be a zoned, closed circuit, electrically supervised system, wherein activation of any device sounds evacuation signals until manual function acknowledges alarm conditions or until system is reset.
 - a. Assemblies and Components: Manufactured by one manufacturer and complete in every respect.
 - b. Complete System: Installed in compliance with most restrictive of each of referenced standards and codes.
- B. Manual Stations: Provide semiflush manual stations, complete with appropriate back box and of rectangular design.
 1. Use of hammer in operation not allowed.
 2. Provide locking device that when opened for test or fire drill purposes will activate system.
 3. Provide manual stations with keys, master keyed with other equipment specified in this Section.
 4. Provide contact rating and arrangement compatible with system operation characteristics.
 5. If these stations contain element which ruptures upon activation of station, furnish Owner three spare elements for each such station.
 6. Exterior Finish of Station: Manufacturer's standard.
- C. Automatic Detector Stations:
 1. Automatic Temperature Detector Stations: Provide either fixed temperature type detectors or combination fixed and rate of rise detectors with temperature ratings and types as required by design.
 - a. Rate of Rise Detectors: Self-restoring.
 - b. Fixed Temperature Detectors: Type which clearly indicates that detector has operated.
 - c. Where detectors are installed in air handling units, they shall be approved for purpose.
 2. Automatic Ionization Smoke Detector Stations: Provide State Fire Marshall approved smoke detector system with pilot lights to indicate alarm condition and field adjustable sensitivity with locking setscrew.
 - a. Head: UL approved for any sensitivity setting.
 - b. Include remote alarm light where alarm light is not visible in room.
 3. Automatic Air Duct Ionization Detectors: Provide ionization detectors designed for detection in air conditioning and ventilation system ducts.

- a. Each Detector: Two electrically separate dry contacts, one to shut down supply and return air fans, and other for alarm.
 - b. Provide detector with air sampling assembly which extends across duct of ventilating system.
 - c. Detector: UL approved for any sensitivity setting.
 - d. Assembly: Include test jack, reset switch and alarm pilot light.
- D. Audible Signals: Provide an approved emergency alarm system outside all interior exits per UFC. Provide audible signal devices, distinctive from sound of other signal devices in same area. Provide coil winding compatible with system operating characteristics.
 - 1. Surface mount signal devices unless otherwise noted.
 - 2. Signal Devices: Minimum rated sound level of not less than 90 decibels, measured at distance of 10 feet.
 - 3. Provide weatherproof exterior signal devices complete with weatherproof back box.
 - 4. Provide circuiting for signal devices so that devices will be equally distributed on each of horn circuits, and also equally distributed throughout building, or provided with return loop power supply.
- E. Visual Signals: Provide visual signal devices of distinctive flashing red light in accordance with ANSI A117.1. Install signals in conjunction with each audible signal and elsewhere as required.
- F. Control Panel: Provide fire detection system control panel, complete with control devices, annunciator and input/output load terminals, etc. Provide panels and cabinets with locked, hinged front door with two master keys that also fit fire alarm apparatus. Panels: Provide, but shall not be limited to, the following functions and features:
 - 1. Automatically detect operation signal initiating device and visually and audibly indicate alarm condition at control panel and annunciator.
 - 2. Provide external supervision for AC power supply and each signal initiating loop.
 - a. AC Power Supply: Supervised to indicate normal power failure.
 - b. Provide supervision for each signal initiating loop against opens or grounds.
 - c. Any trouble on any of above circuits shall energize visual and audible trouble signals at control panel and at remote locations indicated.
 - d. Provide switch for silencing of audible signals which will not affect visible indicator on control panel and at remote trouble light locations.
 - e. Visible Indicators: Remain on until control panel is manually reset.
 - 3. Zone Alarm Light: One zone alarm light for each zone, properly identified with zone description, which shall remain energized, following initiation of alarm, until control panel is manually reset.
 - 4. Auxiliary Contacts: Provide minimum of two normally open and one normally closed 120V, 1 phase, 20A inductive contacts for control of remote equipment. Provide power for fan control relay coil from fire alarm system control panel which shall ensure coil is de-energized under fire alarm condition or if AC power to panel is lost.
 - a. Provide auxiliary contacts for use in signaling central office equipment of alarm or other trouble conditions.
 - 5. Provide terminal strips for termination of each wire leaving control panel.
 - 6. Provide pushbuttons for fire alarm test and reset purposes.
 - 7. Provide power supply for smoke and ionization detectors in control panel.
 - 8. Provide separate audible alarm and trouble signals.
 - 9. Auxiliary Contact Override Keyed Switch: Operation of switch shall initiate trouble condition in panel and remote annunciators.
- G. Power Supplies:
 - 1. Provide power supplies for 120V normal power (3 wires) and supply standby battery power for alarm and detection equipment.
 - 2. Provide standby power supply from lead-acid gelled electrolyte batteries with manual high and automatic trickle charge battery charger.
 - a. Storage batteries of automobile type construction not allowed. Provide batteries with continuous visual indication of state of charge and general condition.

- b. Battery Installations: Conform to requirements of NFPA 72.
 - c. Submit certified statement that battery installation conforms to above operating requirements with shop drawings.
- 3. Where power supplies are not provided as integral part of other equipment, provide with sheet metal cabinets and hinged door and key lock master keyed with balance of fire alarm system equipment.
- H. Remote Fire Alarm Test, Reset and Trouble Signal Station: Provide assembly or assemblies as required by the authority having jurisdiction. Provide station with following:
 - 1. Fire alarm test or drill switch.
 - 2. Fire alarm system reset switch.
 - 3. Fire alarm system remote trouble light.
 - 4. Remote trouble buzzer. Where buzzer is not integral part of anchor assembly, mount it directly above station.
- I. Electromagnetic Door Holders: Where required by the authority having jurisdiction, provide door holders complete with mounting hardware. Electromagnetic Assembly: When door is in open position, it is aligned parallel to corridor. Where recessed mounting is required, provide special boxes and plates required, and adjust projection of electromagnet to attain proper door alignment. Wire door ladders to auxiliary contact within control panel.
- J. Fan Cut-Off Relays: Provide, where required, to remove motor from power source under alarm conditions and keep motor inoperative until system has been returned to its normal supervisory conditions. Locate relays either adjacent to control panel or motor controller, at Contractor's option.
- K. Wire for Fire Alarm Circuits: Approved for use in either power limited or nonpower limited circuits as required below. Provide wire of type and size recommended by fire alarm equipment manufacturer and acceptable to code enforcing authority.
 - 1. General: Provide wiring in accordance with NEC, manufacturers requirements, and as specified in this Section. Install conductors in raceways as specified in Section 16050.
 - a. When fire alarm zone supplied as spare, provide necessary additional wires from control panel to annunciator for future use of that zone.
 - 2. Detector and signal circuits and wiring may be either nonpower limited type or power limited type, but do not mix different wire types in same raceway.
 - a. Both Types of Circuits: Comply with applicable portions of NEC and install in raceways separate from detector and alarm circuits.
 - 3. Provide minimum conduit size as required by Table 4, Chapter 9, of NEC, using actual cross-sectional area of wiring to be installed.

3. EXECUTION

3.1 INSTALLATION

- A. Installation, General: Perform work in accordance with highest standard practice and deliver to Owner complete system approved by authority having jurisdiction.
 - 1. Detector Location: Provide drawings to indicate quantity and type of detectors required. Provide correct number of detectors required in accordance with NFPA 72.
 - 2. Where sprinkler system valve supervision is required, wire valve switch contacts to cause trouble condition to appear in system (and zone) when valve is closed. Arrange wiring or equipment so that supervision does not interfere with transmission of alarm signals from alarm initiating devices.

3.2 FIELD QUALITY CONTROL

- A. Inspection: When system wiring is completed and prior to closing, notify inspecting authority that wiring is ready for inspection.
- B. Acceptance Tests: Conduct tests of the complete system as required by authority having jurisdiction.

3.3 DEMONSTRATION

- A. Fire Alarm and Detection System:
 - 1. Demonstrate electrical system in accordance with Section 16010.
 - 2. On-site training shall be provided to the Owner for proper operation and maintenance of the system after the system has been accepted by the authority having jurisdiction. Training shall consist of a minimum 8-hour course.

* * * END OF SECTION * * *