CITY OF SEATTLE
1989 STANDARD SPECIFICATIONS
FOR
ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION

Prepared By
Seattle Engineering Department
Gary Zarker, Director

Examined and Approved
by the
Board of Public Works
February 10, 1989

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PREFACE

The 1989 City of Seattle Standard Specifications for Road, Bridge, and Municipal Construction (hereinafter referred to as the "1989 Seattle Standard Specifications") have been prepared by the Seattle Engineering Department for the Board of Public Works. This document was compiled by combining the 1986 WSDOT/APWA Standard Specifications with Seattle's 1986 Supplemental Specifications, and then revising or supplementing the resulting whole to reflect current City policies and procedures.

For all public works projects administered by the Seattle Engineering Department, or by other departments and agencies working within the jurisdiction of the Seattle Engineering Department, the following are part of the Contract Documents on all individual projects and are to be considered as a whole:

- 1989 Seattle Standard Specifications
- 1986 Seattle Standard Plans
- Traffic Control Manual for In-Street Work (used in conjunction with the M(TE)D)
- Laws of the State of Washington
- Charter and Ordinances of the City of Seattle
- Project Manual for the individual project

The 1989 Seattle Standard Specifications and the 1986 Seattle Standard Plans apply whenever any public or private work is performed within the street rights of way or the City of Seattle, including work performed by private parties at their own expense under authority granted by ordinance of the City Council or permit of the Board of Public Works. All requirements of the 1989 Seattle Standard Specifications apply to such work in the same manner as though the work were being performed under Board of Public Works contract, with the exception of those requirements or conditions pertaining to payment for the work performed or to withholding or receiving money due the Contractor. All matters relating to financing of such work shall be between the permittee and the Contractor, and the City shall not enter into such matters.

Despite considerable efforts to produce a completely error-free document, some mistakes seem to defy detection until after publication. Should you discover errors in this document please bring them to our attention at the following address:

Seattle Engineering Department
Construction Contracts Section
Municipal Building, Room 910
Seattle, Washington 98104

My sincere thanks and appreciation to all those individuals in the Engineering Department, and other City Departments and outside agencies who participated in the effort of drafting, typing, and reviewing this document. It was a chore that took more time and was more involved than was originally anticipated. In particular, thanks to Alan F. Chinn who shouldered most of the work in drafting, coordination, and conflict resolution. Without his dedication, resolve and cheerful disposition under stress, this project would have been much harder to complete. Thanks also to D. L. Freist, G. R. Gant, R. L. Rainwater, M. Stallings, L. Henderson, P. Nakle, and T. Tame for their word processing skills in getting this document ready for the typesetter. Finally thanks to the editor, D. Scott McLean, P.E. for his efforts in coordinating the final circulation, typesetting, proofing, and printing, and for taking care of all the finishing details that are a necessity for getting the job done right.

Additional copies of this document may be obtained from the 9th Floor Information Counter in the Seattle Municipal Building, 600 Fourth Avenue, Seattle, Washington 98104 at a cost of $35 per copy.

D. J. Howell, P.E.
Manager, Construction Contracts
Seattle Engineering Department
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ACRONYMS, ABBREVIATIONS AND DEFINITIONS

DIVISION 1

GENERAL REQUIREMENTS

SECTION 1-01 ACRONYMS, ABBREVIATIONS AND DEFINITIONS

1-01.1 GENERAL

Standard acronyms, abbreviations, definitions and symbols common to the fields of engineering and construction are used throughout the Contract Documents without further definition. A listing of acronyms, abbreviations, and definitions often used in the Contract Documents is included hereinafter. Additional acronyms, abbreviations, definitions, and symbols may also be found in the Project Manual or Drawings. Welding symbols are defined in the current edition of the American Welding Society Structural Welding Code.

When used in the Bid Form to denote items of work and units of measurement, abbreviations are defined to mean the full expression.

When used in the Contract Documents, the following acronyms and words (or pronouns used in place of them) have the indicated meanings unless the context implies otherwise:

1) Words in the plural indicate singular and vice versa.
2) Words of a particular gender include any gender and genderless words may refer to any gender when the sense so indicates.

1-01.2 ACRONYMS

ABAA American Association of Asphalt Paving Analysts
ABAA American Association of Asphalts
ABBA American Bar Association
ACI American Concrete Institute
ACSF Arterial City Street Fund
ADP Arterial Development Fund
AGA American Gas Association
AGC Associated General Contractors of America
AIA American Institute
AIA American Institute of Architects
AISI American Institute of Steel Construction
AISI American Iron and Steel Institute
AITF American Institute of Timber Construction
ANSI American National Standards Institute
APA American Plywood Association
APWA American Public Works Association
APA American Railway Association
AREA American Railway Engineering Association
ARMA Asphalt Roofing Manufacturers Association
ASA American Standards Association
ASCE American Society of Civil Engineers
ASLA American Society of Landscape Architects
ASMES American Society of Mechanical Engineers
ANST American Society for Nondestructive Testing
ASTM American Society for Testing and Materials
AWPA American Wood Preservers Association
AWS American Welding Society
AWWA American Water Works Association
B&B Bridge and Canal Corporation
BRE Bridge Replacement and Rehabilitation Program
CBD Central Business District
CDSE Committee for the Development of Standard Practice
CL City light
CLC Chain Link Institute
CMAC County Road Administration Board
CFB Cumulative Reserve Fund
CRS Concrete Reinforcing Steel Institute
CSS Construction Specifications Institute
DRPA Ductile Iron Pipe Research Association
EAE Edison Electrical Institute
ER Emergency Fund
EPA Environmental Protection Agency
ER Emergency Relief Program
FAI Federal Aid Interstate
FAS Federal Aid Secondary System
FAUS Federal Aid to Urban Systems
FHWA Federal Highway Administration
FSA Federal Specifications
FSS Federal Specifications and Standards, General Services Administration
HES Hazard Elimination Program
HPA Hardwood Plywood Manufacturers Association
HRB Seattle Human Rights Department
HUD United States Department of Housing and Urban Development
IHE Insulated Cable Engineers Association
IEE Institute of Electrical and Electronics Engineers
ITC Institute of Transportation Engineers
IES Illuminating Engineering Society
LEED Local Environmental District
LIP Lighting Protection Institute
MBE Minority Business Enterprise
METRO Municipality of Metropolitan Seattle
MSEA Mine Safety and Health Act
MUTCD Manual on Uniform Traffic Control Devices for Streets and Highways
NAPA National Asphalt Pavement Association
NCES National Center for Education Statistics
NEMA National Electrical Manufacturers’ Association
NEPA National Environmental Protection Agency
NEP National Environmental Protection Fund
NBFP Neighborhood Improvement Fund
NF National Fire Protection Association
NRA National Roofing Contractors Association
OMWB Office of Minority and Women’s Business Enterprises
OSHA Occupational Safety and Health Administration
PCA Portland Cement Association
PCE Port of Seattle
PI Plastic Pipe Institute
PSC Pennsylvania Concrete Institute
RCW Revised Code of Washington
RPP Railway-Purchase Products Program
RPA Railway-Purchase Association
SEP State Environmental Policy Act
SF Sewer Fund
SIF Sewer Improvement Fund
SOS Sales-Off System Grant
SSPC Steel Structures Painting Council
SWD Seattle Water Department
SWF Solid Waste Fund
SUN Targeted Area Neighborhood
TAU Transportation Improvement Board
TRIF Transit Fund
TEN Transit Agency
UL Underwriter’s Laboratory
ULMB Utility Local Improvement District
UMTA Urban Mass Transit Administration
USAEE United States Army Corps of Engineers
USACE United States Department of Energy
ACRONYMS, ABBREVIATIONS AND DEFINITIONS

BASE BID
The summation of Bid Item amounts (extension) or the lump sum Bid in the Bid Form, excluding Additives, Alterations, Deductions and taxes collected separately pursuant to Washington State Excise Tax Rule 170 or 171.

BASE COURSE
The layer of aggregate, crushed aggregate, treated soil, or soil aggregate which rests upon the subbase or, if no subbase, upon the subgrade.

BID
The written offer of a Bidder, executed pursuant to the Bid Documents, to perform the Work for a specific price. The terms "Bid", "Proposal", "Bid Proposal", and like terms are synonymous.

BIDDER
An individual, partnership, firm, corporation, or joint venture, submitting a Bid. When required by law or otherwise such individual, partnership, firm, corporation or joint venture shall be properly qualified.

BID DOCUMENTS
The Advertisement for Bids, Instructions to Bidders, Bid Form, and the proposed Contract Documents including any Addenda issued prior to Bid opening.

BID FORM
The form included in the Bid Documents: The Bid, the Women's and Minority Business Enterprises Utilization Commitment and the Addendum.

BID GUARANTY
Bid bond, cash, cashier's check or certified check accompanying the Bid as a guarantee that the Bidder will enter into an agreement with the Owner for performance of the Work if the Bidder is awarded the Contract.

BRIDGE APPROACH EMBANKMENT
An embankment beneath a structure and extending 100 feet beyond on each side of the structure's centerline to the original ground elevation. Also, any embankment that replaces unstable foundation soil beneath the bridge approach embankment.

CHANGE ORDER
A written order to the Contractor, issued by the Engineer after execution of the Contract, authorizing an addition, deletion or other revision to the Work, within the scope of the Contract Documents, and establishing the basis of payment and time adjustments, if any, for work affected by the change.

COMBINATION WOMEN'S AND MINORITY BUSINESS ENTERPRISE
An independent and continuing business for profit which performs a commercially useful function, which is owned and controlled by a combination of women and minorities.

CONTRACT
The entire and integrated agreement between the Owner and the Contractor, (see definition of Contract Documents).

CONTRACT BOND
The approved form of security furnished by the Contractor and the Contractor's Surety guaranteeing completion of the Work and payment to persons supplying labor and materials in the prosecution of the Work, in accordance with the terms and conditions of Contract Documents.

CONTRACT DOCUMENTS
The component parts of the Contract which may include, but are not limited to, the executed Bid Form, Bonds, Insurance Certificates, Project Manual, Drawings, Standard Specifications, Standard Plans, Addenda, Supplemental Agreements and Change Orders.

CONTRACTOR
The individual, partnership, corporation, firm or joint venture, contracting with the Owner to do the Work.

CONTRACT PRICE
Awarded Contract Price:
The summation of Bid Item amounts (extension) or a lump sum for all items of Work, including applicable taxes, upon which the Award is made.

Revised Contract Price:
The Awarded Contract Price at any time after Award but prior to the Acceptance Date as adjusted as a result of approved Change Order.

Final Contract Price:
The total monies payable to the Contractor under the terms and conditions of the Contract Documents.

CONTRACT TIME
The period of time established by the terms and conditions of the contract within which the Work must be completed.

CULVERT
A drainage structure which may or may not directly support traffic, extending across and beneath a highway, street, driveway, or alley, or other public way.

DATES
Bid Opening Date:
The date on which Bids for the Work are opened and read publicly.

Award Date:
The date on which the Owner formally accepts the Bid of the lowest and best Bidder and awards the Contract.

Contract Completion Date:
The date by which the Work is required to be satisfactorily completed. The Contract Completion Date will be stated in the Notice to Proceed. Because of this date will be authorized in writing by the Engineer whenever there is an extension to the Contract Time.

Notice to Proceed Date:
The date stated in the Notice to Proceed on which the contract time begins.

Substantial Completion Date:
The date, established in writing by the Engineer when the Contract Work is completed to the extent that the Owner has full and unrestricted use and benefit of the facilities and only minor incidental work, replacement of temporary facilities or correction or repair remains to complete the total Contract.

Actual Completion Date:
The date, certified in writing by the Engineer, when the Work (including every item or element, is satisfactorily completed in accordance with the Contract Documents.

Acceptance Date:
The date on which the Owner accepts the Work as complete.

DAY
Unless otherwise specified, day(s) shall mean calendar day(s).

Calendar Day:
The time period of twenty-four hours measured from midnight to the next midnight.

Non-Working Day:
(1) Saturday
(2) Sunday
(3) Holiday
(4) a day(s) upon which a suspension order is issued by the Engineer.
(5) a day(s) upon which the Contractor is specifically required by the Contract Documents to suspend the Work.

Business Day:
Any day other than Saturday, Sunday, or Holiday.

Working Day:
A day not otherwise defined as a Non-Working Day.

DEDUCTIVE
A supplemental unit of work or group of Bid Items, identified separately in the Bid which may, at the discretion of the Owner, be deducted from the Base Bid.

DRAWINGS
The portion of the Contract Documents showing in graphic or pictorial form the design, location, and dimensions of the elements of a project; a graphic representation.
ENGINEER
The chief executive officer, or authorized assistant, of a City Department or Division, who is a licensed registered Engineer of the State of Washington, acting directly or through duly authorized representatives in the administrative management of the Contract.

EQUIPMENT
The machinery, tools, implements, apparatus, and appliances, together with the necessary supplies for their upkeep and maintenance, which are necessary to enable the Contractor to perform the Work.

FEDERAL HIGHWAY ADMINISTRATION
The Federal Agency authorized to approve plans and contracts for Federal Aid Highway projects. This agency also inspects such projects to ensure contract compliance.

FRONTAGE ROAD
A local street or road usually next to an arterial highway that serves abutting property and adjacent areas and controls access.

HIGHWAY (ARTERIAL)
Any U.S. or numbered route, controlled access highway, or other major rural or circumferential street or highway designated by local authorities within their respective jurisdiction as part of a major arterial system of streets or highways.

HIGHWAY (STREET, ROAD, ALLEY)
The entire width between the boundary lines of every way, publicly maintained, when any part thereof is open to the use of the public for purposes of vehicular travel.

HOLIDAY
A day designated by law commemorating a religious festival or some important event in history; a day of exemption from labor.

Recognized Holidays for the City of Seattle are:
- the first day of January (New Year’s Day)
- the third Monday in January (Martin Luther King Jr. Day)
- the twelfth day of February (Lincoln’s Birthday)
- the third Monday in February (Washington’s Birthday)
- the last Monday of May (Memorial Day)
- the fourth of July (Independence Day)
- the first Monday of September (Labor Day)
- the eleventh day of November (Veteran’s Day)
- the last Thursday of November and the Friday following (Thanksgiving Day)
- the twenty-fifth day of December (Christmas Day)

When any recognized Holiday falls on a Sunday, the following Monday shall be considered a Holiday. When any recognized Holiday falls on a Saturday, the preceding Friday shall be considered a Holiday.

INSPECTOR
The Engineer’s authorized representative assigned to make detailed inspections of the Work.

JBI SITE
See "Project Site."

JOINT VENTURE
An association of two or more persons or businesses to carry out a single business enterprise for profit for which purpose they combine their property, capital, efforts, skills or knowledge and in which they exercise control and share in profits and losses in proportion to their contributions to the enterprise.

LABORATORY
The Materials Laboratory of the Engineer or each other laboratories authorized by the Engineer.

LIQUIDATED DAMAGES
The amount fixed in the Contract Documents to be paid to the Owner by the Contractor, for each working day of delay in completing all or any specified portion of the Work beyond the time specified in the Contract; such obligation shall not be construed as a penalty, and may be deducted by the Owner from any payments due to or for the benefit of the Contractor.

MAJOR BID ITEM
A Bid Item, unless specifically excluded in the Project Manual, for which the estimate is 10 percent or more of the Awarded Contract Price. A Bid Item other than a Major Bid Item, is a Minor Bid Item.

MATERIAL
Any substance specifically for use in the construction of the project and in its operation which enters into and forms a part of the finished structure of improvement and is capable of being so used and is furnished for that purpose.

MATERIALMAN
A person or organization who furnishes raw materials, supply, commodity, equipment, or manufactured or fabricated product and does not perform labor at the Project Site, a supplier.

MINORITY BUSINESS ENTERPRISE
An independent and continuing business for profit, which performs a commercially useful function, and which is owned and controlled by one or more minority persons residing in the United States or its territories.

NOTICE OF AWARD
The Written Notice from the Owner to the successful Bidder accepting the Owner’s acceptance of the Bid.

NOTICE TO PROCEED
The Written Notice from the Engineer to the Contractor authorizing and directing the Contractor to proceed with the Work and establishing the date on which the Contract Time begins.

OFFICIAL NEWSPAPER
The publication designated annually by the Board of Public Works to publish all official proceedings of the City of Seattle.

OWNERS
The City of Seattle, acting through its Board of Public Works.

PAVEMENT STRUCTURE (PAVEMENT)
The combination of subbase, base course, and surface course placed on a subgrade to support the traffic load and distribute it to the road bed.

PLANS
See "Drawings."

PROFILES
See "Drawings."

PROJECT
See "Work."

PROJECT ENGINEER
See "Engineer."

PROJECT MANUAL
The compilation of written provisions and requirements for the Work related to a specific Project. The Project Manual includes, but is not limited to, the bidding requirements, sample forms, Agreement Forms, wage rates, conditions of the Contract, specifications and addenda.

PROJECT SITE
The geographical location, usually defined by legal boundary lines, where the Work to be performed.

RIGHT OF WAY
Land, property, or property interest, secured and reserved to the public for transportation, utility services, drainage, sidewalks, or other public purposes.

ROADBED
The graded part of the roadway within top and side slopes prepared on a foundation for the pavement structure and shoulders.

SEWER
A pipe or conduit for carrying sewage and other waste liquids. Includes sanitary sewer, side sewer, combined sewer, and storm water sewer or drain.

SHOP DRAWINGS
Drawings, diagrams, illustrations, schedules, performance charts, brochures, and other similar data prepared by the Contractor or a subcontractor, manufacturer, supplier or distributor to illustrate how specific portions of the Work shall be fabricated or installed.

SHOULDER
The part of the roadway next to the traveled way or auxiliary lanes. It provides lateral support of base and surface courses and is an emergency stopping area for vehicles.

SPECIFICATIONS
Written technical descriptions of materials, equipment, construction systems, standards, and workmanship which, in conjunction with the Drawings, detail the requirements for acceptable completion of the Work. Specifications include notes, schedules, and comments on the Drawings.

STANDARD PLANS
The current edition of the City of Seattle Standard Plans for Municipal Construction adopted by the Owner which show frequently recurring components of work that have been standardized for use by various Departments within the City of Seattle.

STANDARD SPECIFICATIONS

STAGE
The State of Washington acting through its representatives.

STRUCTURES
Bridges, culverts, walls, buildings, foundations, water tanks, transmission towers, cribsing, caissons, or cofferdams, and other similar features which may be encompassed in the Work and are classified as structures in the Contract Documents.

SUBBASE
The layer(s) of specified or selected material of designated thickness in a pavement structure immediately above the subgrade and below the base course.

SUBCONTRACTOR
An individual, partnership, firm, corporation, or joint venture to whom the Contractor, with the prior written approval of the Engineer submits or subcontracts part of the Work.

SUBGRADE
The top surface of the roadway on which subbase, base, surfacing, pavement, or layers of similar materials are placed.

SUBSTANTIAL COMPLETION
Completion of the Contract Work to the extent that, as evidenced by Written Notice from the Engineer, the Owner has full and unrestricted use and benefit of the facilities, and only minor incidental work, replacement of temporary substitute facilities, or correction or repair remains to complete the total Contract.

SUBSTRUCTURE
The part of the structure below:
1. Simple and continuous span bearings, or
2. Arch skewbacks and construction joints at the top of vertical abutment members or rigid frame piers.

Substructures include backwalls, wingwalls and wing protection railings.
WOMEN'S BUSINESS ENTERPRISE
An independent and continuing business for profits which performs a commercially useful function and which is owned and managed by one or more women residing in the United States or its territories.

WORK
The provision of all labor, materials, equipment, and everything needed to successfully complete a project or improvement pursuant to the Contract Documents. The term Work when capitalized may mean "project" or "improvement.""}

WORKING DAY
See "Day."

WRITING DRAWINGS
See "Drawings."

WRITTEN NOTICE
A notice in writing to the Owner, Engineer, Contractor or Surety relative to the Work.

SECTION 1-02 BID PROCEDURES AND CONDITIONS

1-02.1 QUALIFICATIONS OF BIDDERS
Bidders shall be qualified by experience, financing, equipment, and organization to do the Work required by the Contract Documents.

1-02.2 BID DOCUMENTS
Information as to where Bid Documents can be obtained or reviewed will be found in the Advertisement for Bids.

1-02.3 ESTIMATED QUANTITIES
The quantities shown in the Bid Forms are estimates only, and are not binding for purposes of the Contract. The Owner reserves the right to increase or decrease the amount of any item of Work, or to make other changes in the Work as necessary. Payment will be made on the basis of the actual quantities of each item of Work completed in accordance with the Contract Documents.

1-04.4 EXAMINATION OF BID DOCUMENTS AND PROJECT SITE
Before submitting a Bid, each Bidder shall:
(1) examine the Bid Documents thoroughly,
(2) familiarize the Project Site to be familiar with local conditions that may be an impact on cost, progress, or performance of the Work,
(3) carefully and thoroughly correlate the Bidder's observations and conclusions in the Bid Documents with the Project Site and the Contract Documents. If public access to the Project Site is restricted, the Engineer will schedule access for all Bidders at a specific date prior to Bid submission so that Bidders may examine the site of the Work.

BID PROCEDURES AND CONDITIONS

The bids upon which the Work is to be performed, rights of way for access, and all other lands designated by the Owner for use in performing the Work, are identified in the Contract Documents. The submission of a Bid shall constitute an unequivocal representation that the Bidder has examined the information included in this section, and that the Bid Documents are sufficient, in scope and detail, to indicate and convey sufficient information of all terms and conditions for performance of the Work.

The Bidder shall determine the methods, labor, and equipment required to perform the Work, and shall reflect their costs in the Bid prices. Costs exceeding those anticipated by the Bidder will not entitle the Bidder to additional compensation, except as may be authorized by Change Order. If the Engineer has made substantive investigatory of the site of the proposed Work, the locating log data and soil sample test data accumulated by the Engineer will be made available for inspection by theBidder. It is mutually recognized and agreed by all parties that:
(1) when any of this data is included in the Engineer's Drawings, it is for information, and does not constitute a contract document, nor a contract document.
(2) the substantive investigations made by the Engineer were for the sole purpose of locating data necessary for planning and design of the Work.
(3) the Engineer assumes no responsibility whatsoever for the sufficiency or completeness of the data furnished, with respect to meeting the needs of the Bidder in planning the Bidder's work.
(4) the Engineer warrants that the data represents, with reasonable accuracy, the conditions and materials found in the specific borings at the time the borings were made and that the data does not warrant the condition, materials, or properties of the materials between the specific borings.
(5) the Engineer makes no representation or warranty, expressed or implied, that:
(a) the interpretations from the data are correct,
(b) the equipment and methods used in the borings were correct,
(c) the ground at the location of the boring has not been physically disturbed or altered after the boring was made, and
(d) the availability of subsurface information from the Engineer is suitable for the convenience of the Bidder, and shall release the Bidder or the Contractor from any corrective measures to determine the subsurface conditions as required by this section, or any other responsibility under the terms and conditions of the Contract.

1-02.5 FORM AND STYLE OF BID
A Bid shall be submitted in the form and manner required by the Contract Documents. The identical form may be found in the Project Manual. The Bid Form will identify the project and may describe the Work by listing estimated quantities, units of measure, items of Work, and materials to be furnished.

Bids shall be completed by typewriting or shall be printed in ink by hand, preferably in black ink. Where indicated by the Bid Form, prices shall be expressed in words and figures. A price shall be submitted for each Bid Item listed. The Bidder shall include spaces for unit price bids items or lump sum prices; bid item amounts (contractor's estimate) not expressed in words and figures, a price shall be submitted for each Bid Item listed. The Bidder shall include spaces for unit price bids items or lump sum prices; bid item amounts (contractor's estimate) not expressed in words and figures. A price shall be submitted for each Bid Item listed. The Bidder shall include spaces for unit price bids items or lump sum prices; bid item amounts (contractor's estimate) not expressed in words and figures. A price shall be submitted for each Bid Item listed. The Bidder shall include spaces for unit price bids items or lump sum prices; bid item amounts (contractor's estimate) not expressed in words and figures. A price shall be submitted for each Bid Item listed. The Bidder shall include spaces for unit price bids items or lump sum prices; bid item amounts (contractor's estimate) not expressed in words and figures. A price shall be submitted for each Bid Item listed. The Bidder shall include spaces for unit price bids items or lump sum prices; bid item amounts (contractor's estimate) not expressed in words and figures.

BID documents shall contain the following:
(1) Ordinance, L.I.D., or specification number of the improvement.
(2) Name and nature of the improvement.
(3) One of City of Seattle name as applicable.
(4) The amount of the bid shall identify the property owner as either a dollar figure or as a percentage of the property improvement.
(5) A bid shall be made on a unit basis, square feet, Linear feet, or unit of measurement, as applicable, and submitted to the City of Seattle, which shall be signed by a duly licensed and authorized representative of the Bidder.

The signature of the person authorized to submit the Bid should agree with the
1-02.12 OPENING OF BIDS
Bids will be opened and read aloud in Suite 740, Arctic Building, 700 Third Avenue, Seattle, Washington, immediately after 2:00 p.m., on the date indicated in the Advertisement for Bids or in an Addendum.

1-02.13 IRREGULAR BIDS
A Bid not considered irregular and nonresponsive, and will be rejected if:
1. The authorized Bid Form is not used or is altered;
2. The completed Bid Form contains any unauthorized addition, deletion, alternate bid, or condition;
3. The bidder adds provisions restricting the right to accept or reject the Award or to enter into the Contract;
4. The bidder has not been prequalified prior to Bid submission as required by the Bid Documents;
5. A price per unit cannot be determined;
6. The bidder failed to commit to use certified WBES and MBEs in the minimum required by the Bid Documents.
A Bid may be considered irregular and may be rejected if:
1. The Bid does not include a unit price for every Bid Item;
2. The Bid Quantity is incorrect or imprecise;
3. Any of the unit prices are excessively balanced (either above or below the amount of a reasonable Bid) to the potential detriment of the Owner;
4. Receipt of Addenda is not acknowledged;
5. A bidder is not a joint venture or partnership and the joint venture or partnership failed to submit a Bid for the same project (in such an instance, both Bids may be rejected);
6. The entries in the Bid Form are not typewritten or entered in ink;
7. The joint venture or partnership is not in the WBE or MBE commitment requirements and the joint venture or partnership failed to submit with the Bid Form;
8. The Bid is not properly executed;
9. The bidder did not bid on all Additives, Deductives, or Alternates.

1-02.14 DISQUALIFICATIONS OF BIDDERS
A Bidder may be deemed not responsible and its Bid rejected if:
1. More than one Bid is submitted for the same project from a Bidder under the same or different names;
2. Evidence of collusion exists with any other Bidder or potential Bidder. Participants in collusion will be restricted from submitting future Bids.
3. A Bidder, in the opinion of the Owner, is not qualified for the work specified, or to the extent that the Bid exceeds the authorized prequalification amount as may have been established under the prequalification or pre-award evaluation of the Bidder;
4. A satisfactory performance record exists as shown by past or current Work or other evidence, as shown by the standpoint of conduct of the Work, workmanship, progress, affirmative actions, equal employment opportunity practices, or Disadvantaged Business Enterprise, Minority Business Enterprise, or Women's Business Enterprise utilization.
5. There is uncompleted work on other Bid (Owner or otherwise) which might hinder or prevent the prompt completion of the Work bid submitted;
6. The Bidder selected for all labor or materials on past or current contracts;
7. The Bidder has failed to complete a public contract, or has been convicted of a crime arising from a previous public contract;
8. The Bidder has signed and is party to a contract or other agreements to bind the owner for consideration in the award of a contract or otherwise described in the Bid Documents.

1-02.15 CHANGE OF BID SUBMITTAL DATE
The Owner reserves the right to change the date and time of Bid Submittal. Notification of the change will be by Addendum.

1-02.16 MODIFICATION OR WITHDRAWAL OF BID
No Bid may be modified or withdrawn after a Bid has been deposited with the Owner if a written request for a withdrawal or modification, signed by an authorized individual, or a telegram is received by the Owner prior to the time designated for receipt of Bids. If the request for modification or withdrawal is not accepted, written confirmation of the signature of the Bidder shall be mailed and postmarked on or before the time designated for receipt of Bids.

The original Bid, as received in writing, and received prior to the time designated for receipt of Bids, will be written as the official Bid. However, if Bid is not modified, withdrawn, or canceled by the Bidder after the time for Bid Submittal, except that withdrawal with permission of the Owner for a period not to exceed the limit set forth for Award, or a Bidder's claim of error is upheld by the Owner.

1-02.11 ADDITIVES, ALTERNATES, DEDUCTIVES
The Engineer reserves the right to arrange the Bid Form with Additives, Alternates, or Deductives, if so to the advantage of the Owner. The Bidder shall bid all Additives, Deductives, or Alternates set forth in the Bid Form unless otherwise specified in the Project Manual.
AWARD AND EXECUTION OF CONTRACT

1-03.14G RIGHTS OF OWNER

In addition to such other rights as may be reserved elsewhere in the Contract Documents, the Owner reserves the right to reject all or any portion of the Work in Bid, or to waive any defects discovered in the Bid, to accept a Bid of the lowest and best Bidder, to correct any errors in a Bid, to waive-Bid, to revise or cancel the Work, or to require the Work be done in another manner if it is the opinion of the Owner the best interest of the public will be served.

1-03.2 AWARD OF CONTRACT

The Owner reserves the right to award such Additions, Deductions, or Alterations, as may be set forth in the Bid Form. If a Contract is to be awarded, it shall be awarded to the lowest and best Bidder within 60 days, beginning the day after the Bid opening. Upon mutual consent of the lowest and best Bidder and the Owner, the 60-day limit may be extended.

A Notice of Award will be mailed to the successful Bidder following Award by the Owner.

1-03.3 EXECUTION OF CONTRACT

1-03.3(1) GENERAL

The Owner is prohibited by ECW 10.0.100 from executing a Contract with a Contractor who is not registered or licensed as required by the laws of the State. In addition, Seattle Municipal Code 15.44 requires that every person engaging in construction business with The City of Seattle possesses a City of Seattle Business License. Contractors having a City of Seattle Business License, a State of Washington Contractor's Registration, or both, shall have the license number and registration number in the spaces provided on the Bid Form Affidavit. The Owner may, at its option, require that liable copies of the State of Washington Contractor's Registration and the City of Seattle Business License be submitted prior to Award of Contract.

1-03.3(2) TIME TO EXECUTE AGREEMENT FORM

The Agreement Form provided to the Contractor, including the signed Agreement Form, will be available for signature by the Owner and the Contractor or as required by the Agreement Contract. The Agreement Form is not due until both the Owner and Contractor have executed and delivered the Agreement Form to the City of Seattle, Department of Finance

The successful Bidder shall sign and return to the Board of Public Works, the original copy of the Agreement Form based on the Project Manual, if the Project Manual has been approved by the City of Seattle. The successful Bidder shall execute and deliver the Agreement Form to the City of Seattle Department of Finance, and the successful Bidder shall return a signed copy of the Agreement Form to the City of Seattle Department of Finance.

1-03.4 CONTRACT BOND

The successful Bidder shall provide an executed Contract Bond for the Awarded Contract price. This Contract Bond shall:

(a) be on an Owner-approved form;
(b) be signed by an approved surety (or sureties) that:
   (i) is registered with the Washington State Department of Insurance Commissioner;
   (ii) is a member of the current authorized Insurance List in the State of Washington published by the Office of the Insurance Commissioner;
   (iii) is a member of the current authorized Insurance List in the State of Washington published by the Office of the Insurance Commissioner;
   (iv) is conditioned upon the faithful performance of the Contract by the Contractor within the prescribed time.

SCOPE OF WORK

1-04.1 INTENT OF CONTRACT DOCUMENTS

The intent of the Contract Documents is to prescribe a complete operating unit, system, or improvement, ready for use by the Owner. The Contractor shall furnish all equipment, materials, tools, equipment, transportation, supplies, and everything needed or required to make said work and every part of the work complete. The Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

1-04.2 COORDINATION OF CONTRACT DOCUMENTS

All parts of the Contract Documents are essential and complementary. A requirement occurring in one is binding as though occurring in all.

Work or material that has been described from the description of a part of the Work, but is clearly implied, shall be furnished by the Contractor as though it had been specifically stated.

If the Contractor finds any discrepancy between various parts of the Contract Documents, or any errors or omissions in the Drawings, or in the instructions and directions given by the Engineer, the Contractor shall immediately inform the Engineer, in writing, and shall not proceed with any work affected by such discrepancy until directed to do so by the Engineer.

In the event of any conflicting provisions or requirements between the component parts of the Contract Documents, each component part shall take precedence in the following order:

(a) Change Orders and Supplemental Agreements
(b) Addenda
(c) Project Manual
(d) Drawings
(e) Standard Specifications
(f) Standard Plans

In case of any ambiguity or dispute over interpretation of the provisions in the Contract Documents, the decision of the Engineer shall be final unless put in writing.

As shown on the Drawings, dimensions denoted by figures shall govern over scaled dimensions.

1-04.3 VACANT

1-04.4 CHANGES

As the Work proceeds, the Owner may at any time change the Work within the general scope of the Contract. Among others, these changes may include:

(a) delete any part of the Work;
(b) add or delete construction quantities;
(c) change the quality or requirements of the Work; or
d) add or delete new work.

If the Owner desires the Contractor to proceed, the Contractor is required to submit a written Change Order for any such change unless the remainder of this section provides otherwise.

If the Owner desires the Contractor to proceed, the Contractor is required to submit a written Change Order for any such change unless the remainder of this section provides otherwise.

Item 1, an equitable adjustment for deleted work will be made as provided in Section 104.5 and Item 2, the quantities of a major item do not exceed the total amount of the contract price plus 10 percent, an equitable adjustment will be made as provided in Section 104.5. If the change is 10 percent or more, the Owner will require a written order, but will be paid at the unit prices that apply.

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1-04

SCOPE OF WORK

1-04.52 DISPUTES

1-04.52(a) When a dispute occurs the Contractor shall pursue resolution through the Engineer. If the Engineer fails to provide a decision, the Contractor shall file a claim as provided in Section 1-04.55(b). If the Engineer fails to provide a decision, the Contractor shall pursue the procedures outlined below in submitting a claim:

1-04.52(b) CLAIMS

1-04.52(b)(1) If the Contractor claims that additional payment is due and the Contractor has not filed a claim as provided in Section 1-04.52(a), the Contractor shall file a claim as provided in Section 1-04.55(b). If the Contractor fails to file a claim as provided in Section 1-04.55(b), the Contractor shall pursue the procedures outlined below in submitting a claim:

1-04.53 PROTEST, DISPUTE, AND CLAIM PROCEDURES

1-04.53(1) PROCEDURE AND PROTEST BY THE CONTRACTOR

1-04.53(1)(a) If in disagreement with anything required in a Change Order or written order from the Engineer, the Contractor shall:

1-04.53(1)(b)(i) File a written protest with the Engineer within 15 calendar days after the work is performed.

1-04.53(1)(b)(ii) Supplement the written protest within 30 calendar days of the date of the protest, with a written statement that:

1-04.54 APPEALS

1-04.54(a) If the Engineer denies the claim, appeal may be made to the Owner. Appeal shall be made by the Contractor in writing within 30 days of receiving the Engineer’s Written Notice denying the claim or before the Acceptance Date, whichever comes first. The Owner will hold a hearing within 30 days of the appeal filing to determine the merits of the claim. If the Owner concurs with the Contractor, an equitable adjustment will be made. If the Owner concurs with the Engineer, no adjustments will be made. The Contractor may pursue judicial resolution in the Superior Court of King County. For convenience of the Contractor and the Owner, it is mutually agreed that:

1-04.55 APPLICABLE LAW AND VENUE

1-04.55(1) The Contract shall be construed and interpreted pursuant to the laws of the State of Washington.

1-04.6 INCREASED OR DECREASED QUANTITIES

1-04.6(1) If there is a change that increases or decreases by more than 5 percent:

1-04.6(2) (a) The total cost of the Work when calculated from the original Bid quantities

1-04.6(3) (b) The total quantity of a Major Bid Item when calculated from the original Bid quantities

1-04.6(4) (c) The adjusted total of the Work when calculated from the Awarded Contract Price

1-04.7 CHANGED CONDITIONS (DIFFERING SITE CONDITIONS)

1-04.7(1) The Contractor shall promptly, and before such conditions are disturbed, notify the Engineer in writing whenever the following conditions are encountered:

1-04.7(2) (a) Pre-existing subsurface or lateral physical conditions at the Site differing materially from those indicated in the Contract Documents

1-04.7(3) (b) Pre-existing unknown physical conditions at the Site of an unusual nature, different from those ordinarily encountered and generally recognized in the trade as work of the character provided for in the Contract Documents

1-04.7(4) Upon notification by the Contractor, the Engineer will promptly investigate the alleged changed conditions. If the Engineer finds that the changed conditions do not justify an adjustment in compensation or contract time, the Contractor will be notified in writing. Should the Contractor disagree with such determination, the Contractor may file a Notice of Protest with the Engineer. The Contractor shall proceed with the Work unless ordered to suspend that portion of the Work involved, pending a decision as to the value of any such claim for changed conditions, or pending the execution of a Change Order. If a claim for changed conditions is recognized by the Engineer, no claim of changed conditions by the Contractor will be allowed unless the Contractor has given the notice required above; provided, however, that the Contractor be entitled for the Engineer to good cause shown. The time for claiming
SOCIE OF WORK

At the Contractor's risk, the Engineer may suspend all or part of the Work if:
1. the Contractor fails to comply with any of the conditions of any Contract Document, or
2. the Contractor commits a fraud or otherwise derides conditions of any nature,
   or
3. it is in the public interest.

Nothing in these Sections or in any of the Contract Documents shall affect the Engineer's right to make an adjustment in costs or time, and in the event of any conflict, the Contractor for an equitable adjustment hereunder will be allowed if asserted after the Acceptance Date.

1-04.8 VACANT

1-04.9 VACANT

1-04.10 USE OF MATERIALS FOUND ON THE PROJECT SITE

With written approval of the Engineer, the Contractor may use in performing the Work stone, gravel, sand, or other material obtained from required excavations, or timbers removed in performing the Work, provided that such material satisfies the requirements of the Contract Documents and are not required for use by the Contract Documents or as selected materials. In no case will such use be permitted to the detriment of the Owner.

Disposition of suitable materials obtained in the course of the Work shall be as follows, per the Engineer's direction:
1. Use as specified material in accordance with Section 2.01.3;
2. Delivered to the Engineer as salvage in accordance with Section 2.02.2;
3. Waste and dispose of in accordance with Section 2.01.2.

SECTION 1-05 CONTROL OF WORK

1-05.1 AUTHORITY OF ENGINEER

All work on the Contract shall completely satisfy the Engineer. The Contract Documents, the Contract specifications, and the Island Authority over the Work. Whatever it is so provided in this Contract Document, the decision of the Engineer shall be final provided, however, that if an action is brought within the time allowed in this Section 1-05.1, the decision of the Engineer shall be subject to the scope of judicial review provided in such other public act.

The Engineer's decisions will be final on all questions including, but not limited to the following:
1. quality and acceptability of materials and Work;
2. measurement of unit price work;
3. acceptability of rates of progress on the Work;
4. change orders, if any, and specifications;
5. determination of the number of days on which the Work is to be performed;
6. fulfillment of the Contract by the Contractor; and
7. payments under the Contract.

If the Contractor fails to respond promptly to the requirements of the Contract to orders from the Engineer:
1. the Engineer may use City forces, other contractors, or other methods to accomplish the Work as needed;
2. the Contractor will not be obligated to pay the Contractor, and will deduct from the Contractor's payments any costs that result, unless they are necessary and the Contractor must be used to meet the demands of the Work.

1-05.2 AUTHORITY OF INSPECTORS

The Engineer may appoint inspectors to assist in determining that work performed and materials furnished comply with the Contract Documents. Inspectors have the authority to reject defective material and suspended work that is being done improperly, subject to the final decision of the Engineer. Inspectors may exercise their authority as may be delegated to them by the Contractor. An inspector is not authorized to approve or accept any Work or materials, or to issue instructions or advice, contrary to the provisions of the Contract Documents.

Work performed or materials furnished which at any time is found not to conform to the Contract Documents shall be at the Contractor's risk and shall not be a basis for a claim, even though an inspector approves the work or material, unless the work or material is accepted by the inspector contrary to the provisions of the Contract Documents.

If the Contractor fails to respond promptly to the requirements of the Contract to orders from the Engineer:
1. the Engineer may use City forces, other contractors, or other methods to accomplish the Work as needed;
2. the Contractor will not be obligated to pay the Contractor, and will deduct from the Contractor's payments any costs that result, unless they are necessary and the Contractor must be used to meet the demands of the Work.

1-05.3 DRAWINGS

The Contract Documents include Drawings that show such details as are necessary to understand the Work. Any alterations affecting the Work shall be so noted on the Drawings, and the Contractor will be provided with written evidence proving the alterations.

In addition to supplemental Drawings furnished by the Engineer, the Contract Documents may be supplemented by Shop Drawings prepared by the Contractor, or a material supplier or manufacturer, when necessary or as required by the Engineer and illustrated in accordance with the instructions of the Engineer. Shop Drawings shall not be reviewed by the Engineer, and the Contractor shall not be relieved of the responsibility for the Work by such drawings after the date of the Contract Documents. The Engineer shall not be responsible for the Work by such drawings after the date of the Contract Documents.

1-05.4 CONFORMITY WITH DRAWINGS, STAKES, AND DEVIATIONS THEREFROM

Work performed shall be in conformity with the lines, grades, cross sections, data, and dimensions indicated on the Drawings, or staked by the Engineer. Where specific tolerances are stated in the Contract Documents, the Work shall be performed within those stated limits. The Engineer will determine if the Work is in reasonable conformity with the lines, grades, cross sections, and dimensions given.

The Contractor shall not deviate from the Drawings except when authorized in writing by the Engineer.

1-05.5 CONSTRUCTION STAKES

The Engineer will provide construction stakes and marks for establishing lines, grades, and points as stipulated in Sections 1-05.5(1) and 1-05.5(2). The Contractor shall assume full responsibility for detailed dimensions, elevations, and excavation slopes measured from these Engineer furnished stakes and marks.

The Contractor shall provide a work site which has been prepared with adequate drainage to prevent in a safe and orderly manner. The Contractor shall keep the Engineer informed of all requirements and provide at least 48 hours notice to the Engineer for adequate time for setting stakes. Stakes, reference marks, and other reference points, including existing monuments, set by Owner forces shall be correctly preserved. The Contractor will be charged the cost of replacing stakes, markers and monuments that were not replaced due to the fault or faulted by the Contractor. This charge will be doubled from the amount charged for the same work by the Contractor.

Any claim by the Contractor for extra compensation due to errors in the Engineer's line and grade will not be allowed unless the original control points set by the Engineer still exist, or the error is due to the fault or faulted by the Contractor. In the absence of such evidence, any claim shall be rejected.

In the event of a claim by the Contractor for extra compensation due to errors in the Engineer's line and grade, the Contractor will be allowed unless the original control points set by the Engineer still exist, or the error is due to the fault or faulted by the Contractor. In the absence of such evidence, any claim shall be rejected.

In the event of a claim by the Contractor for extra compensation due to errors in the Engineer's line and grade, the Contractor will be allowed unless the original control points set by the Engineer still exist, or the error is due to the fault or faulted by the Contractor. In the absence of such evidence, any claim shall be rejected.

1-05.6 GUIDELINES AND CRITERIA FOR SURVEY WORK

The Contractor shall establish all secondary survey control points, both horizontal and vertical, to facilitate a proper placement of all project elements based on the primary control point established by the Engineer. Survey work shall be performed in accordance with the following guidelines:

1-05.6.1 Surveying

1-05.6.2 Drawing

1-05.6.3 Recording

1-05.6.4 Survey Equipment

The Contractor shall be fully responsible for the correct coordination of field locations and measurements with the
1-05 CONTROL OF WORK

appropriate dimensions of structural members being fabricated.

1-05.1 INSPECTION OF WORK AND MATERIALS

Work and materials which do not conform to the requirements of the Contract Documents, work done beyond the time and grades shown in the Drawings or specified in the Contract Documents, and extra work and materials furnished without written approval as herein authorized shall be considered defective or unauthorized work. Such work shall be at the Contractor’s risk and expense and will be rejected, even if the work has been inspected, or progress payments made. Upon order of the Engineer, such work shall immediately be removed, properly disposed of, or replaced by the Contractor’s employees.

Failure on the part of the Engineer to inspect or correct defective or unauthorized work shall not relieve the Contractor from the contractual obligation to correct any defect or damage to the Work or the Owner, or Acceptance, has the Owner from recovering direct or indirect damages or costs resulting from such defects or damage.

No extension of time or compensation will be allowed because of delay in the correction of defective work.

1-05.8 OWNER’S RIGHT TO CORRECT DEFECTIVE OR UNAUTHORIZED WORK

If the Contractor fails to remedy defective or unauthorized work within the time specified in a written notice from the Engineer, or fails to perform any part of the Work required by the Contract Documents, the Engineer may correct such work as part of the Work in the written notice with or by other means as the Owner may determine necessary.

If the Contractor fails to comply with a written order to remedy such work as part of the Work in the written notice, or by other means as the Owner may determine necessary, such work will be performed by the Contractor at the Contractor's expense.

1-05.10 VACANCY

1-05.10.1 GENERAL GUARANTY AND WARRANTY

The Contractor shall furnish to the Engineer all guarantees or warranties furnished as a normal trade practice in connection with the purchase of equipment or materials, or in connection therewith any subcontractor, of any equipment, materials, or items incorporated in the Work.

Within one year after the Acceptance Date of the Work by the Owner, the Contractor, the Engineer, and the Owner shall comply with the Engineer’s instructions in connection with the repair of any defective or unauthorized work. The Contractor shall promptly, upon written order by the Owner, return to the Contractor all equipment furnished by the Owner.

Failure to do so within the time specified in the written notice, or replacement of the defective or unauthorized work shall be at the Contractor’s risk and expense and will be rejected, even if the work has been inspected, or progress payments made. Upon order of the Engineer, such work shall immediately be removed, properly disposed of, or replaced by the Contractor’s employees.

Failure on the part of the Engineer to inspect or correct defective or unauthorized work shall not relieve the Contractor from the contractual obligation to correct any defect or damage to the Work or the Owner, or Acceptance, has the Owner from recovering direct or indirect damages or costs resulting from such defects or damage.

1-05.10.2 FINAL INSPECTION DATE

When the Contractor considers the Work complete and ready for final inspection, the Contractor must give written notice to the Engineer, who shall inspect the Work and either approve it or notify the Contractor of the reason why approval is not given. The Contract Documents require that the Work be inspected by the Owner not later than 14 days after written notice of completion, or such longer period as required by the owner.

The Contractor agrees to be present at the time of final inspection. The Contract Documents require that the Work be inspected by the Owner not later than 14 days after written notice of completion, or such longer period as required by the owner.

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CONTROL OF MATERIALS

1-06.1 SOURCES OF SUPPLY AND QUALITY OF MATERIALS

Materials furnished from other sources approved by the Contractor shall be the sole liability of the Contractor and he will accept no responsibility for the quality of such materials, unless such materials are under the direct supervision of the Engineer. Any good faith order of a contractor, with respect to materials furnished from other sources, shall be held to indicate the Contractor’s acceptance of the materials furnished and to affect the Contractor's responsibility for their quality.

1-06.2 SAMPLES AND TESTS

Materials, not tested prior to Award pursuant to Section 1-06.1, shall be delivered to the Project Site in sufficient time for permit examination and test by the Engineer. Any apparent disagreements between the Contractor and the Engineer, as to the manner or order of performing such work, may be resolved by the Engineer. The Contractor shall furnish samples of materials prior to use, but the Contractor shall not be required to furnish samples of materials for which the Engineer has approved the use of the material without objection.

Tasting of materials will be required to meet the specifications of tests set forth in the written instructions to the Contractor and the written instructions to the Contractor shall be the basis for the determination of the quality of the materials. Unless otherwise authorized, the Contractor shall be responsible for determining the true current construction and content of such tests, regulations, and ordinances.

1-06.3 MANUFACTURER’S CERTIFICATE OF COMPLIANCE

The Contractor shall furnish certain materials on the basis of a manufacturer's certificate of compliance as an alternative to testing, and it is the responsibility of the Contractor to establish that the materials meet the requirements of the manufacturer's certificate of compliance. The manufacturer's certificate of compliance shall be a written statement that the materials meet the requirements of the manufacturer's certificate of compliance. The manufacturer’s certificate of compliance must meet the following requirements:

(1) The certificate must be signed by the manufacturer and must contain the following information:
(2) The certificate must be dated and must contain the name, address, and telephone number of the manufacturer.
(3) The certificate must specify the type, size, and quantity of the material being delivered.
(4) The certificate must include a statement that the material meets the requirements of the manufacturer's certificate of compliance.

The Contractor shall accept the material if the manufacturer's certificate of compliance is acceptable to the Engineer. The Contractor shall comply with the manufacturer's certificate of compliance and shall be responsible for the proper installation of the material.

LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

1-07.1 LAWS AND REGULATIONS

The Contractor shall observe and comply with all federal, state, and local laws and regulations, including those regulations which affect the construction of the Project. The Contractor shall comply with all applicable federal, state, and local laws and regulations, including those regulations which affect the construction of the Project.

1-07.2 STATE TAXES

The Washington State Department of Revenue has issued special rules designed to assist the Contractor in accurately reporting and paying sales and use taxes. The Contractor shall ensure that all applicable taxes are paid and that all necessary registration and reporting requirements are met.
LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

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sales tax on the full contract price. The Owner will automatically add this sales tax to each payment to the Contractor. For this reason, the Contractor shall not include any sales tax in the unit bid item prices, or in any other contract amount.

1-07(2)(c) SERVICES

The Contractor shall not collect retail sales tax from the Owner on any contract wholly for professional, or other service (as defined in State Department of Revenue Rules 138 and 226).

1-07(3) VACANT

1-07-4 SANITATION

The Contractor shall provide and maintain in a clean, neat and sanitary condition any accommodations for Contractor and Owner employees that are necessary to comply with the requirements of regulations of the State Department of Social and Health Services and other agencies. The Contractor shall commit no public nuisance, keep all sites clean, dispose of all ordure in a proper manner and leave the premises in a neat and sanitary condition.

1-07(5) PREVENTION OF ENVIRONMENTAL POLLUTION AND PRESERVATION OF PUBLIC NATURAL RESOURCES

During the life of the Contract the Contractor shall comply with all provisions of Federal, State and local statutes, rules, or regulations pertaining to the prevention of environmental pollution and the preservation of natural resources. The Contractor shall comply with the requirements set forth in R.C.W. 70.70.010(30) and (6) Sec. 4, Chap. 142, Laws of 1973, 3rd Ex. Session, as such provisions are reasonably interpreted by the Contracting Officer. Where the contract is for the construction of new or the amendment of existing structures, the contractor shall install and maintain at his own expense, any sanitary facilities or sinks to be used by employees.

1-07-1(1) WATER QUALITY

The Contractor shall comply with all applicable federal, state and local sanitary and safety regulations governing the transmission of water in the State.

(1) Preserve precautions throughout the life of the Contract to prevent pollution, erosion, silting, and damage to property.

(2) Provide for the flow of all water courses, including but not limited to streams, ditches, sewers, and drains, intercepted during the progress of the Work.

(3) Preserving the disturbed water courses in an east condition as the Contractor finds them, or make such repairs as are required to prevent them from becoming obstructed.

(4) Do not obstruct the gutter of any street;

(5) Do all measures to provide for the free passage of surface water; and

(6) Make provisions to take care of all surplus waste, mud, silt, slippings, or other run-offs pumped from the Work site, resulting from flushing or other operations.

The Contractor shall comply with the water quality criteria set forth in the Washington State Department of Health and Environmental Protection Agency, or other United States federal or state agencies.

1-07(11) (b) Provide the Engineer with a copy of each waste discharge permit before starting the Work.

1-07(16) Water treatment, discharging to ground surface, by percolation, evaporation or by passing through gravel, sand or similar media.

(4) Erosion Control: Temporary erosion control shall be established to prevent the displacement of soil, and other permanent measures are effective. Plastic sheet covering shall be placed on exposed ground areas to protect the rain water from erosion. Other alternative methods for erosion control can be used in conjunction with contour setting, mulching with binder, and seeding.

Siltation and erosion occur the Contractor shall be responsible for restoring damaged areas and for clean-up of eroded material including that in ditches, catch basins, channels, and culverts and other pipes.

(4) Chlorine Residues: Water containing chlorine residue shall not be discharged directly into storm drains, streams, or State waters. Chlorine may be discharged into sanitary sewers or disposed on land for percolation. Chlorine residues may be reduced chemically with a reducing agent such as sodium thiosulfate.

(5) Vehicle and Equipment Washing: Water used for washing vehicles and equipment shall not be allowed to enter storm drain, streams, or State waters unless separation of petroleum products, fresh concrete products or other deleterious material is accomplished prior to discharge. Detergent solution may be discharged into sanitary sewers or allowed to be held on the ground for percolation. A rectification system for detergent washing is required. Steam cleaning equipment shall pro vide a device for oil separation.

(7) Oil and Chemical Storage and Handling: Handling and storage of oil and chemicals shall not take place adjacent to waterways. Storage shall be made in double walled, monitored buildings, with structures and piping in a definite separating area. Shut-off and lock valves shall be provided on roads. The surface of the road shall be lighted. Dispersion of waste shall not be allowed on oil or chemical spills. Pounding shall not be done near large storage. Locks shall be provided on valves, pumps, and tanks.

(8) Sewerage: If a sanitary sewer line is encountered and required, the Contractor shall provide blocking and sealing of the sanitary sewer line. Sanitary sewer flow shall be diverted through a bypass and later collected and hauled by tank truck or pumped directly to a sanitary sewage manhole. Each bypassing of sanitary sewers shall be by the Contractor without the prior knowledge of the Engineer.

In the event of a sanitary sewer break, notification shall be made to the Seattle-King County Health Department.

The Contractor shall immediately notify the Engineer and the local United States Coast Guard office of all accidents of chemical, oil, or other contaminated spills or discharges into State waters which where known. The United States Coast Guard office cannot be reached the Contractor shall call the Department of Ecology at 875-7300 or the toll free number 875-7300.
LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

1-07.6 PERMITS AND LICENSES

The Contractor shall obtain all permits and licenses required to perform the work except for those permits and licenses obtained by the Owner and not required in the Contract. A copy of each permit or license shall be furnished to the Engineer before the work is begun. Any permits and licenses shall be included in the contract bid for the Work.

1-07.7 LOAD LIMITS

While moving equipment and materials on any public highway, the Contractor shall comply with any laws that control traffic or limit loads. The Contractor does not exempt the Contractor from these laws nor does it license overloads. At the Engineer’s request, the Contractor shall provide any information necessary to determine the weight of equipment on the Work.

When the Contractor moves equipment or materials within the oveall project, the load shall be:

1. Any road open to and used by public traffic,
2. Any existing road not scheduled for major reconstruction under the current Contract, and
3. Any newly paved road (with its final fill in place) built under this Contract. The Contractor may load roads (not exceeding 50 percent) on such roads not open to public traffic if this does not damage completed work.

Should damage occur, the Contractor shall pay all repair costs.

1-07.8 VACANT

1-07.9 WAGES

1-07.9.1 GENERAL

The Work is subject to the wage regulations of RCW 39.32 (Prevailing Wages on Public Work), RCW 48.28 (Hours of Labor), and to RCW 48.43 (Minimum Wage Act) as amended or supplemented. On projects funded in whole or part from Federal or State funds, wage and hour rates shall also apply.

When the Work is subject to both State and Federal prevailing wage requirements, the Contractor and every subcontractor must comply with whichever standard is higher.

The Contractor, any subcontractor or other person doing any portion of the Work, including any labor, or works or performs any labor, work, or workman is classified as a laborer, workman, or mechanic under the prevailing wage rates and standards.

The Contractor shall be responsible for complying with the wage regulations of both the State and the Federal Government.

1-07.9.2 PREVAILING WAGE RATES

The Project Manual includes hourly minimum rates for wages and fringe benefits under RCW 39.32. The Federal Contract Labor Standards Act and wages and fringe benefits rates, as identified by the U.S. Department of Labor’s “General Wage Decision,” in the Contract, are shown.

Any project funded in whole or part from Federal funds, the effective date for determining prevailing wages shall be the date the Contract is awarded. If the Contract is not awarded pursuant to the Federal funds, the effective date for determining prevailing wages shall be the Award Date of the Contract.

For projects funded in whole or part from Federal monies, the effective date for determining prevailing wages shall be the date the Contract is awarded.
LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

awarded within 90 days after bids are due, unless the Owner determines it is insufficient time to notify bidders of changes in the prevailing wage rates up to the date of bid opening, in which case rates shall apply. If the Contract is not awarded within 90 days after bids are due, the effective date for determining prevailing wages shall be the Award Date.

1.07(9)(C) PAYROLLS

Payroll reports for the Contractor and every subcontractor shall be submitted weekly to the Executive Director of the Board of Public Works, Arctic Building, Suite 700, 700 Third Avenue, Seattle, Washington 98109, within 72 hours after the expiration of each pay period. The payroll reports shall contain the following information:

(a) Name and address of each worker.
(b) Social Security number of each worker.
(c) Classification of work performed by each worker. The classification must be specific and match the classification categories in the Project Manual.
(d) Total number of hours worked each day.
(e) Total number of hours employed during the payroll period.
(f) Total rate of wages paid to each worker.
(g) Total or gross amount earned by each worker.
(h) Deductions for Federal Aid, FICA, Federal withholding tax, and any other deductions taken.
(i) Net amount paid each worker.
(j) Contractor’s or subcontractor’s name and address.
(k) Date of each pay period.
(l) Whether fringe benefits were paid to each worker as part of the hourly wage rate or whether fringe benefits were paid in an approved plan, fund, or program.

Payroll reports may be submitted on Federal payroll form WS-1347 for work performed on projects subject to the Federal Wage Rate by obtaining a Federal Surety Bond, Federal Building, 252 Second Avenue, Seattle, 98104, telephone (206) 624-4720. The reverse side of the form contains an affidavit which must be filled out and signed. If the Contractor’s payroll reports are computerized, the computer printout of the reports may be submitted along with a Statement of Compliance affidavit form which may be photocopied from the Office of the Director of Labor and Industries in the Project Manual.

The first payroll submitted for the Work for both the Contractor and each subcontractor shall be labeled “initial.” The last payroll submitted for the Work for both the Contractor and each subcontractor shall be labeled “final.” Payroll reports shall be sequentially numbered for all periods in which work is performed.

1.07(9)(D) REQUIRED DOCUMENTS

Before payment is made by the Owner of any sums due and payable under this Contract, the City Comptroller shall receive from the Contractor and each subcontractor a copy of a “Statement of Intent to Pay Prevailing Wages” (form 710-025-000), approved by the Industrial Statistics of the Washington State Department of Labor and Industries. Upon completion of the Work, the City Comptroller shall route a copy of this report to the Director of Labor and Industries, and in compliance with the requirements of RCW 39.11.030, the Contractor shall pay:

(1) The City Comptroller the amount of any additional payment for labor certified by the Director.
(2) The amount of any additional payment for labor certified by the Department of Labor and Industries (along with notice that complaints or adjustments have been filed). The Director shall be notified immediately of any additional payment for labor certified by the City Comptroller.

1.07(9)(D) DISPUTES

In the event any dispute arises as to what the prevailing wages are for this Contract, and the dispute cannot be resolved by the Director of Labor and Industries, the dispute shall be referred to the Director of the Department of Labor and Industries of the State of Washington when such dispute involves State prevailing wage rates. In such case, the Director’s decision shall be final, conclusive, and binding on all parties. If the dispute involves a Federal prevailing wage rate, the matter shall be referred to the U.S. Secretary of Labor for a decision. In such case, the Secretary’s decision shall be final, conclusive, and binding on all parties.

When the Work is in progress, the City Comptroller and all subcontractors shall comply with whatever standard is higher.

1.07(9)(E) AUDITS

The Contractor’s records pertaining to wages paid and payroll shall be open to inspection or audit by representatives of the Owner and, if applicable, representatives of grant agencies funding or controlling funding for the project at any time during the life of the Contract for a period of not less than three years after the Acceptance Date. The Contractor shall retain such records for that period. Where such records pertaining to wages paid on any payrolls are maintained by subcontractors or agents of the Contractor, the Contractor guarantees that the records of such subcontractors or agents shall be open to inspection and audit on the same terms and conditions as the records of the Contractor.

If an audit is to be commenced more than 60 days after the Acceptance Date of the Contract, the Contractor will give a reasonable notice of time when such audit is to begin.

1.07(9)(F) APPRENTICES

A laborer, worker, or mechanic employed on the Work for which an apprentice agreement is registered and approved by the State Apprenticeship Council prior to Chapter 49.06 RCW within 80 days of the Registration date, shall be paid hourly rate for apprenticeship that of a journeyman. If formal registration with the State Apprenticeship Council is not accomplished within 60 days of hiring, the laborer, worker, or mechanic must be paid the prevailing hourly journeyman rate for all hours worked on the Contract until an apprenticeship agreement is registered.

If the Contractor makes use of any one of apprentices on the Work, and any apprentice agreement is registered and approved by the State Apprenticeship Council and recognized by the U.S. Bureau of Apprenticeship and Training. Such evidence shall be submitted with the first payroll upon which the name of the employee appears. In the absence of such a state apprenticeship council, the Contractor shall submit evidence of registration with the U.S. Bureau of Apprenticeship and Training.

1.07(9)(G) POSTING NOTICES

In a location available to the Department of Labor and Industries, and in compliance with the requirements of RCW 39.11.030, the Contractor shall post:

(1) A copy of the “Statement of Intent to Pay Prevailing Wages,” for the Contractor, each subcontractor, and each agent of the subcontractors.
(2) The address and telephone number of the Industrial Statistics of the Washington State Department of Labor and Industries (along with notice that complaints or adjustments have been filed). The Director shall be notified immediately of any additional payment for labor certified by the City Comptroller.

1.07(9)(H) DISPUTES

In the event any dispute arises as to what the prevailing wages are for this Contract, and the dispute cannot be resolved by the Director of Labor and Industries, the dispute shall be referred to the Director of the Department of Labor and Industries of the State of Washington when such dispute involves State prevailing wage rates. In such case, the Director’s decision shall be final, conclusive, and binding on all parties. If the dispute involves a Federal prevailing wage rate, the matter shall be referred to the U.S. Secretary of Labor for a decision. In such case, the Secretary’s decision shall be final, conclusive, and binding on all parties.

When the Work is in progress, the City Comptroller and all subcontractors shall comply with whatever standard is higher.

1.07(9)(I) EQUAL EMPLOYMENT OPPORTUNITY REQUIREMENTS

The Contractor shall not discriminate and shall take affirmative action to ensure equal employment opportunity pursuant to Title 50 of RCW. The Contractor shall ensure that all applicable laws, regulations, and requirements which may be set forth in the Project Manual, shall constitute the specific Affirmative Action Plan and work requirements for the Work. The Contractor and all subcontractors (not including material) holding subcontracts of $1,000 or more shall comply with the following minimum specific requirement activities of equal employment opportunity. The Contractor shall include these requirements in every subcontract of $1,000 or more with such modifications of language as necessary to make them binding on the subcontractor.

The Contractor will not discriminate against any employee or applicant for employment because of race, religion, creed, color, sex, marital status, sexual orientation, political ideology, ancestry, national origin, or the presence of any sensory, mental or physical handicap; and to promote the full realization of equal employment opportunity through a positive continuing program.

The Contractor will not discriminate against any employee or applicant for employment because of race, religion, creed, color, sex, marital status, sexual orientation, political ideology, ancestry, national origin, or the presence of any sensory, mental or physical handicap; and to promote the full realization of equal employment opportunity through a positive continuing program.

The Contractor agrees to provide in a timely manner, and without discrimination, all notices to the Director of Labor and Industries of the State of Washington of all complaints or grievances received by the Contractor.

The Contractor will post in conspicuous places, a copy of this contract for employment, notices to be provided by the contracting officer, and an office for the receipt of communications in accordance with the Act.

The Contractor agrees to provide, in a timely manner, all notices to the Director of Labor and Industries of the State of Washington of all complaints or grievances received by the Contractor.

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LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

1.10.7.11(C) EQUAL EMPLOYMENT OPPORTUNITY OFFICER
The Contractor shall designate and make known to the Employer in the Human Rights Department at the Pre-Construction Conference the Contractor's Equal Employment Opportunity Officer (Contractor's EEO Officer) and the Employer's EEO Officer. The Contractor's EEO Officer shall have the authority to make him/herself known to each of the Contractor's employees and shall be responsible for the Contractor's EEO policies and practices. All employees shall be provided training to understand their responsibilities.

1.10.7.11(D) RECRUITMENT
The Contractor shall be responsible for directing recruitment in such a manner as to achieve diversity in employment and community organizations and shall take the following actions:

(i) Equal Opportunity Employer: When advertising for employees, the Contractor shall include in all advertisements for employees the statement: "An Equal Opportunity Employer." All such advertisements shall be published in newspapers or other publications having a large circulation among minority and women's groups in the area from which the project work force would normally be derived.

(ii) Systematic and Direct Recruitment: The Contractor shall, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority and women applicants, including but not limited to, State employment agencies, schools, colleges, and minority and women's organizations. To meet this requirement, the Contractor shall, through the designated EEO Officer, identify sources of potential minority and women applicants, and shall keep records of the number and sources of employment referrals.

(iii) Exclusive Hiring: If the event the Contractor has a valid collective bargaining agreement prohibiting the Contractor from employing minority or women from the applicant pool referred by the Union, the Contractor shall publish notice in the Union bulletin or other communications media in which the Contractor is a member, the Contractor's EEO Policy and requirements as they relate to minority and women applicants. The Contractor's EEO Officer shall clearly and effectively communicate the Contractor's efforts to implement this requirement.

(v) Application Forms: The Contractor shall provide application forms to all minority and women applicants with a reasonable likelihood of employment. The Contractor shall provide all necessary information in connection with the application forms and provide to all applicants an equal opportunity to apply for the position.

(vi) Notice and Address: The Contractor shall maintain a current file of the names and addresses and telephone numbers of all job applicants.

1.10.7.11(E) PERSONNEL ACTIONS
Wages, working conditions, and employee benefits shall be established, maintained, and administered in a manner which is sound, fair, and equitable. The Contractor shall conduct periodic inspections of project sites to ensure that working conditions and employee facilities do not indicate discriminatory treatment of Project Site personnel.

1.10.7.11(F) Training
The Contractor shall provide training to all employees who are required by law or by this Agreement to receive training in the performance of their duties.

1.10.7.11(G) PROVIDING POSITIVE REMARKS
The Contractor shall provide positive remarks to all employees who have met or exceeded performance expectations.

1.10.7.11(H) TRAINING PROGRAMS
When the Bid Form includes a Bid Item for "Training," part of the contractor's training program shall be provided as follows:

(i) The Contractor shall provide on-the-job training aimed at developing all employees at the same rate of progress as the project.

The minimum number of apprentices or trainees on a project will be specified in the Project Manual. The number of Wages paid for each apprentice or trainee will be determined by the Contractor and will be specified in the Bid Item, "Training.

At the request of any apprentice or trainee, in each occupation in which they are employed, the Contractor shall assign them to a skilled trade without discrimination against any applicant for training, whether a protected group in any class or category or not, in the past, present, or future as to work, job site, or site of training.

The Contractor may determine how many, if any, employees are to be trained by the Employer. The Contractor shall be responsible for the preparation and submission of the Bid Form and any of its subcontracts, training program on the forms provided by the Employer.

The training program shall be submitted to the Employer and the Seattle Human Rights Department (SHRD) for approval at the Pre-Construction Conference, and shall be resubmitted to the Employer for approval before changes to the training program. The Training Program shall indicate how the Contractor will meet the required number of training hours and the minimum number of trainees, including the number of first year apprentices or trainees required. The hours shown on the Contractor's Training Program submitted at the Pre-Construction Conference shall establish a minimum requirement the Contractor must attain to be in compliance with those training provisions. The training program shows less than the number of hours set forth in the Bid Form as a maximum, minimum, or both, the Contractor may provide proof that the number of hours set forth in the Bid Form is an unreasonable amount before the reduced training hours will be approved.

1.10.7.11(I) TRAINING PROGRAMS
The Contractor's training program shall be provided as follows:

(i) The Contractor shall provide positive remarks to all employees who have met or exceeded performance expectations.

The minimum number of apprentices or trainees on a project will be specified in the Project Manual. The number of Wages paid for each apprentice or trainee will be determined by the Contractor and will be specified in the Bid Item, "Training.

At the request of any apprentice or trainee, in each occupation in which they are employed, the Contractor shall assign them to a skilled trade without discrimination against any applicant for training, whether a protected group in any class or category or not, in the past, present, or future as to work, job site, or site of training.

The Contractor may determine how many, if any, employees are to be trained by the Employer. The Contractor shall be responsible for the preparation and submission of the Bid Form and any of its subcontracts, training program on the forms provided by the Employer.

The training program shall be submitted to the Employer and the Seattle Human Rights Department (SHRD) for approval at the Pre-Construction Conference, and shall be resubmitted to the Employer for approval before changes to the training program. The Training Program shall indicate how the Contractor will meet the required number of training hours and the minimum number of trainees, including the number of first year apprentices or trainees required. The hours shown on the Contractor's Training Program submitted at the Pre-Construction Conference shall establish a minimum requirement the Contractor must attain to be in compliance with those training provisions. The training program shows less than the number of hours set forth in the Bid Form as a maximum, minimum, or both, the Contractor may provide proof that the number of hours set forth in the Bid Form is an unreasonable amount before the reduced training hours will be approved.

The training program shall be provided as follows:

(i) The Contractor shall provide positive remarks to all employees who have met or exceeded performance expectations.
LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

1.07.11.7C ACCEPTABLE TRAINING PROGRAMS

1.07.11.7C(1) Acceptable training programs shall be those employing trainees/apprentices from the following:

(1) Apprentices registered with the Washington State Apprenticeship and Training Council (JATC) approved apprenticeship agreement.

(2) Apprentices registered with the Washington State Apprenticeship and Training Council (JATC) approved apprenticeship agreement.

(3) Apprentices registered with the Washington State Apprenticeship and Training Council (JATC) approved apprenticeship agreement.

(4) Apprentices registered with the Washington State Apprenticeship and Training Council (JATC) approved apprenticeship agreement.

(5) Apprentices registered with the Washington State Apprenticeship and Training Council (JATC) approved apprenticeship agreement.

1.07.11.7D TRAINING PROGRAM APPROVAL

Training programs will be approved on the basis of the number of trainees for the Contractor and all subcontractors to which the Program is established in the Project Manual and the proposed number of training hours in the Bid Form. A program will be approved only if it is reasonably calculated to the equivalent of the EEO obligations of the Contractor to and to qualify the average class to the minimum training hours indicated in the calculation required to be calculated over the total training hours in the blanket training program.

1.07.11.7F TYPICAL TRAINING PROGRAMS

Training programs shall be approved on the basis of the number of trainees for the Contractor and all subcontractors to which the Program is established in the Project Manual and the proposed number of training hours in the Bid Form. A program will be approved only if it is reasonably calculated to the equivalent of the EEO obligations of the Contractor to and to qualify the average class to the minimum training hours indicated in the calculation required to be calculated over the total training hours in the blanket training program.

1.07.11.7B1 TRAINING PROGRAM

The minimum length of training for each occupational classification of trainees shall be determined by the Contractor and shall be presented in the training program classification selected by the Contractor. Training Programs shall be approved by the Washington State Department of Transportation and the Federal Highway Administration.

OUTLINE

1.07.11.7C ACCEPTABLE TRAINING PROGRAMS

1.07.11.7D TRAINING PROGRAM APPROVAL

1.07.11.7F TYPICAL TRAINING PROGRAMS

1.07.11.7B1 TRAINING PROGRAM

LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC
with a certification showing the type and length of training satisfactorily completed. Copies shall also be provided to the Contractor in the form prescribed by the Engineer in accordance with the training requirements of the training provision. It is not required to notify the Contractor in the form prescribed by the Engineer in accordance with the training requirements prior to the training program on or before the date specified in the Notice to Proceed. The Contractor shall be notified in writing of the training program at least two weeks before the date of the training program, or as otherwise specified by the Engineer.

(6) Certification of Training: The Contractor shall periodically review the training and experience of potential employees. The Contractor shall ensure that all employees are capable of performing the tasks required by the Contract.

1.07.11(7) LIQUIDATED DAMAGES

The Contractor shall be liable for the minimum liquidated damages specified in the Contract for non-performance of the work, or for any breach of the Contract. If the Contractor fails to perform the work as specified, the liquidated damages shall be due and payable to the Owner.

2.00 REALIGATIONS OF RESPONSIBILITIES TO THE PUBLIC

(2) EEO Clause: The Contractor’s best efforts shall be used to incorporate an equal employment opportunity clause into the contract with the Owner in the following form: (EEO) the Contractor shall comply with the EEO regulations prescribed by the Department of Labor and the courts, as amended.

(3) Federal Practices and Policies: The Contractor shall be subject to the same federal regulations and policies of the labor union, except to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information. The Contractor shall furnish to the Owner all such information if requested. The Contractor shall be subject to the labor union’s right to require such information.

(4) Non-Cooperation: If the labor union refuses to cooperate with the Contractor, the Owner may refuse to cooperate with the labor union. The Contractor shall be subject to the labor union’s right to require such information.

1.07.11(10) RECORDS AND REPORTS

The Contractor shall keep all records and reports as required by this Contract. The Contractor shall submit monthly reports to the Owner, including but not limited to, the following:

(a) Progress Reports: The Contractor shall submit progress reports, including the progress of work performed, to the Owner on a monthly basis.

(b) Financial Reports: The Contractor shall submit financial reports, including the progress of work performed, to the Owner on a monthly basis.

(c) Progress Reports: The Contractor shall submit progress reports, including the progress of work performed, to the Owner on a monthly basis.

(d) Financial Reports: The Contractor shall submit financial reports, including the progress of work performed, to the Owner on a monthly basis.

1.07.11(11) GENERAL

The Contractor shall be subject to the same federal regulations and policies of the labor union, except to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information. The Contractor shall furnish to the Owner all such information if requested. The Contractor shall be subject to the labor union’s right to require such information.

1.07.11(12) UNIONS

If the Contractor is a union shop, the union’s rate of pay shall be the same as that of the Owner. No employee shall be employed by the Contractor unless the work is performed by the Owner or the Contractor in the same manner as that of the Owner.

1.07.11(13) WORK FORCE REPORTS

The Contractor shall submit to the Owner a report on the work force performance, including the number of women and minorities employed in the work force. The report shall be submitted within 30 days of the termination of the Contract.

1.07.11(14) COMPLIANCE MONITORING

The Contractor shall cooperate with the Owner in monitoring the work force to ensure compliance with the Contract. The Contractor shall also report any violations of the Contract to the Owner.

3.00 LEGAL RESPONSIBILITIES OF THE CONTRACTOR

(1) Equal Employment Opportunity: The Contractor shall comply with all applicable laws and regulations governing equal employment opportunities, including but not limited to, the Civil Rights Act of 1964, the Equal Pay Act of 1963, and the Age Discrimination in Employment Act of 1967.

(2) Federal Practices and Policies: The Contractor shall comply with all applicable federal regulations and policies, including but not limited to, the Federal Acquisition Regulation (FAR) and the Federal Aviation Administration (FAA) rules and regulations.

(3) Financial Reporting: The Contractor shall submit timely and accurate financial reports to the Owner, including but not limited to, the progress of work performed, the costs incurred, and the performance of the Contract.

(4) Record Keeping: The Contractor shall maintain accurate and complete records of all work performed, including but not limited to, the costs incurred, the work performed, and the performance of the Contract.

4.00 LEGAL RESPONSIBILITIES OF THE CONTRACTOR

(1) Performance Standards: The Contractor shall perform all work in accordance with the specifications and other work requirements specified in the Contract.

(2) Safety and Health: The Contractor shall comply with all applicable laws and regulations governing safety and health, including but not limited to, the Occupational Safety and Health Act of 1970 (OSHA).

(3) Environmental Protection: The Contractor shall comply with all applicable laws and regulations governing environmental protection, including but not limited to, the Clean Air Act, the Clean Water Act, and the Resource Conservation and Recovery Act (RCRA).

5.00 LEGAL RESPONSIBILITIES OF THE CONTRACTOR

(1) Performance Standards: The Contractor shall perform all work in accordance with the specifications and other work requirements specified in the Contract.

(2) Safety and Health: The Contractor shall comply with all applicable laws and regulations governing safety and health, including but not limited to, the Occupational Safety and Health Act of 1970 (OSHA).

(3) Environmental Protection: The Contractor shall comply with all applicable laws and regulations governing environmental protection, including but not limited to, the Clean Air Act, the Clean Water Act, and the Resource Conservation and Recovery Act (RCRA).

6.00 LEGAL RESPONSIBILITIES OF THE CONTRACTOR

(1) Performance Standards: The Contractor shall perform all work in accordance with the specifications and other work requirements specified in the Contract.

(2) Safety and Health: The Contractor shall comply with all applicable laws and regulations governing safety and health, including but not limited to, the Occupational Safety and Health Act of 1970 (OSHA).

(3) Environmental Protection: The Contractor shall comply with all applicable laws and regulations governing environmental protection, including but not limited to, the Clean Air Act, the Clean Water Act, and the Resource Conservation and Recovery Act (RCRA).

7.00 LEGAL RESPONSIBILITIES OF THE CONTRACTOR

(1) Performance Standards: The Contractor shall perform all work in accordance with the specifications and other work requirements specified in the Contract.

(2) Safety and Health: The Contractor shall comply with all applicable laws and regulations governing safety and health, including but not limited to, the Occupational Safety and Health Act of 1970 (OSHA).

(3) Environmental Protection: The Contractor shall comply with all applicable laws and regulations governing environmental protection, including but not limited to, the Clean Air Act, the Clean Water Act, and the Resource Conservation and Recovery Act (RCRA).
LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

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SUBSTITUTION OF WBEs, MBEs, OR COMBINATION WBEs, MBEs

(1) The Contractor may substitute a WBE, MBE, or Combination WBE/MBE designated to be utilized in the Bid Form if the Contractor shall certify to the satisfaction of the Owner that there is not, at the date of proposal, an economically qualified WBE, MBE, or Combination WBE/MBE which is capable of performing the work specified in the Schedule of Work. The substitution must be made on or after the first practical opportunity to begin using another certified firm. The decision to allow substitutions in accordance with this paragraph shall be in the sole discretion of the Owner.

1.07.13 CONTRACTORS RESPONSIBILITY FOR WORK AND DAMAGE

Except as provided for otherwise herein, the Work, including Change Order Work, shall be the sole risk of the Contractor until the Acceptance Date. Damage to or destruction, of either permanent or temporary work, utilities, materials, or equipment and plant shall be corrected or replaced by the Contractor, at the Contractor's expense, regardless of the cause of damage.

1.07.15 TEMPORARY WATER POLLUTION/EROSION CONTROL

Temporary water pollution/erosion control work shall consist of temporary measures which may be indicated in the Contract Documents, proposed by the Contractor and approved by the Engineer, or ordered by the Engineer during the performance of the Work. The temporary work is intended to provide prevention, control, and abatement of water pollution/erosion within the limits of the project, and to minimize damage to the Work, adjacent property, streams, and other bodies of water.

The Contractor shall coordinate temporary water pollution/erosion control work with the permanent drainage and erosion control work that may be specified in the Contract Documents to the extent that effective and continuous water pollution/erosion control is maintained during performance of the Work.

The Contractor is hereby notified that compliance with these requirements may necessitate performance of operations at a different time or in a different manner than has been considered normal and that such operations may cause material damage, loss, or destruction thereto.

Therefore, if required by the Contract Documents, the Contractor shall file with the Engineer for approval an effective temporary water pollution/erosion control plan. The plan shall show the scheduling for permanent pollution/erosion control work and for temporary work and shall include a review of the temporary group work plan to show proposed steps to prevent water pollution/erosion due to the Work on areas within the limits of the project or on other work areas outside of the project limits. The Contractor shall coordinate with the Engineer the time of submission of the plan. This plan is intended to provide for the protection of the Work, adjacent property, streams, and other bodies of water. The Contractor shall coordinate temporary pollution/erosion control work with all permanent pollution/erosion control work and with any other temporary work that may be necessary.

The Contractor shall prepare and submit to the Engineer a copy of the proposed plans and specifications for temporary pollution/erosion control work as required by this section. The Contractor shall file with the Engineer a report of the work performed under the temporary pollution/erosion control plan. The report shall show the items and facilities protected and the time of protection.

INDEMNIFICATION

The Contractor shall indemnify, defend, and save harmless the Owner and its officers, employees and agents from all claims, suits, losses, damages, and expenses, whether or not incurred by the Owner, whether or not the same are the result of the negligence of the Owner, its officers, employees, and agents or of the Contractor, its officers, employees, and agents, and shall hold the Owner harmless from all costs and expenses, including the costs of defense of all suits, claims, and proceedings, and shall pay all judgment or award resulting therefrom.

The Contractor shall forthwith inform the Owner of any such claim, action, suit or proceeding and the Contractor shall not settle or compromise any such claim, action, suit or proceeding without the prior written consent of the Owner and reasonably satisfactory to the Owner.

The Owner shall be afforded a reasonable opportunity to take part in any such settlement or compromise negotiations.

The Owner shall not be liable to the Contractor for failure to approve any portion of an originally submitted or revised temporary pollution/erosion control plan, nor for any delays to the work due to the implementation of the approved plan. The Contractor shall allow the Engineer not less than 5 working days for review of any submitted plan.

When the Engineer determines that water pollution/erosion is likely to be a problem, the Engineer may require that the Contractor perform operations as may be required to minimize and prevent pollution/erosion. These operations shall be coordinated with the Engineer and shall be performed in a manner that will not interfere with the normal activities of the Project.

The Contractor shall coordinate temporary pollution/erosion control work with all permanent pollution/erosion control work and with any other temporary work that may be necessary.

The Contractor shall file with the Engineer a report of the work performed under the temporary pollution/erosion control plan. The report shall show the items and facilities protected and the time of protection.

The Owner shall be afforded a reasonable opportunity to take part in any such settlement or compromise negotiations. The Owner shall not be liable to the Contractor for failure to approve any portion of an originally submitted or revised temporary pollution/erosion control plan, nor for any delays to the work due to the implementation of the approved plan. The Contractor shall allow the Engineer not less than 5 working days for review of any submitted plan.

The Contractor shall coordinate temporary pollution/erosion control work with all permanent pollution/erosion control work and with any other temporary work that may be necessary.
LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

1.07 RELATIONSHIPS WITH OTHERS

Prior to the construction of any new water or wastewater service lines, the Contractor shall ensure that all necessary permits and approvals are obtained from the appropriate regulatory agencies. The Contractor shall be responsible for coordinating with other utilities to ensure that their service lines are properly insulated and isolated to prevent interference or damage.

2.07 DAMAGES TO PRIVATE PROPERTY

In case of private water service lines damaged by the Contractor shall be repaired by the Contractor at the Contractor's expense. The Contractor shall repair any damage to private property caused by the Contractor or its agents or contractors.

3.07 UTILITIES AND SIMILAR FACILITIES

The Contractor shall protect from damage private and public utilities encountered during the work. Utilities shall include, but are not limited to, sewer and storm drain systems.
LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

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1.07.12/GAS MAINS AND OTHER UTILITIES
A minimum of 1 foot vertical and 6 inch horizontal clearance shall be provided between existing mains or gas service lines, and new ductile iron water lines. If relocation of utility lines is required, a protective wrap shall be provided by the contractor for the entire distance where clearance is less than required. Water main shall be protected with a soft PVC pipe or steel wrapping of at least 0.5 inch thick, and shall be capped at both ends of the wraps.

1.07.18/PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE

1.07.18(1) GENERAL

The Contractor shall maintain and forestall in full force and effect during the term of the contract, public liability and property damage insurance.

When the Contractor delivers the executed Contract for the Work to the Owner it shall be accompanied by a Certificate of Insurance (or a Certificate and a Binder) for a primary policy of Comprehensive General Liability Insurance meeting the requirements set forth hereinafter. This Certificate of Insurance shall be subject to approval by the Owner as to company, terms, and coverages. Failure of the Contractor to fully comply during the term of the Contract with these requirements regarding insurance will be considered a material breach of contract and shall be cause for immediate termination of the Contract at the option of the Owner.

The Contractor shall provide evidence of insurance in the form of an "errors and omissions" policy for errors and omissions in addition to the General Liability Insurance. The policy shall include a clause regarding any claims for personal injuries, including, but not limited to, long-term disability claims for property damages which may arise from any act or omission of the Contractor or the Subcontractors or of any person by direct or indirect employment of either of them. If required, the Contractor shall forward to the Owner's Risk Manager the original policy or endorsement obtained, to the Contractor's policy currently in force.

1.07.18(3) COVERAGE

The insurance shall provide the minimum coverages set forth below:

(a) General Liability
(b) Bodily Injury
(c) Property Damage
(d) Medical Payments
(e) Personal Injury

1.07.18(4) LIMITATION

The Contractor shall not be permitted to modify or cancel the General Liability Insurance, unless the modification or cancellation is for a period of less than one year and only after obtaining the written consent of the Owner.

1.07.18(5) EVIDENCE OF INSURANCE

The Contractor shall provide evidence of insurance by one of the following methods:

(a) Evidence of an insurance policy which is valid for the term of the contract.
(b) Evidence of a Certificate of Insurance which is valid for the term of the contract.
(c) Evidence of a Certificate of Insurance and a Binder which is valid for the term of the contract.

1.07.19/GRAVITY

The Contractor shall not file any claim for any losses, damages, or property damage unless the claim is submitted to the Owner in writing within 30 days after the occurrence of the loss.

1.07.20/PATENTED DEVICES, MATERIALS, AND PROCESSES

The Contractor shall assume all costs arising from the use of patented devices, materials, and processes which are incorporated in the Work, and agrees to indemnify, defend, and hold harmless the Owner from any and all claims for property damages which may arise from any act or omission of the Contractor or the Subcontractors or of any person by direct or indirect employment of either of them.

1.07.21/VACANT

The Contractor shall not enter into any contract with the Owner that provides for the construction of property without the Owner's consent.

LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

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1.07.23/TRAFFIC CONTROL

Traffic control shall be performed in accordance with the requirements of the Project Manual and the "Traffic Control Manual for In-Street Work."

1.07.24/RIGHTS OF WAY

Street right of way lines, limits of easements, and limits of construction permits shall be indicated on the Drawings. The Contractor's construction activities shall be confined within these limits, unless arrangements for use of private property are made.

Generally, the Owner will have obtained, prior to Bid opening, all rights of way and easements, both permanent and temporary, necessary for carrying out the completion of the Work. Exceptions to this will be noted in the Contract Documents or brought to the Contractor's attention by a duly issued Authorization.

Whenever any of the Work is accomplished on or through property other than public right of way, the Contractor shall meet and fulfill all covenants and stipulations of any easement agreement obtained by the Owner from the owner of the private property. Copies of the easement agreements will be included in the Project Manual made available to the Contractor as soon as practical after they have been obtained by the Engineer.

Whenever easements or rights of entry have not been acquired prior to advertising, they will be noted on the Drawings. The Contractor shall not proceed with any portion of the Work in areas where easements or rights of entry have not been acquired. The Engineer reserves the right to require that the easement be available or that the right of entry have been acquired before proceeding. If the Owner fails to authorize and record the easement or the right of entry, the Contractor shall be entitled to an extension of time. The Contractor agrees that such delay shall not be a breach of contract.

Each property owner shall be given 48 hours notice prior to entry by the Contractor. This includes entry into private property and any private property where private improvements must be adjusted.

The Contractor shall be responsible for providing, without expense to the Owner, all necessary construction facilities, storage of materials, or access thereto that the Contractor may desire for temporary storage, construction, and equipment during the course of the work. The Contractor shall provide the necessary facilities, storage, and equipment at its own expense.

The Contractor shall provide the necessary facilities, storage, and equipment at its own expense. The Contractor shall be required to notify the Owner of all such restrictions as may be required by the proper authorities. The Contractor shall be responsible for providing, without expense to the Owner, all necessary construction facilities, storage of materials, or access thereto that the Contractor may desire for temporary storage, construction, and equipment during the course of the work. The Contractor shall provide the necessary facilities, storage, and equipment at its own expense.
LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

107.25 OPENING OF SECTIONS TO TRAFFIC

The Owner reserves the right to use and occupy any portion of the Work prior to completion of the entire Contract without incurring any liability to the Contractor except as otherwise provided in this Contract and without constituting acceptance of any of the Work.

If any portion of the Work is opened for traffic prior to the completion of the entire Work because (1) early opening is in the best interest of public safety, or (2) the Contractor through neglect or default failed to prosecute the Work continuously and efficiently then any work remaining after that portion of the project is opened for traffic shall be performed at unit contract prices for items of work involved. In addition, no additional compensation will be made for costs incurred by the Contractor because of inconvenience, additional length of time to complete established traffic patterns and planned access features, compliance with traffic governing traffic regulations and limitations of loads, or for the additional flagging costs. The Contractor shall take into account all costs of construction resulting from the contractual requirement that public traffic be able to use, concurrent with construction activities, portions of the Work and shall include such costs in the lump sum bid or the unit prices for the various items of Work listed in the Bid Form.

107.26 PERSONAL LIABILITY OF PUBLIC OFFICERS

No public officer, nor any officer or employee of the Owner, shall be personally liable for any acts or failures to act in connection with the Work. It being understood that in such matters they are acting solely as agents of the Owner.

107.27 NO WAIVER OF OWNER'S LEGAL RIGHTS

The Owner shall not be precluded or stopped by any measurement, estimate or certificate made either before or after the completion and acceptance of the Work and payment therefor from showing the true amount and character of the materials furnished by the Contractor or from showing that any such measurement, estimate, interest or certificate was or was not adequate or complete or that the Work or materials do not conform to the details of the Contract. The Work shall be completed as specified in the Contract. The Owner shall be precluded or stopped notwithstanding any such measurement, estimate, interest or certificate and payment in accordance therewith from recovery from the Contractor and/or the sureties and from proceeding in any manner as it may seem by reason of the Contractor's failure to comply with the terms of the Contract. The Owner shall have the right to make payment for the whole or any part of the Work or any extension of time or any suspension taken by the Owner shall operate as a waiver of any portion of the Work or of any power reserved or any right to damages herein provided or be recovery of any money wrongfully or erroneously paid to the Contractor and the Contractor shall forever be estopped from asserting any lien or claim not to be held to a waiver of any other or subsequent breach.

The Contractor and the Owner recognize that the impact of the Owensboro Public Utility Work on the Owensboro Public Utility System and the Owensboro Public Utility System Users will be significant and that the Owensboro Public Utility System Users will have certain rights and interests in the Owensboro Public Utility System Users. The Contractor shall make every reasonable effort to minimize any disturbance to the Owensboro Public Utility System Users during the period of the Owensboro Public Utility System Users and shall work with the Owensboro Public Utility System Users to ensure that the Owensboro Public Utility System Users are not adversely affected by the Owensboro Public Utility System Users.

The Contractor shall be responsible for providing all necessary equipment and materials to the Owensboro Public Utility System Users and shall be responsible for all work performed in the Owensboro Public Utility System Users. The Contractor shall be responsible for all work performed in the Owensboro Public Utility System Users and shall be responsible for all work performed in the Owensboro Public Utility System Users. The Contractor shall be responsible for all work performed in the Owensboro Public Utility System Users and shall be responsible for all work performed in the Owensboro Public Utility System Users. The Contractor shall be responsible for all work performed in the Owensboro Public Utility System Users and shall be responsible for all work performed in the Owensboro Public Utility System Users.

107.28 NOTIFICATIONS RELATIVE TO CONTRACTOR'S ACTIVITIES

The Contractor shall notify the public agencies and authorities with the street in the right of way as to the time the work shall be performed, a reasonable time of starting and the time it will be finished. The Engineer will also define what the project consists of and will point out particular problems. TheContractor shall be responsible for making detailed notifications on all work. Theorchestration of work performed in the City street areas is outlined in the Traffic Control Manual for Street Work and the Project Manual. Notification shall be in such detail as to give the time of commencement of the work, names of streets or sections of streets to be closed, schedule of operations, routes of detours, etc. The Contractor shall call the Utilities Underground Location Center for field location of utilities, not less than 2 or more than 10 Business Days before the scheduled date for commencement of excavation which may affect underground utility facilities, unless otherwise mutually agreed to in writing by the Contractor and the Utilities Underground Location Center. The Utilities Underground Location Center toll free telephone number is 1-800-438-5055. If a utility is known or is suspected of having underground facilities within the area of proposed excavation, and if utility is not a subscriber to the Underground Utilities Location Center, notice shall be provided individually to the utility.

In addition the Contractor shall make the following notifications when applicable:

(1) Partial or Complete Street Closure:
   a) Within Seattle City Limits: The Contractor shall notify the Seattle Fire Department (206-1006) and Seattle Police Department (684-7972) at least 24 hours in advance of the date of actual closure.
   b) Outside Seattle City Limits: The Contractor shall notify the King County Roads Division (225-2621), King County Fire Marshall (266-6707), and King County Police (266-6808) at least 24 hours in advance of the date of actual closure.
   c) Underground Utilities Location Center: The Contractor shall notify the agencies set forth in (a) and (b) above.

(2) Water Shutoffs:
   a) Within Seattle City Limits: The Contractor shall notify the City of Seattle, Water Department (684-7972) at least 24 hours in advance of actual shutoff.
   b) Outside Seattle City Limits: The Contractor shall notify the King County Fire Marshall (266-6707) and the King County Health Department (567-7722) 24 hours in advance of water shutoffs.
   c) On Boundaries of Seattle City Limits: The Contractor shall notify the agencies set forth in (a) and (b) above 24 hours in advance of water shutoffs.

(3) Other Notifications:
   a) For work on roads and highways outside the Seattle City limits, notifications shall be provided in accordance with permit requirements of the City of Lynnwood, the Washington State Department of Transportation, and the Department of Transportation. The Contractor shall also observe all requirements prior to starting work.
   b) Water service connections will be scheduled by the Engineer with the Water Department.

PROSECUTION AND PROGRESS

SECTION 10-08 PROSECUTION AND PROGRESS

108-1 PRELIMINARY MATTERS

The Engineer will furnish the Contractor with up to 10 copies of the Drawings and Project Manuals. Additional documents shall be furnished to the Contractor at the cost of reproduction. Prior to undertaking any part of the Work the Contractor must compare the Contract Documents and check and verify pertinent figures shown therein and all applicable field measurements. The Contractor shall promptly report in writing to the Engineer any conflict, error or discrepancy which the Contractor may discover.

After the Contract has been executed, but prior to the Contractor beginning the Work, a preconstruction conference will be held between the Contractor, the Engineer and such other interested parties as may be invited. The purpose of the preconstruction conference will be:

(1) To review the initial progress schedule;
(2) To establish a working understanding among the various groups associated or affected by the Work;
(3) To establish and review procedures for progress payment of subcontracts, etc.;
(4) To establish normal working hours for the Work;
(5) To review safety standards and traffic control; and
(6) To discuss such other related items as may be pertinent to the Work.

The Contractor shall prepare and submit at the preconstruction meeting the following:

(a) A breakdown of all lump sum items;
(b) A list of proposed subcontractors;
(c) A preliminary schedule of drawing review submittals;
(d) Application for funds; and
(e) A Work Force Report Form.

108-11 SUBCONTRACTORS

The Contractor has the option of subcontracting work amounting to not less than 40% of the Awarded Contract Price with the Contractor's own employees, or it may subcontract or enter into any other contract, or enter into any contract of any kind, with a subcontractor preapproved by the Engineer. The cost of any specialty items as specified by subcontractor or the work to be performed in the Work related to the Work shall be considered specially.

Work shall not be subcontracted, regardless of time, without written consent of the Engineer. A request to subcontract shall be made to the Engineer who shall determine that the proposed subcontractor is responsible and equipped to do the Work. Consent to subcontract shall not be given unless the Engineer is satisfied that the subcontractor is responsible and equipped to do the Work. Consent to subcontract any portion of the Work will not relieve the Contractor of responsibility for performance of the Work.

Subcontracting shall create no contract between the Owner and the subcontractor, and the subcontractor shall have no rights against the Owner by reason of its subcontract with the Contractor. The Contractor shall be responsible for all work subcontracted and materials furnished and no subcontract shall in any case release the Contractor of the Contractor's obligations for liability under the terms of the Contract Documents or the Contract. The Contractor shall be required to be subcontracted and the names of all proposed first tier subcontractors shall be submitted to the Engineer at the Preconstruction Meeting. A Contractor wishing to substitute subcontractors during the progress of the work shall submit the proposed substitute for approval.

The Contractor shall submit to the Engineer, with any request for first tier subcontractor approval, subcontractor agreement forms, current insurance certificates, a copy of the proposed subcontract, a current second or lower tier subcontractor if any for the subcontractor. Such second and lower tier subcontractors shall be required to perform work involving over 25 percent of the total subcontracted amount being handled by the subcontractor involved. Other than the 25 percent limitation, the second or lower tier subcontractor shall be subject to the same requirements as first tier subcontractors. The 25 percent limitation on the Work which may be performed by second or lower tier subcontractors shall not apply to such activities as may be specifically excluded in the Project Manual. Each subcontract shall contain a provision which requires the subcontractor to comply with RCW 39.12 and furnish all certificates, statements, and submittals required by the Contract Documents.

The purchase of sand, gravel, crushed stone, crushed slag, batched concrete aggregates, ready mixed concrete, fabricate structural steel, or any other materials produced and furnished from established recognized commercial plants together with the delivery of these materials to the site of the Work by means of vehicles owned or operated by such plants or by recognized commercial handling companies shall not be construed as subcontracting under these provisions. Such purchase shall be considered as being purchased from materials suppliers.

When a portion of the Work which has been subcontracted by the Contractor is not being progressed in a manner satisfactory to the Engineer, the subcontractor shall be removed and replaced immediately upon the Engineer's written order, and shall not again be employed on the Work unless the Contractor makes a formal application and the Contractor's proper is upheld by the Owner.

If the Engineer determines that any subcontractor is performing services in an unsatisfactory manner or is not complying with the provisions of the Contract Documents or is otherwise unsatisfactory or incapable of performing the Work, the Engineer shall so notify the Contractor. The Contractor shall then take immediate steps to terminate such subcontractor. Submitting by subcontractors shall be subject to the approval of the Engineer.

108-12 HOURS OF WORK

Except in case of emergency or unless otherwise approved by the Owner, the normal hours of work shall be from 7:00 a.m. to 5:00 p.m. on any working day and shall consist of 8 hours exclusive of a lunch period of not more than one hour. The normal hours of work shall be established at the preconstruction meeting of the Contractor, and the Contractor shall perform the Work commencing the Work and shall not be changed or extended without prior written approval of the Engineer.

Work to be performed Saturdays, Sundays, holidays or other than the normal hours of work months. Work shall be scheduled under conditions giving subject to certain conditions set forth by the Owner or Engineer. These conditions include, but are not limited to, requiring the Engineer or other Owner employees to be present during the Work. Such other Owner employees include, but are not limited to, survey crews personnel from the Owner's material testing and material handling employees and others from the administration or other departments.
complaint is received from the public or adjacent property owners. The Contractor shall have no claim for damages or offset or reduction of contract price for any losses of any kind that may occur during the period of suspension. The suspension of work shall be in accordance with the terms of the Contract.

PROVISIONS AND PROGRESS

1-08.4 PROGRESS SCHEDULE

The Contractor shall submit a progress schedule to the Engineer for approval within 14 days after receipt of the Notice to Proceed.

1-08.5 TIME FOR COMPLETION

The Work shall be completed within its entirety within the time specified in the Contract Documents or as extended by the Engineer. The Contract Time shall be stated in working days, shall begin on the date indicated in the Contract Documents, and shall end on the date indicated in the Contract Completion Date.

The Contractor has been established to allow for periods of normal inclement weather, which from historical records, is to be expected during the Contract Time, and during which periods, work is anticipated to be performed. Each successive period of suspension will be added to the Schedule Time for the purpose of determining the new total period of time within which the Work shall be completed. Each period of suspension will be calculated from the date on which the suspension notice is given by the Engineer to the date on which the Contractor requests permission to work.

1-08.6 SUSPENSION OF WORK

The Contractor shall immediately suspend the Work or work or any part of the Work as directed by the Engineer, and the Engineer may, in his discretion, order the Contractor to stop work on any part of the Work or any portion of the Work, and the Engineer may, in his discretion, order the Contractor to stop work on any part of the Work or any portion of the Work, and the Contractor shall comply with such order.

1-08.7 MAINTENANCE DURING SUSPENSION

In the event of a suspension of work by the Contractor, the Contractor shall maintain the Site and the Work in a safe condition and free from any hazards to life or property. The Contractor shall be responsible for the safety and security of the Work during the period of suspension and shall take all necessary precautions to protect the Work from damage or destruction.

1-08.8 TIME EXTENSIONS AND DELAYS - ENTITLEMENT AND COMPENSATION

The Contract Time shall be extended for an equivalent period to the actual time which the Work is suspended or delayed for an extension of time if the activities which are subject to the delay are on the critical path of the construction schedule and the Contractor has submitted a request for an extension of time within the prescribed time limits.

Excusable delays may include, but are not limited to: acts of God; acts of the public or governmental authority; acts of war; armed hostilities; any act of God or any other cause which may result in the suspension or delay of the Work, and the Contractor believes the excuse for suspension or delay is justifiable, and the Contractor agrees that the suspension or delay is justifiable.

Normal inclement weather, which from historical records, is to be expected during and which periods the Work is anticipated to be performed, is considered normal inclement weather. Normal inclement weather shall not be entitled to an extension of time for periods of
compensation for damages resulting from failure to complete the Contract on time.

The Contractor shall:
1. Determine the Work for each working day beyond the Contract deadline date for completion, as set forth in the Contract Document.
2. Authorize the Owner to deduct these liquidated damages from the remaining balance due for the Work.

When the Contractor fails to complete the Contract in the time allowed for the Work, the Owner may determine the Contract Work is substantially complete. The Owner will notify the Contractor in writing of the substantial completion date. For overrun in Contract Time occurring after the date set forth above, liquidated damages shall not apply. After the substantial completion date, liquidated damages shall be assessed on the basis of direct engineering and related costs. Such costs may be computed as follows: the excess of direct costs for completing the Work, and all damages sustained, or which may be sustained, by the Owner for reason of such refusal, neglect, delay, or discontinuance of work by the Contractor, the excess shall be paid to the Owner by the Contractor. If the expenses and damages exceed the unpaid balance, the Contractor and the Contractor's Surety shall be jointly and severally liable to the Owner and shall pay due to the Owner on demand.

1.8-10.1(3) TERMINATION OF CONTRACT for Default

1.8-10.1(3)(a) TERMINATION FOR DEFAULT

If the Contractor:
1. Fails to perform or continues to perform the Work in a manner which is not substantially in accordance with the plans and specifications contained in the Contract Documents, the Owner may terminate the Contract and give written notice to the Contractor.
2. Becomes insolvent or is declared bankrupt or is disabled or is unable to perform the Work due to the loss of or damage to any of the Owner's property or loss or damage caused by the loss of or damage to any of the Owner's property.

The Contract shall be terminated and, in lieu of any liquidated damages, the Owner may acquire the balance of the Work directly from the Contractor or any other person or company at the same cost to the Owner as was provided for in the original Contract. The Contractor shall be liable for all costs and expenses incurred by the Owner in completing the Work, including all increased costs for completing the Work, and all damages sustained, or which may be sustained, by the Owner for reason of such refusal, neglect, delay, or discontinuance of work by the Contractor, the excess shall be paid to the Owner by the Contractor. If the expenses and damages exceed the unpaid balance, the Contractor and the Contractor's Surety shall be jointly and severally liable to the Owner and shall pay due to the Owner on demand.

1.8-10.1(4) TERMINATION FOR DELAYS DUE TO LITIGATION

Pursuant to RCW 69.09.080, if the delay caused by litigation exceeds six months, the Contractor may then elect to terminate the Contract and to delete the completion of the Contract and to require liquidated damages in proportion to the amount of the work completed plus the cost of the delay. Amounts retained as liquidated damages under RCW 69.09.080 shall be credited for a period of thirty days following the election of the Contractor to terminate.
MEASUREMENT AND PAYMENT

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MEASUREMENT AND PAYMENT

1.09.21A  GENERAL REQUIREMENTS FOR WEIGHING EQUIPMENT

Equipment for weighing contractor's materials shall be approved by the Engineer, and the weights indicated on the scale shall be accurate, approved scales by competent, qualified personnel at locations satisfactory to the Engineer. Scales for the weighing of natural, manufactured, or processed construction materials obtained from natural or artificial sources, subject to proper documentation of the materials purchased, shall be certified, proportioned, and measured for weight, shall be calibrated, and shall be used in accordance with the specifications of the Contract Documents.

1.09.21B  SPECIFIC REQUIREMENTS FOR HITCHING SCALES

Platform scales shall be certified scales which automatically print the net weight and correctly weight the vehicle on the platform, and shall be in full compliance with the specifications of the Contract Documents. Platform scales shall be of the load cell type and designed for use with construction vehicles. The scales shall be certified by the State Department of Weights and Measures, and the certificates of the scales shall be issued and maintained by the Engineer. The certificates shall be valid for a period of five years, and shall be renewed annually.

Any Contractor-supplied scale shall include a scale house with a four-floor scale at least 6 ft by 10 ft. The scale house shall be wired and weather-tight, shall have ventilation, shall include a door, and shall be located. It shall include a scale, a chart, a scale, and a temperature control mechanism which will prevent displacement, building or variation of the various components of the scale. Working parts of scales or connections shall be protected from material falling upon or against them and shall be protected from wind and weather. Special care and protection of vital edges shall be exercised. Ramps and platforms shall be kept clean of material which may accumulate and introduce errors.

Each batch of materials on platform scales shall be taken at the end of each batch and recorded to the nearest 20 pounds and during weighing operations, weights shall be read and recorded to the nearest hundred weight.

Before use at a site on or after the six months thereafter, the scales shall be approved in accordance with local ordinances or rules of the State Department of Agriculture's Weights and Measures Section, or be certified and tested by a scale company representative with at least 10,000 pounds, with a copy of the final test results provided to the Engineer.

1.09.21B  SPECIFIC REQUIREMENTS FOR BELT CONVEYOR SCALES

Belt conveyor weighing may be acceptable for unprocessed materials provided that this method or device meets the general requirements of weighing equipment. Belt conveyor scales shall meet the requirements for belt conveyor scales as specified in the National Bureau of Standards, Handbook No. 46, except as modified by these Specifications.

A daily static load test shall be made after about 2 1/2 hours of continuous running of the belt conveyor whenever and the air temperature varies significantly. A chart test will be required whenever a test has been determined by the daily static load test.

The test chart calibration, computation, calibration procedures and results, and related documents shall be available for review by the Engineer. The test charts shall be clearly marked in calibration. It shall be carried in a suitable container and shall be in a readily accessible location for the use of the best conveyor scales.

Comparison procedures may be completed by the average of 5 or more sequential chart readings and shall not be less than 100 feet. The scale on which the materials are measured shall be acceptable. Since the recording edometer of conveyor belt scales in general use is graduated in 0.1 ft meters (200 ft) increments, and since the scale is graduated in 0.1 ft meters, the comparison data shall be recorded to 0.1 ft meters. Since the recording edometer of conveyor belt scales in general use is graduated in 0.1 ft meters, the comparison data shall be recorded to 0.1 ft meters.
MEASUREMENT AND PAYMENT

1-09.2(1) MEASUREMENT

In the event inspection reveals that scales have been
underweighing the scales should be adjusted and no additional payments shall be allowed for materials previously weighed and recorded. Scales overweighing—
indicating that true weight was not permitted to operate and all materials received subsequent to the last previous inspected weight, the overweighing accuracy test will be reduced by the percentage of error in excess of one-half of one percent. No payment will be made for materials received by weight which have not been weighed in accordance with the foregoing specification or other methods specifically approved in writing for the individual project.

1-09.2(1) PAYMENT

All costs in connection with furnishing, installing, certifying and maintaining scales for furnishing check weights and scale
house and for all other items specified in this section for the weighing of construction materials for proportioning or payment shall be included in unit bid item prices for the various items of work which comprise the Contract.

1-09.3 SCOPE OF PAYMENT

1-09.3(1) GENERAL

The Contractor shall receive and accept compensation provided for in the Contract Documents as full payment for the following:

(1) Furnishing all materials and for performing all work under the Contract in a complete and acceptable manner including changes in the work, materials, or Drawings as provided for by approved Change Orders.

(2) Theft, loss, damage, or exposure of whatever character arising out of the nature or prosecution of the Work.

(3) All expense incurred in consequence of the suspension or discontinuance of the Work as specified in the Contract Documents.

Unless the Contract Documents provide otherwise, the unit
bid item prices for the various items of Work shall be full and complete compensation for all labor, materials, supplies, equipment, tools, and all things of whatever nature required for the completion of the Work. All costs should be entered into the Work, the same as though the items were to be paid "in place."
The item "Bid Item," as used in this item of payment means complete payment for the work described for that item in the Contract.

Unless modified otherwise in the Project Manual, the bid
items listed or referenced in the "Payment" clause of each Section of the Standard Specifications, will be the items for which the complete payment will be made for the Work described in or specified in that particular Section when the Contractor performs the work. Should a bid item be listed in a "Payment" clause but not in the Bid Item, and Work for that item, by the Contractor, then payment for that Work will be made as for Extra Work pursuant to a Change Order.

The words "Bid Item," "Contract Item," and "Pay Item," and
similar terms used throughout the Contract Documents are synonymous.

If the "Payment" clause in the Specifications relating to any
unit bid item price in the Bid Item requires that said unit bid item price cover and be considered reasonable for certain work or loss to be assessed to the item, then when the work or material will not be measured or paid for under any other bid item or which may appear elsewhere in the Bid Item or Specifications.

Change bid item in Specifications are changed in singular form.

Certain unit bid items appearing in the Specifications may be modified in the Contract Documents to include words such as:

(1) "Structure," or "For Concrete Barrier," or "For Bridge," etc. with the intent of clarifying specific use; or

(2) "the" (case dependent) with the intent of clarifying where a specific item of work is to be performed.

Modifications of the unit bid items in this manner shall not
change the intent of the Specifications relating to these items.

Payment for bid items listed or referenced in the "Payment" clause of any particular Section of the Specifications shall be considered as including all of the Work required, specified, or described in that particular Section. Payment items will generally be listed generically in the Specifications, (e.g., "Mashboles (type 1)" and specifically in the bid items (e.g., "Mashbole, Type 130"). When items are to be "furnished" under one payment item and "installed" under another payment item, such items shall be furnished P.O. project site,

or, if specified in the Project Manual, delivered to a designated City site. Materials to be "furnished," or "furnished and installed" under these conditions, shall be the responsibility of the Contractor with regard to storage until such items are incorporated into the Work or, if such items are not to be incorporated into the Work, delivered a programmable to the applicable City storage site when provided in the Specifications for materials "furnished," but not yet incorporated into the Work, may be made on monthly estimates to the extent allowed.

1-09.2(2) LUMP SUM BREAKDOWN

The Contractor shall submit a breakdown of costs for each lump sum bid Item. The unit price values may be used as a guideline for determining total payments or deductions for authorized changes in the Work.

1-09.3(2) ADJUSTMENTS

Adjustments in the amount to be paid by the Owner under the item "Bid Item" and paid in whole or in part in accordance with the item "Bid Item" for specific work that is not part of the unit contract work. Payment for partially completed lump sum items will be as initially agreed for or for Work performed under approved Change Order.

(3) Changes in Laws: The Owner will not adjust payment to compensate the Contractor for changes in general laws or governmental requirements unless those changes are specifically within the scope of the Contractor's Scope of Work. The manner of payment for each lump sum bid Item 39.04.120 the Owner will compensate the Contractor by negotiated Change Order or by Force Order.

(4) Changes in Taxes: The Owner will adjust payment to compensate for tax changes under the following conditions:

(a) Changes involve Federal or State taxes on

materials used or consumed for the Work;

(b) Changes in taxes by the Contractor, then payment for that Work will be made as for Extra Work pursuant to a Change Order.

The words "Bid Item," "Contract Item," and "Pay Item," and
similar terms used throughout the Contract Documents are synonymous.

Within the above conditions the Owner will adjust compensation by the actual dollar amounts of increase caused by the tax changes.

1-09.4 PAYMENT FOR CHANGES

Payment for work pursuant to a Change Order (other than
delivered work) shall be full compensation for any such change.

The amount of payment shall be determined by one of more of the following methods:

(a) by unit prices contained in the Bid;
(b) by unit prices mutually agreed upon;
(c) by mutual acceptance of a lump sum price; or
(d) by Force Account.

When the Work performed can be measured and paid for at
unit bid item prices, it will be measured and paid for at such prices. When payment is by Method (3), the Contractor shall
provide substantiation to the lump sum price in a form acceptable to the Owner. Payment by methods (3), (2) and (3) shall include all costs for overhead and profit except that any mark-ups for overhead and profit included in any compensation requested to justify a lump sum agreed shall be limited to those permitted for method (4) (force account). If the Contractor and Engineer are unable to agree on compensation the Engineer will determine the compensation or if deemed appropriate by the Engineer compensation will be paid by method (4) Force Account.

When payment for extra work is by lump sum agreed price or by unit prices mutually agreed upon, the Contractor shall include in the agreed prices valid sales tax on useable materials when such extra work is for improving public roads. When the extra work is for water systems, sanitary sewer systems, sewage disposal facilities, electrical distribution, or other work not related to public roads, the Contractor shall not include retail sales tax in the agreed price.

1-09.5 DELETED OR TERMINATED WORK

When the Work is terminated in accordance with Section 1-09.4, payment will be made for all Work performed to the date of Work completion. The price for each lump sum bid Item 39.04.120 the Owner will compensate the Contractor by negotiated Change Order or by Force Order.

(1) Costs of Work.

(2) Costs of Materials.

(3) Costs of Labor.

(4) Costs of Equipment, 

(5) Costs of permits, 

(6) Costs of subsistence, 

(7) Costs of insurance, 

(8) Costs of transportation, 

(9) Costs of storage, 

(10) Costs of legal fees.

A Weighted Rate Wage shall be computed for each classification of labor used. This rate shall reflect the Contractor's actual cost. It shall neither exceed what is necessary to complete the Work nor be less than the minimum required by Section 1-07.9. If the Engineer directs otherwise, the Weighted Rate Wage shall be determined on the same basis.

Travel Allowance and Subsistence. This includes the actual costs of allowances for travel or subsistence paid to employees in the course of their work on the Item. This reimbursement will be calculated based on the actual expenses incurred by the Contractor or乙方 in providing services required by the Owner. The Owner will reimburse Contractor paid premiums for Marine Island Insurance, Workers' Compensation, Industrial Insurance, and Medical Aid premiums which become an obligation of the Contractor and are
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**1-09.6** MATERIALS

The Owner will refigure actual invoice cost for Contractor-supplied materials. This cost includes actual freight and express charges and taxes as described in Section 105-2 provided that these costs have not been paid in some other manner under the Contract. A deduction will be made for any offered or available discounts or rebates if the Owner has provided the Contractor with the means to comply with the provisions allowing the discount. The Owner will then add 15 percent of the balance to cover project overhead, general company overhead, profit, and any other cost of supplying materials.

To support charges for materials, the Contractor shall provide the Engineer with valid copies of vendor invoices, including freight and express bills. If invoices are not available for materials from the Contractor's stock, the Contractor shall certify actual costs by affidavit. If claims for materials costs are too high, inappropriate, or unsupported by satisfactory evidence, the Engineer may determine the cost for all or part of the materials. When determined in this manner, the cost will be the lowest current with a sale price from a source that can supply the required quantity (including delivery costs). The Owner reserves the right to provide materials.

1-09.6(4) EQUIPMENT

The Engineer shall be required for the selection of machine, power tools or equipment prior to their use.

The payment for machine-power tools or equipment shall be made to the current ACG/WSDOT Equipment Rental Agreement which is in effect at the time the Force Account work is authorized. The rates set forth in the Rental Rate Book (as modified by the current ACG/WSDOT Equipment Rental Agreement) are the maximum rates allowable for equipment of modern design and in good working condition. These rates shall be full compensation for all fuel, oil, lubrication, repairs, maintenance, and all other costs associated with operating and maintaining equipment, except labor for operation.

1-09.6(5) FORCE ACCOUNT MOBILIZATION

For additional work performed as the preparatory work performed by the Contractor including transportation of tools, equipment, and personal travel time when included in a bargaining agreement.

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**1-09.9** PAYMENT FOR MATERIAL ON HAND

Particular payment to the extent of 10% of the invoiced cost of materials excluding taxes, or the unit Bid Item price whichever is less, but not more than $10,000.00 in total will be paid for such materials not yet incorporated into the Work if the materials:

- Are delivered to the project site.
- Are identified in the Contract based upon inspections or testing by the Engineer.
- Are delivered to the project site or are stockpiled at an offsite storage facility approved by the Engineer.
- Are properly measured and protected.
- Are insured against loss or damage.

In addition to the requirements of (i) and (j) above, material delivered to the project site or to an offsite storage facility as permitted in (i) above will be considered for partial payment only if the following additional conditions are met:

- The storage of materials is required for more than 30 calendar days.
- The material stored offsite is segregated from materials for any other project.
- The material is tagged, labeled, or otherwise identified as belonging to the project.
- The cost of transportation to the Project Site is excluded from payment or other provisions acceptable to the Engineer are made with regard to eventual delivery to the Project Site.

The cost of materials on hand will be determined by invoices from a material supplier in sufficient detail to determine the actual cost. The Contractor shall furnish the Engineer an invoice marked "paid" within 60 days of the initial payment by the Engineer for the material on hand. If the paid invoice is not furnished in the prescribed time, and the material has not been incorporated into the Work, a payment that has been made will be deducted from the next progress estimate and the material will not be eligible for future payment as material on hand. Invoices for paid materials or groups of items of materials on hand, amounting to an invoice total of less than $10,000.00 will be paid by the Engineer for partial payments. Payment for sales taxes due on the purchase of such material or equipment will not be made unless said taxes were paid by the Contractor to the material supplier or fabricator for transportation to the site by the material supplier or fabricator and such tax is included on the bill of sale issued by the material supplier or fabricator.

Payment for materials will not constitute acceptance. Final payment will be made upon completion of all construction work. Such payment will be made within 30 days after the last payment is made to cover all equipment costs to cover project overhead, general company overhead, and profit.

1-09.9(6) ACCOUNT MOBILIZATION

For additional work performed as the preparatory work performed by the Contractor including transportation of tools, equipment, and personal travel time when included in a bargaining agreement.

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1-09.9(1) PROGRESS PAYMENTS

Progress payments for completed work and material on hand shall be based upon progress estimates prepared by the Engineer. Each progress payment due date will be established at the preconstruction meeting.

Within 30 days after the progress estimate due date, the Contractor shall submit to the Engineer for review an Application for Payment. Exhibit E and all support documents used in determining the work completed prior to the progress estimate due date for the payment shall be accompanied by documentation supporting the Contractor's Application for Payment. If it is determined that the payment for materials and equipment not incorporated in the Work is requested, the Contractor shall provide the documentation supporting the claim. The Application for Payment shall be accompanied by a bill of sale, invoice, or other documentation warranting that the Contractor has received the materials and equipment, physical evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect the Owner's interest therein.

The initial progress estimate will be made not later than 30 days after the Contractor commences the Work, and successive progress estimates will be made every month thereafter until Acceptance. Progress estimate made during progress of the Work are tentative, and made only for the purpose of determining progress payment. The progress estimates are subject to change at any time prior to Acceptance date.

The value of the progress estimate will be the sum of the following:

(i) Unit Price Items in the Bid Form - the approximate quantity of acceptable units of Work completed multiplied by the Unit Price.
(ii) Lump Sum Items in the Bid Form - the estimated percentage complete multiplied by the Bid Form amount for each Lump Sum Item.
(iii) Materials on hand - 90 percent of invoiced cost of material delivered to Job Site or other storage area approved by the Engineer.
(iv) Change Orders - entitled for approved extra cost or completed extra work as determined by the Engineer.

Progress payments will be made in accordance with the progress estimate less:

(i) Five (5) percent for retained percentage.
(ii) The amount of Progress Payments previously made.
(iii) Funds withheld by the Owner for work in progress in accordance with the Contract Documents.
(iv) Progress payments shall not be evidence of acceptable performance or an admission by the Owner that any work has been satisfactorily completed.

Payments will be made by warrant, issued by the Owner's fiscal officer, against the appropriate fund source for the project.

1-09.9(2) RETAINAGE

Pursuant to RCW 63.08.28 there will be reserved and retained from monies earned by the Contractor on the progress of the Work a sum not to exceed five percent (5%) of the monies earned by the Contractor. Such retainage shall be used as a trust fund for the protection and payment to (i) the State with respect to taxes paid or required to be paid by the Contractor under the RCW 84.40.050, or (ii) to any person or persons, mechanical, subcontractors, or materials suppliers for performance of labor upon such contract or the doing of said Work, and all persons who shall supply such person or persons, or subcontractors or suppliers for carrying on such line.

Monies reserved under provisions of RCW 63.08.28 shall, at the option of the Contractor, be:

(i) Retained in a fund by the Owner until 30 days following Acceptance of the Work; or

(ii) Deposited by the Owner in an interest-bearing account in a bank, mutual savings bank, or savings and loan association, not subject to withdrawal until after Acceptance of the Work or until agreed to by both parties.
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(3) Placed in escrow with a bank or trust company by the Owner for 30 days following Acceptance of the Work. When the demands reserved are to be placed in escrow the Contract will specify which bank or trust company is to be selected by the Owner and the Contractor jointly. Such check shall be converted into bonds and securities chosen by the Contractor and approved by the Owner and the bonds and securities held in escrow.

(4) The Contractor shall designate the option desired on the Agreement Form at the time the Contractor executes the Contract with the City and shall be part of the contract. The Contractor in choosing option (1) or (2) shall agree to assume full responsibility to pay all costs which may accrue from escrow services, brokerage charges or both, and further agrees to assume all risk of loss or damage in connection with the investment of the retained portion in securities.

Release of retained percentage will be made 30 days following Acceptance by the Owner provided the following conditions are met:

(1) Releases have been obtained from the State Department of Labor and Industries, the State of Washington Employment Security Department, and all other departments and agencies having jurisdiction over the activities of the Contractor.

(2) No claims have been filed by the Contractor.

(3) No claims, as provided by law, have been filed against the retained percentage.

(4) Affidavit of Wages Paid is on file with the City Controller for the Contractor and all Subcontractors.

In the event claims are filed the Contractor will be paid such retained percentage less an amount sufficient to pay any such claims together with a sum determined by the Owner sufficient to cover all reasonable costs incurred by the Owner in the enforcement of claims presented.

No wages shall be reduced for any reason below the minimum limit provided by law.

1-09.9(C) OWNERS RIGHT TO WITHHOLD AND WITHHOLD CERTAIN AMOUNTS

In addition to amounts retained pursuant to RCW 60.28, the Contractor has the right to withhold payments due and as described in any amount from any payment to the Contractor of the amount withheld for any reason that the Owner considers necessary to protect the Owner's interest or the work performs.

(1) If the Contractor to submit and obtain approval of a progress schedule.

(2) If the Contractor to remedy defective Work.

(3) Failure of the Contractor to provide for a field officer when required by the Project Manager.

(4) For overtime work performed by Owner personnel.

(5) Lack of construction progress based upon the Owner's judgment.

(6) For work performed the Contractor's employee's performance.

Failure to submit to the Contractor the certifications required by the Governor's Office pursuant to the Long Term Care Act, the Work, or the Contractor's Compliance Program.

Before the Work will be accepted by the Owner, the Contractor must complete the W initialize:88%, Report, in accordance with Section 107.22.

CLOSING, GRUBBING, AND ROADSIDE CLEANSUP

DIVISION 2

EARTHWORK

SECTION 2-01 CLOSING, GRUBBING, AND ROADSIDE CLEANSUP

2-01.1 DESCRIPTION

The Contractor shall close, grub, and clean up those areas affected by the Contractor as described in the Project Manual. This work includes protecting from harm all trees, bushes, shrubs, or other objects selected to remain.

Cleaning work shall consist of removing and disposing of trees, vegetation or other unwarranted materials from the ground surface. Grubbing work shall consist of removing and disposing of such materials from below the ground surface.

Roadside cleanup shall consist of the removal of brush to create a roadside an attractive finished appearance.

2-01.2 DISPOSAL

Unless otherwise specified in the Project Manual, waste sites shall be provided by the Contractor. The Contractor shall dispose of such waste sites in such a manner as to meet the grading, safety and health requirements of the State, county and local seismic, or other causes of such operations, which create a definite nuisance problem, and which result in damage to public or private properties will not be permitted.

Copies of permits for removal and waste sites, and reclamation plans for such permits shall be furnished to the Contractor by the Contractor.

2-01.3 FINAL PAYMENT

Upon Acceptance of the Work by the Owner, the final amount to be paid to the Contractor shall be calculated based upon a Final Progress Estimate made by the Owner. Acceptance by the Owner is hereby made a condition of the Final Payment shall be made as follows:

1. All the Owner's claims and all liabilities of the Contractor other than claims for payment may be specifically excepted in writing by the Owner.

2. All things done or furnished in connection with the Work,

3. Every act and neglect by the Owner; and

4. All other claims and liability relating to or arising out of the Work.

A payment (monthly, final, retainer, or otherwise) shall not release the Contractor or the Contractor's surety of any further obligation required under the terms of the Contract Document or the Contract Final nor shall payment constitute a waiver of the Owner's ability to investigate and act upon all claims presented by the Contractor. The final payment shall be made to the Contractor within 30 days after the date of completion and acceptance by the Owner, as evidenced by the Certificate of Completion.

Waste and borrow sites located outside of the City limits of Seattle shall be approved by the City of Seattle Planning Director. Waste and borrow sites located outside of the City limits of the County of King shall be approved by the King County Planning Director (Ord. No. 198080 as amended by Ord. No. 113553, or as otherwise provided in this Code). Waste and borrow sites located within the City limits of Seattle shall be approved by the City of Seattle Planning Director (Ord. No. 113553, or as otherwise provided in this Code). Waste and borrow sites located within the City limits of King County shall be approved by the King County Planning Director (Ord. No. 113553). Waste and borrow sites located outside of the City limits of Seattle shall be approved by the City of Seattle Planning Director (Ord. No. 198080 as amended by Ord. No. 113553, or as otherwise provided in this Code).

Surplus material shall not be stored on the site, except as required for the public rights Project Manual, as authorized by the Director of the Planning Director, or if within the City limits of Seattle, a street use permit issued by the Director of Engineering.

Upon completion of the work and before final acceptance and payment, the Contractor shall clean up all properties and sites on which the Contractor has constructed any materials with the property owner. The Contractor shall perform all operations necessary to put the site in a neat, clean, and orderly condition. Final cleanup shall be in accordance with the requirements specified in the General Cost Reports and any other agreements and other agreements. Upon completion of grading operations on any site for which a written agreement between the Contractor and property owner is required, the Contractor shall obtain and furnish to the Engineer a release from all damages, fully executed by the property owner, stating that the restoration of the property has been satisfactorily accomplished. By recording the release by the Contractor's payment shall not be released until all such property owner releases have been furnished to the Contractor. The release be, in the opinion of the Owner, arbitrarily withheld, then the Owner may, in its sole discretion, accept that portion of the work involved and cause final payment to be made.

2-01.3 CONSTRUCTION REQUIREMENTS

2-01.3(C) CLEARING

Clearing shall consist of removing and disposing of all unwarranted material from the surface including, but not limited to, trees, brush, down timbered and rooted wood, rubbish, etc.; removing building debris, fences, and other obstructions interfering with the work when removal and disposal of such surface obstructions are not specifically provided for in Section 2-01; and protecting all trees, bushes, shrubs, or other existing improvement which are to remain. Only those trees marked for removal on the Drawings or designated by the Owner shall be removed. The Contractor shall be responsible for clearing, removing, and disposing of all trees, bushes, shrubs, or other existing improvements which are to remain. Only those trees marked for removal on the Drawings or designated by the Owner shall be removed. The Contractor shall be responsible for clearing, removing, and disposing of all trees, bushes, shrubs, or other existing improvements which are to remain. Only those trees marked for removal on the Drawings or designated by the Owner shall be removed.
CLEARING, GRUBBING, AND ROADSIDE CLEANUP

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2-01.3(3) LIMITS OF CLEARING AND GRUBBING

The limits of clearing and grubbing shall be as indicated on the Drawings or in the Project Manual.

2-01.3(4) ROADSIDE CLEANUP

Every time a road is to be entered by the Engineer and immediately after completion of the work, the Contractor shall clean up and remove all refuse and unused materials of any kind resulting from the work. Upon failure to do so within 24 hours after request by the Engineer, the work may be done by the Owner and the cost thereof be charged to the Contractor and deducted from the Contractor’s final estimate.

All cleaning shall be performed as specified in the various Sections of this Specification.

2-01.3(5) PROTECTION OF EXISTING IMPROVEMENTS

Existing utilities and structures, driveways and other landscape items designated to remain, shall be protected from damage as specified in Section 140.36 and 140.17.

2-01.4 MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured as provided in Section 140.1 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein this Section.

2-01.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 2-01.5 will be made at the unit contract prices bid only for the pay item listed or referenced below.

(a) "Cubing," per square foot.
(b) "Grubbing," per square foot.
(c) "Clearing and Grubbing," per square foot.

The unit contract price for "clearing," "Grubbing," or "Clearing and Grubbing," shall not be included to pay item pertaining to the work of "Clearing," "Grubbing," or "Clearing and Grubbing," which shall be itemized and specified as incidental to the construction of the project and all costs incurred by the Contractor shall be included in the prices bid for other items of the construction.

Roadside cleanup shall be considered as incidental to the construction of the project.

All costs and expenses incurred in securing, operating and maintaining any waste or borrow area, including cleaning up such areas, and any erosion or anti-pollution controls required in the permit, property owner agreements, grading agreements, and other contract documents will be considered as incidental to the work. The work also includes the blocking of trenches, holes, or pits that result from such removal.

SECTION 2-02 REMOVAL OF STRUCTURES AND OBSTRUCTIONS

2-02.1 DESCRIPTION

This work shall consist of removing and disposing of, as described, materials named in the Project Manual or identified by the Engineer. The work also includes the building of bridges, culverts, and other drainage structures.

2-02.2 REMOVAL OF BRIDGES, BOX CULVERTS AND OTHER DRAINAGE STRUCTURES

In subsection any removal of a structure bridge that will remain on the property of the Owner, the Contractor shall prevent unnecessary damage to the material. Steel members shall be match-marked.

REMOVAL OF STRUCTURES AND OBSTRUCTIONS

2-02

2-02.3(3) REMOVAL OF EXISTING STREET IMPROVEMENTS

2-02.3(3A) REMOVE NON-RIGID PAVEMENT AND UNTRATATED ROADWAY SURFACES

Non-rigid pavements shall be streets, driveways, alleys, sidewalks or other surfaces constructed from a bituminous mix, or any combination of bituminous mixes or surface treatments, upon an earth or granular base. Unbecteded roadway surfaces shall be soil, crushed rock, and gravel surfaces. Unbecteded roadway surfaces shall not be considered pavement.

Removal of non-rigid pavements and untreated roadway surfaces shall be considered part of the work of excavation.

Removal shall be to the side line trench width with the following exceptions:

(a) Open cuts which straddle the edge of roadway shall be removed to the side line or 2 feet from the edge of roadway, whichever is greater.

(b) Removal to be the edge of roadway if the strip remaining between the edge of roadway and side line is less than 2 feet in width.

Non-rigid pavements shall be great prior to removal by use of an asphalt cutting wheel, saw cutting, or line driling of the Contractor’s option to ensure a neat straight line. Cutting shall be completely through the non-rigid pavement.

If the Contractor’s cutting equipment causes damage beyond the cut line, the Contractor shall make good the damages and payment of asphalt shall be to the width as directed by the Engineer.

2-02.3(3B) REMOVE ASPHALT OVERLAY

When removing an asphalt overlay from a rigid base pavement the Contractor shall use methods and equipment that will not structurally damage the existing rigid base. The method and equipment shall be subject to the Engineer’s approval.

2-02.3(3C) REMOVE RIGID PAVEMENT

Right of ways are present in streets, alley, and other rigid roads greater than 4 inches in thickness, constructed from concrete, brick, tile overlays, or any combinations of these materials, with or without an asphalt overlay.

Right of way removal shall be removed to the maximum pay widths shown on Standard Plan No. 40-A, or beyond, subject to the following requirements:

(a) Pavement shall be removed to any longitudinal joint, crack, or edge of pavement that is less than 5 feet from the existing structure bridge.

(b) Pavement shall be removed to any transverse joint or crack that is less than 5 feet from the existing structure bridge.

Minimum restoration shall be full panel replacement if one or more of the following conditions exist:

(i) On any panel less than 3 years old.

(ii) On any panel where the cut removes or requires removal of more than half of the panel.

(iii) On any panel in a street that is a part of the General Business District or on any principal arterial where the cut requires the removal of more than 5 feet of the existing structure bridge.

(iv) Areas of asphalt pavement over rigid base, the following requirements shall apply:

(i) No joints or cracks show through the asphalt paving, then all of the requirements extending pavement removal beyond next line shall apply.

(ii) If no joints or cracks are visible, or their location cannot be determined, no additional removal beyond the trench side line area will be required.

(iii) The existing asphalt surfacing, showing the trench line or cut shall be "striped back" a minimum of 4 inches to completely expose the rigid base.

After removal and before restoration, the Contractor shall trim the edges of the remaining pavement leaving clean vertical edges.

Rigid pavement shall be line drilled full depth or saw cut at the Contractor’s option, except when sawing is specifically required on the Drawings. No sawing or line drilling is required where pavement removal extends to a full depth joint or crack.

After line drilling or saw cutting the pavement, the Contractor shall not proceed with pavement removal until he has demonstrated to the satisfaction of the Engineer, the method he will use to break and remove the concrete pavement shall not damage the existing utilities, pavement that is to remain in place. A backhoe may be used to remove broken concrete only after the concrete portion that is to be removed is clearly broken away from the pavement that is to remain in place.

Use of a "hammer ball" to break concrete pavement will not be permitted.

2-02.3(3D) REMOVE CATCH BASIN, SANDBOX, VALVE, CHAMBER, MANHOLE, OR DRAINAGE STRUCTURE

The Contractor shall excavate and completely remove the structure including casing and outlet trap, concrete base, and all other masonry, as applicable to each removal item listed in the Bid Form.

Connecting pipes shall be plugged by filling with Cast 5 (C/4) concrete for a minimum length of 12 inches. Backfill shall be with select material in accordance with Type 17, or other material aggregate as designated by the Engineer.

Backfill material shall be compacted to meet the requirements of Section 717.32(B).

2-02.3(3E) REMOVE CURB, CURB AND GUTTER

Curb removal shall be classified as Class A or Class B. Class A is removal by cutting the curb horizontally and preserves the curb base and asphalt below the curb. Class B is removal of the curb by removal of the curb base vertically at the face of the curb and removing the curb with the base material.

The removal of curbs shall be completed by the Contractor. Removal of curbs placed on top of rigid pavement or base shall be Class A, and removal of curb base and asphalt shall be Class B. Removal of curbs for construction of curb ramps, driveways, and isolated curb and sidewalk shall be Class B irrespective of the type of curb to be removed.

Curb shall be sawed at the next line limits of removal, or removed to the nearest joint at the Engineer’s option.
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2-02.30(6) REMOVE SIDEWALK
For removal purposes, all concrete slabs that average 4 inches or less in thickness shall be considered as sidewalk removal.

Cement concrete sidewalk shall be removed by using a concrete cutter and removing the entire width of the sidewalk, up to and including the curb line. No sidewalk shall be removed except to the line of the original sidewalk.

2-02.30(7) REMOVAL OF STRUCTURES AND OBSTRUCTIONS
For concrete pavement, the surface of the concrete shall match the grade of the existing pavement and shall be flush with it.

2-02.30(8) ABANDON AND FILL PIPE
Pipes designated on the Drawings to be filled and abandoned shall be filled with material as specified in the Project Manual. At each end of the pipe, the pipe shall be plugged with Class 5 Q-00 concrete for a minimum length of 12 inches.

2-02.30(9) SAWING AND LINE DRILLING
When sawing rigid pavement, driveway, or sidewalk, the depth of saw cut shall be 2 inches or half the depth of pavement, driveway, or sidewalk, whichever is greater. All sawed decorative or special pavement (e.g., brick, cobblestone, pebble block, etc.) shall be sawed full depth along a neat line with intent of salvaging as many units as possible.

2-02.30(10) ASPHALT
Asphalt shall be sawed full depth. When sawing, spacing of drilled holes center to center shall be 6 inches maximum. Holes shall be perpendicular to the surface and shall penetrate completely through the pavement.

2-02.30(11) SALVAGE
When the Drawings indicate that the Engineer requires evaporating pavement which comprises rigid base and asphalt overlay, the minimum sawed-depth for the rigid base shall be as follows:

(a) For concrete rigid base, the depth shall be 2 inches or half the thickness of the rigid base whichever is greater, and
(b) For rigid base constructed with mastic decorative or special pavement (e.g., brick, cobblestone, pebble block, etc.) or any combination of such materials the depth shall be half the thickness of the rigid base along a neat line with intent to salvaging as many special pavement units as possible.

2-02.30(12) GENERAL
Unless otherwise indicated, all materials of recoverable value which are alle, devises or otherwise on the project, and which in the opinion of the Engineer are suitable for salvage, shall be removed, cleaned, sorted and salvaged and shall be delivered to the location designated by the Engineer. The Contractor shall become the property of the Engineer and shall be disposed of as he deems fit.

All castings and all other materials removed from the existing utilities which are not to be reused on the project, and which in the opinion of the Engineer are suitable for salvage, shall be removed, cleaned, sorted and salvaged and shall be delivered to the location designated by the Engineer.

2-02.30(13) WATER MAINS AND APPURTENANCES
The pipe shall not be damaged or removed except for salvageable as specified in the Bid Form. All utilities shall be carefully salvaged and delivered to the Owner in good condition and in such order of salvage as the Engineer may direct. Materials and things deemed of no value by the Engineer shall be removed by the Contractor and become his property to be disposed of as he deems fit.

All castings and all other materials removed from the existing utilities which are not to be reused on the project, and which in the opinion of the Engineer are suitable for salvage, shall be removed, cleaned, sorted and salvaged and shall be delivered to the location designated by the Engineer.

2-02.30(14) STREET SADDLES AND STEEL PLATES
Saddle board shall be made of 4-inch roughcut, construction grade lumber with a 2 x 6 frame. Saddle iron flanges shall be 8 inches wide x 8 inches long. They shall be made of 1⁄4 inch thick plate steel and shall be screwed together. The support iron shall be of adequate size so that there is no significant deflection with traffic. At any time the saddle iron flanges do not lie flat on the roadway surface, shoes shall be used. Saddle boards and irons may be held together providing the kit equipment is provided by the Seattle Engineering Department for their removal. Saddle boards shall be held in place when not in use by bolts and straps. Saddle boards shall be held in place by straps when not in use by bolts and straps. Saddles and bolts shall be used on all streets which have a concrete or other surface which can safely support them.

2-02.30(15) ILLUMINATION, SIGNALS, AND ELECTRICAL
Electrical and traffic items to be salvaged shall include the following:

(a) High pressure sodium luminaires, lamps and photo cells,
(b) Aluminium lighting poles,
(c) Aluminium lighting poles.
(d) Traffic poles, including joint lighting and traffic poles.
(e) Masts,
(f) Pedestals,
(g) Traffic signal controller assemblies and cabinets,
(h) Signal heads,
(i) Bollards,
(j) Handrails,
(k) Intersection and Terminal boxes,
(l) Traffic signs, signals, etc.,
(m) Miscellaneous signal appearance items.

Items (a) through (m) shall be delivered to the Contractor to City Light South Service Center at 4th Avenue South and South Spokane Street. Call 286-1700 prior to delivery of wood pole, 286-1704 prior to delivery of metal poles, high pressure sodium luminaires, lamps, photo cells, and aluminum bracket arm.

Items (a) through (g) shall be returned to Seattle Engineering Department Traffic Shops at 1010 8th Avenue. Call 286-1700 prior to delivery.

2-02.30(16) BIDS FOR COMPLETE CONSTRUCTION
Bid items of work completed pursuant to Contract Documents shall be measured as provided in Section 14.01 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein this Section. Measurement for saw cutting will be by the linear foot along the slope of the surface cut. During excavation, measurement for removal and sawing of street improvements will be based on the Formulas and measurements listed on Standard Plan No. 404A modified by the extended limits provided for in Section 2-02.30(17), and any limits designated by the Engineer.

Abandon pipe will not be measured. Measurement for "Abandon and Fill Pipe" shall be by the linear foot along the linear feet designated in the Project Manual. Measurement for "Bench Marking" and "Remove Thermoset Striping" will be by the actual linear feet of pavement marked removing the striping.

2-02.5 PAYMENT
Compensation for the cost necessary to complete the work described in Section 242 will be made at the unit contract prices bid only for the pay items listed or referenced below:

(1) "Remove Item," per square yard.
(2) "Remove Item," per linear foot.
(3) "Remove Item," per each.
(4) "Remove Item," per each.
(5) "Saw Concrete, 2 Inch Minimum Depth," per linear foot.
(7) "Abandon Item," per each.
(8) "Abandon and Fill Pipe," per linear foot.
(9) "Removal of Structures and Obstructions," per linear foot.

The unit contract price for "Remove Item," shall include all costs for the removal and disposal of the item or of salvaging the item as applicable.

Removal of items not listed in the Bid Form shall be considered as incidental to the construction, and the costs thereof shall be included in the various items comprising the improvement. Removal of non-rigid pavement over granular base will be measured and paid as "Common Excavation" in accordance with Section 3-02, with the following exceptions:

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ROADWAY EXCAVATION AND EMBEWARDMENT

2-03

2.03.3(1) WIDENING OF CUTS

If routine cuts do not supply enough material to form the embankments described in 2.03.3(1), the Contractor shall obtain more fill from cuts inside or outside the right of way as the Engineer may direct or from existing embankments or existing cuts staked by the Engineer.

In either case, the Contractor shall dress the sides of the cuts to pay slopes the Engineer may require.

2.03.3(2) ROCK CUTS

(a) Preserving rock below subgrade. The Contractor shall take care not to break down, loosen, or damage the rock under the subgrade line. Normally, cuts will be made from the top, left by lift, to protect the rock beneath. Where it will not be possible to do this, the Contractor shall be responsible for methods used and any damage caused to the roadway, and he shall obtain any necessary approvals by the Engineer.

(b) Drilling and dynamiting. To leave rock cuts in a safe, stable condition, the Contractor shall scale and dress them, removing all loose fragments and rocks not firmly wedged to the rock slope. The Contractor shall also remove any overhanging rock the Engineer may consider a hazard to roadway users.

If the Engineer requires it, the Contractor shall remove loose fragments and rocks lying outside the slope stakes. Payment for such work shall be by force account as provided in Section 1081. The Owner will pay for loading and hauling these materials at the unit contract prices that apply as so provided in Section 1046.

(c) Controlled blasting. Not less than 21 days before the Contractor submits and obtains the approval of the Engineer for a blasting plan outlining how drilling, loading, and shooting will be done.

Sec Section 107.2 Use of Explosives for additional requirements.

When blasting to establish slopes 1/2 to 1 or steeper, and more than 10 feet high, the Contractor shall use controlled blasting. The Engineer may require the Contractor to use controlled blasting to form the faces of slopes, even on cuts steeper than 1/2, provided the slopes could be formed by blasting methods.

Controlled blasting techniques covered by this specification include premixing and compass blasting. Other controlled blasting techniques may be used. The Contractor shall not be limited to the specifications for even the specified techniques.

In addition to the requirements of Section 107.16 and 1-17 the Contractor shall insure that mineral aggregates, rock, and materials from roadway excavation are prevented from entering existing manholes. Markers shall be placed in the vicinity of roadway structures at or adjacent to the Erickson buildings, for any materials that are not subject to inspection by the Engineer and for any materials that are subject to inspection by the Engineer.

The Engineer shall submit to the Contractor a proposal for the inspection and payment for roadway excavation and grading operations. The within 24 hours thereafter, any material which has been accepted for inspection for which the Engineer shall be removed. Removal shall be such that no debris or material falls into the construction.

2.03.2 VACANT

2.03.3 CONSTRUCTION REQUIREMENTS

2.03.3(1) GENERAL

This workman's surveyor's data sheets for all explosives, primes, and initiators, firing system and blasting machine to be employed.

(d) Removal of any overhanging rock the Engineer may consider a hazard to roadway users.

(e) If the Engineer requires it, the Contractor shall remove loose fragments and rocks lying outside the slope stakes. Payment for such work shall be by force account as provided in Section 1081. The Owner will pay for loading and hauling these materials at the unit contract prices that apply as so provided in Section 1046.

(f) Controlled blasting. Not less than 21 days before the Contractor submits and obtains the approval of the Engineer for a blasting plan outlining how drilling, loading, and shooting will be done.

Sec Section 107.2 Use of Explosives for additional requirements.

When blasting to establish slopes 1/2 to 1 or steeper, and more than 10 feet high, the Contractor shall use controlled blasting. The Engineer may require the Contractor to use controlled blasting to form the faces of slopes, even on cuts steeper than 1/2, provided the slopes could be formed by blasting methods.

Controlled blasting techniques covered by this specification include premixing and compass blasting. Other controlled blasting techniques may be used. The Contractor shall not be limited to the specifications for even the specified techniques.

In addition to the requirements of Section 107.16 and 1-17 the Contractor shall insure that mineral aggregates, rock, and materials from roadway excavation are prevented from entering existing manholes. Markers shall be placed in the vicinity of roadway structures at or adjacent to the Erickson buildings, for any materials that are not subject to inspection by the Engineer and for any materials that are subject to inspection by the Engineer. The Contractor shall submit to the Contractor a proposal for the inspection and payment for roadway excavation and grading operations. The within 24 hours thereafter, any material which has been accepted for inspection for which the Engineer shall be removed. Removal shall be such that no debris or material falls into the construction.
(8) Any necessary vibration monitoring device(s) with latest site-specific report. Method of anchoring devices and exact location(s) at blast site.

Review and signatures of the Engineer shall not relieve the Contractor of the responsibility for the accuracy and completeness of the data or for the implementation of the data. When using blast controls the Contractor shall:

(1) Prior to commencing full-scale blasting operations, the Contractor shall demonstrate the adequacy of the proposed blast plan by drilling, blasting, and excavating short test sections, up to 100 feet in length, to determine whether combination of method, hole spacing, and charge works best. When field conditions warrant, the Contractor may be ordered to use test section lengths less than 100 feet.

(2) Unless otherwise approved by the Engineer, the Contractor shall begin the tests with the controlled blast holes spaced 30 inches apart, then adjust, if needed, until the Engineer approves the spacing to be used for full-scale blasting operations.

(3) The Contractor shall completely remove all vegetation and loose or decomposed rock along the top of the excavation for a distance of at least 3 feet beyond the end of the production hole drilling limits, or to the end of the cut, before drilling the preplanning holes.

(4) The controlled blast holes shall be no less than 2 1/2 inches nor more than 3 inches in diameter.

(5) The Contractor shall control drilling operations by the use of the proper equipment and techniques to ensure that no hole shall deviate from the plane of the planned slope by more than 9 inches either parallel or normal to the slope. Drill holes exceeding these limits shall not be paid for unless satisfactory slopes are being obtained.

(6) Controlled blast holes shall be drilled a maximum of 20 feet beyond the limits of the production holes to be drilled and charged, or to the end of the cut as applicable.

(7) The length of controlled blast holes for any individual lift shall be limited to 20 feet unless the Contractor can demonstrate to the Engineer the ability to stay within the above limitations and provide a uniform slope. If greater than 5 percent of the planned holes are inclined in any one lift, the Contractor shall provide the location of the lift and the fact that an inclined hole will exceed the 9-inch tolerance. Upon satisfaction of the Engineer, the length of holes may be increased to a maximum of 60 feet with written approval of the Engineer.

(8) Controlled blast holes shall be drilled at a maximum of 20 feet unless the Contractor can demonstrate to the Engineer the ability to stay within the above limitations and provide a uniform slope. If greater than 5 percent of the planned holes are inclined in any one lift, the Contractor shall provide the location of the lift and the fact that an inclined hole will exceed the 9-inch tolerance. Upon satisfaction of the Engineer, the length of holes may be increased to a maximum of 60 feet with written approval of the Engineer.

(9) When the cut height requires more than one lift, a maximum of 30 feet will be permitted to allow for drill equipment clearance. The Contractor shall provide the proper equipment for the task and sufficient personnel to drill the required number of blast holes before the end of the day.

(10) The maximum diameter of explosives used in preplanning holes shall not be greater than 2 1/2 inches of the diameter of the drill hole.

(11) Only standard explosives manufactured especially for blast control shall be used for controlled blast holes, unless otherwise approved by the Engineer. Bulk explosives shall not be used for controlled blast holes.

(12) Only standard explosives manufactured especially for blast control shall be used in controlled blast holes, unless otherwise approved by the Engineer. Bulk explosives shall not be used in controlled blast holes.

(13) Standard explosive cartridges are used, they shall be fired immediately after detonation.
ROADWAY ERECTION AND EMBANKMENT

2-03.1.4C EARTH EMBANKMENT CONSTRUCTION

The Contractor shall place earth embankments in horizontal layers of uniform thickness. These layers shall run full width of the embankment and the thickness of the embankment shall be compacted to the required density as part of embankment compaction.

During grading operations, the Contractor shall shape the surfaces of embankments and excavations to uniform cross-sections and eliminate all cuts and low places that could hold water.

On a tangent, the Contractor shall raise the center of the embankment above the side. On a sidehill, the high point of any layer shall intersect the original ground and shall slope uniformly toward the lower side. This slope shall not exceed 1 in 20 feet.

2-03.1.4D COMPACTING EARTH EMBANKMENTS

This section describes three methods (A, B, and C) for building embankments. The Contractor shall use Method B unless the Project Manual requires another method.

Method A. Each embankment shall be made of layers no more than 2 feet thick. The Contractor shall compact each layer by rolling loaded haul equipment over its entire width. If the Engineer approves, the Contractor may use end dumping to begin placing a sidehill fill too narrow for hauling equipment. When the fill is wide enough, the remaining layers shall be compacted by the loaded haulage equipment.

Method B. The top 2 feet of each embankment shall be compacted to 95 percent of the maximum density as determined by the compaction control tests described in Section 2-03.1.4E. All materials below the top 2 feet shall be compacted to the percent of the same maximum density.

In the top 2 feet, horizontal layers shall not exceed 4 inches in depth before compaction. The Contractor shall use compaction equipment approved by the Engineer.

Method C. Each layer of the entire embankment shall be compacted to 95 percent of the maximum density as determined by the compaction control tests described in Section 2-03.1.4E. All materials below the top 2 feet shall not exceed 4 inches in depth before compaction. No layer below the top 2 feet shall exceed 8 inches in depth before compaction.

Laboratory densities may be determined by one of the following methods:

(a) ASTM D1556, Test for Density of Soil by Hydrometer

(b) ASTM D2217, Test for Density of Soil by Hydrometer

(c) ASTM E2992, Test for Density of Soil by Hydrometer

Laboratory densities may be determined by one of the following methods:

(a) ASTM D3243, Moisture-Density Relation of Soils and Soil Aggregate Mixtures

(b) ASTM D4283, Minimum and Maximum Index Density of Soils using a Vibratory Table

(c) ASTM D698 will be used for computing the maximum density of all fill soils except for those granular soils yielding to a shear failure of the optimum of the Engineer, an undrained moisture-density curve. In that case, moisture-density curve will be determined by the method specified in ASTM D4283.

(d) The Contractor shall place embankment fill to the density sampling at locations designated by the Engineer. Density sampling will be performed by Owner's engineer.

Degree of compaction in trench backfill shall be specified. Additional information on compaction methods is given in Section 2-12.4D. All other fill and earth embankments shall be specified in Section 2-03.1.4E.

2-03.1.4E FOUNDATION ERECTION

When the Contractor or the Engineer requires it, the Contractor shall excavate the material beneath the embankment so as to cause the embankment to rest on a stable foundation. The Contractor shall excavate and compact such material to a depth determined by the Engineer.
The work shall not be considered unsuitable foundation excavation, if:

(a) Came from the roadway cut, ditch, or channel change or of size 50 cubic yards or less as required by Section 203.1302.
(b) Resulted from structure excavation.
(c) Resulted from the operation of the roadway.

Materials excavated from the roadway or channel change prism will not be classified as unsuitable foundation excavation as defined in Section 203.1302 unless the removal is accomplished by discharge operation or by special excavation methods requiring different equipment from that used for roadway excavation, as determined by the Engineer.

2-03.3.14.6 DISPLACEMENT OF UNCONSOLIDATED FOUNDATION MATERIALS

If the Contractor requires it, the Contractor shall displace or remove any overburden of peat, muck, or other unsuitable material to permit the embankment on underlying firm ground. The Engineer will determine the direction at which the ground is firm enough to support the embankment.

To displace such material, the Contractor shall use explosives or any other method the Engineer requires. If this work upheaves overburden material outside the slopes of the new fill, the Contractor shall level the material to make it presentable.

2-03.3.14.7 BACKFILLING

When water fills an area after the removal of soil or unsuitable material, the Contractor shall, if possible, drain the site so that it may compact any backfill. If drainage is not possible, the Contractor shall use granular material for backfilling in water-filled areas where blasting has displaced the soft material. The Project Manual may require other backfilling methods.

2-03.3.14.8 PREPARED VERTICAL DRAINS

If the Contractor is required to install prefabricated vertical drains and a sand drainage blanket to stabilize the soft soil or unsuitable material that overlays firm ground.

The Contractor shall furnish all necessary labor, equipment, and materials to place a satisfactory installation in accordance with these Specifications. For this purpose, the Contractor shall install prefabricated vertical drains at different locations within the area.

At least 12 weeks prior to the installation of the drainage works, the Contractor shall submit to the Engineer, for review and approval, a detailed description of the proposed operations necessary for the installation of prefabricated vertical drains in accordance with the Specifications.

The drain blanket shall consist of a continuous plastic drainage core wrapped in a non-woven geotextile material as specified in the Specifications.

The materials shall be free of defects, rips, holes, or flaws. During installation and storage, the drain shall be wrapped in a heavy-duty protective covering. The storage area shall protect the drain material from rain, snow, frost, dirt, debris, and detrimental substances. Manufacturer certifications shall be provided for the drain material delivered to the project.

2-03.3.14.9 EMBANKMENTS AT BRIDGE AND TRESTLE ENDS

The work shall consist of embankment along the ends of bridges and approaches, the area defined in Section 140.3. The Contractor shall construct embankments in a manner as required by the engineer for each bridge or culvert as completed or when the Engineer directs.

The Contractor shall select fill material from an excavation source adjacent to the embankment, and all embankments shall be compacted to at least 95 percent of the maximum density by the loose material obtained by the area described in Section 203.1301. Any embankment area where fill will be placed, the Contractor shall remove all solid material, rocks, boulders, concrete, etc., larger than 3 inches across that would not compact with directional compaction.

To prevent the embankment from being disturbed or displaced, the Contractor shall place several inches of sand around and adjacent to the embankment structure. This extra material will provide sufficient strength to prevent the soil from entering the bottom during installation and shall anchor the bottom of the drain at the required depth when the embankment is removed. The use of falling weight impact hammers or jetting will not be allowed without the approval of the Engineer.

2-03.3.14(10) STEPPED SLOPE CONSTRUCTION

When the Drawings or the Engineer requires it, the Contractor shall construct stepped slopes in cut to a stepped pattern concerning a radius to the sloped face. The approximate midpoint of each horizontal tread shall occur on the straightened line.

(c) The treads shall be approximately level in all directions.
(d) The ends of the treads shall be blended into the natural ground, with loose material removed from transitional areas.
(e) If the Contractor cannot rip a rock outcrop within a total of 5 feet, the step shall be blended into the face of the embankment.
(f) Large rocks and material that may fall into the ditch line or onto the roadway shall be removed, but scaling is not required.

The compaction and seeding requirements of Section 9-03.3.130 shall not apply to stepped slope construction.

The Owner will measure stepped slope excavation by the area defined by the stepped slope face. The unit contract price per cubic yard for roadway or borrow excavation will be full pay for all labor and equipment required to build stepped slopes.

2-03.3.4 MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured and paid for as provided in Section 140.1 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein this Section.

Excavation of the class specified will be measured by the cubic yard in its original place. Quantities will be computed to the nearest line of the cross sections as staked or thereafter modified by the Engineer, except where such modification is the result of excavating beyond the limits established to remove and replace roadway material which has become unsuitable because of the Contractor’s use of improper design or control operation. Borrow will be measured by the ton at the point of delivery in accordance with Section 140.1.

Unsuitable foundation excavation will be measured by the cubic yard in its original place. Prefabricated vertical drains will be measured by the linear foot from the top of the working table to the bottom of the holes.

Sand borrow for drainage blanket will be measured by the cubic yard or by the ton as indicated in the Bid Form, provided that motorizes in excess of 5 percent will be deducted in ascertaining the net quantities when measured by the ton.

Embarkment construction will be measured by the cubic yard of embankment material compacted pursuant to Section 220.1 Method B in Section 220.103. Quantities will be computed based upon measurements taken to the face lines of the stabilized cross section and no allowance will be made for settlement.

Work measuring less than 10 cubic yards of scarping, scalping, and compacting, measurement for the embankment completion will be based upon the length and width of the cut section compacted and a maximum depth of 6 inches.
ROADWAY EXCAVATION AND EMBANKMENT

SECTION 2-03

2-03.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 2-03 will be made at the unit contract price for the pay items listed and referenced below:

(1) "Common Excavation," per cubic yard.
(2) "Ditch Excavation," per linear foot.
(3) "Unclassified Borrow," per use.
(4) "Unclassified Embankment," per cubic yard.
(5) "Unclassified Foundation Excavation," per cubic yard.
(6) "Drain, Vertical, band," per vertical foot.
(7) "Drainage Blanket, sand," per ton or per cubic yard.

The unit contract price for "Common Excavation" and "Solid Rock Excavation" shall include the costs for all work described in Section 2-03 and not otherwise provided for herein. When excavation below the designated subgrade elevation is ordered by the Engineer, that portion of the excavation 3 ft or less below subgrade will be considered as "Common Excavation." If the Engineer orders excavation more than 3 ft below subgrade that portion below subgrade will be paid as extra work per Section 1-04.4. Payment for such types and classes of excavation listed above shall be full compensation for excavating, loading, hauling, stockpiling, placing as backfill, or otherwise disposing of the material as shown on the Drawings, as specified herein, or as directed by the Engineer.

Excavation or embankment work required to bring the subgrade in sidealk areas to the level of the top of the sidewalk will be paid as per Section 2-02.4. Excavation of the subgrade to the depth of the sidewalk will be paid per Section 1-04.4.

Where earthwork is required and a bid item is not provided in the Bid Form, all costs for excavation shall be included in the price of the various bid items shown in the Bid Form.

Where solid rock is encountered on a project for which a price has been quoted as "Solid Rock Excavation," and such rock is included in the Bid Form, then the work and materials involved in the excavation of such rock shall be considered as Extra Work and be paid for in accordance with Section 1-04.4. Payment for such rock excavation shall be paid as per Section 2-03.5.3 or 2-03.5.4 as directed.

"Unclassified Borrow" or "Borrow Type" shall include all costs required to excavate, load, haul, and stockpile, and place as backfill, or otherwise dispose of the material as shown on the Drawings, as directed by the Engineer. Compaction of borrow material shall be paid as per the "Embankment Compaction".

The unit contract price for "Embankment Compaction" shall include all costs for the work necessary to compact embankments per Section 2-03.5.6 and earth embankments made of clay per Section 2-03.5.16. Cost related to work described in Section 2-03.5.15 shall be paid for in accordance with Section 1-04.4. Cost related to all work described in Section 2-03.5.15 shall be considered as Extra Work and be paid for in accordance with Section 1-04.4.

Borrow Type shall be paid as per Section 2-03.5.3 or 2-03.5.4 as directed.

Excavation or embankment work required to bring the subgrade in sidealk areas to the level of the top of the sidewalk will be paid as per Section 2-02.4. Excavation of the subgrade to the depth of the sidewalk will be paid per Section 1-04.4.

If the Bid Form does not include a bid item for subgrade excavation, the owner will pay as per Section 1-04.4.

All costs for building terraces as specified in Section 2-03.5.16 shall be included in the prices for other work.

All costs and expenses involved in drying embankment materials with whatever method is appropriate shall be considered incidental to the various unit contract prices.

The costs of pumping or digging temporary drainage ditches as required per Section 2-03.4.11 shall be incidental to and not included in other items of work that are paid for.

Cost related to all work described in Section 2-03.5.15 shall be incidental to and not included in the unit contract prices. All work shall be done in accordance with the Contract Documents.

All costs and expenses involved in drying embankment materials shall be paid for as per Section 1-04.4.

When excavated material unexpectedly falls short of the amount required to complete an embankment the City will pay for the roadway excavation contract price for the volume required to complete the embankment. However, no payment will be made if it is determined that the material is suitable for the embankment.

When excavated material unexpectedly falls short of the amount required to complete an embankment the City will pay for the roadway excavation contract price for the volume required to complete the embankment. However, no payment will be made if it is determined that the material is suitable for the embankment.

Borrow Type shall be paid as per Section 2-03.5.3 or 2-03.5.4 as directed.

Borrow Type shall be paid as per Section 2-03.5.3 or 2-03.5.4 as directed.

Embankment work shall be considered as Extra Work and be paid for in accordance with Section 1-04.4. Cost related to all work described in Section 2-03.5.15 shall be considered as Extra Work and be paid for in accordance with Section 1-04.4.

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Embankment work shall be considered as Extra Work and be paid for in accordance with Section 1-04.4. Cost related to all work described in Section 2-03.5.15 shall be considered as Extra Work and be paid for in accordance with Section 1-04.4.
ROCK FACING

Subgrade stabilization by Method B in Section 206.3(2) will be paid at an additional cost equal to the excavation area grade, in accordance with Section 204.1.

Subgrade stabilization by Method A in Section 206.3(2) will be paid at an additional cost equal to the excavation area grade, in accordance with Section 204.1.

2.07.1 DESCRIPTION

This work shall consist of furnishing, placing, and compacting water for compacting embankments, constructing subgrade, placing of crushed surfacing, dust control, testing and as the Engineer requires.

2.07.2 VACANT

2.07.3 CONSTRUCTION REQUIREMENTS

2.07.3(1) GENERAL

The Contractor shall apply water upon streets by means of tank trucks equipped with spray bars. Spray controls shall ensure that the water lines are steady and in the amounts required by the Engineer. The Engineer may direct that the Contractor apply water at night or early in the morning to reduce pollution hazards.

Where hauled water is required, the tank truck and/or trailer shall meet all safety and licensing regulations and shall be provided with a pump of such size and capacity as to provide for a discharge equivalent to that required for hydraulic settling tanks.

Where the source of water is hydraulics within the work area, the Contractor may, with the approval of the Engineer, apply water by means of a hose and double check valve directly connected to the hydrant. The hose shall be equipped with a hydrant outlet, and the tank truck necessary to do the required watering, and strictly comply with the provisions of the permit.

2.07.3(2) SOURCE OF WATER SUPPLY AND REGULATIONS PERTAINING TO HYDRANT USE

Within the Seattle Water Department service area, the source of water to be used as a project is subject to approval by the Seattle Water Department. When the source of water is to be by hydrant, a hydrant use permit must be obtained from, and use fees paid to the Water Service Section of the Seattle Water Department.

The Contractor shall use only the sources approved or hydrant use permits provided by SWCD and in strict accordance with the requirements of City of Seattle Ordinance 68777 and the conditions of the permit.

2.07.4 MEASUREMENT

Water described in Section 207 will not be measured.

Water shall be obtained at the Contractor's cost. Providing and hauling of water shall be done at the Contractor's expense in accordance with Section 204.1.

2.08.3 RELOCATE ROCK FACING

This work shall consist of removing the rock facing and relocating it to another location.

2.08.3(1) DESCRIPTION

This work shall consist of removing the rock facing to the specified depth and relocating it to another location.

2.08.3(2) REQUIREMENTS

The rock facing shall be removed to the specified depth and relocated to the specified location.

2.08.3(3) MATERIALS

Materials used shall meet the requirements of Section 204.1.

2.08.4 ROCK FACING

The rock facing shall be cut and removed to the specified depth and relocated to the specified location.

2.08.4(1) DESCRIPTION

This work shall consist of cutting and relocating the rock facing to the specified depth and relocating it to another location.

2.08.4(2) REQUIREMENTS

The rock facing shall be cut and removed to the specified depth.

2.08.4(3) MATERIALS

Materials used shall meet the requirements of Section 204.1.

2.08.4(4) CONTROL

This work shall be supervised by the Engineer, and the work shall be performed in accordance with the specifications and standards.
2-08 MEASUREMENT
Bid items of work completed pursuant to Contract Documents shall be measured as provided in Section 1-99.1 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein this Section. Measurement for Rock Facing and "Relocate Rock Facing" will be by the square foot of rock face for the new rock facing or the relocated rock facing.
Measurement for "Relocate Rock Facing" will be by the square foot based on measurement of the existing rock facing below dismantlement. Measurement will include that portion of the rock facing constructed below the existing ground elevation. Material aggregate of the type specified for drainage backfill will be measured by the ton in accordance with Section 1-99.1.

2-08.5 PAYMENT
Compensation for the costs necessary to complete the work described in Section 2-08 will be made at the unit contract price bid for the aggregate listed or referenced below:
(1) Rock Facing, per square foot.
(2) "Relocate Rock Facing," per square foot.
(3) "Relocate Rock Facing," per square foot.
The unit contract price for "Rock Facing," shall include all costs for the work required to furnish and place the rock, including excavation of the facing foundation.
The unit contract price for the "Relocate Rock Facing" or "Relocate Rock Facing," shall include all costs for the work required to dismantle and reconstruct the rock facing as specified using the existing rock and including temporary stockpiling of the rock and such excavation as may be necessary for rehabilitating or relocating the rock facing.
Costs required to import and place additional rock in order to refill to the original condition shall be included under this item.
All costs for excavation of rock facing area ordered by the Engineer during rehabilitating or relocation of an existing rock facing will be paid in accordance with Section 1-99.4.
Payment for mineral aggregate of the type specified for drainage backfill will be made in accordance with Section 4-05.1.

SECTION 2-09 STRUCTURE EXCAVATION

2-09.1 DESCRIPTION
Excavation consists of excavation, removing, and disposing of all materials, debris, and materials, natural or artificial, subsurface or overburden, and is measured in section by section within the limits hereinafter defined which are necessary for the construction of footings, basements, or other foundation work required to support pump stations, heads, and other water supply work. Access to the rocks, paving, rails, running walls, cribbing, sign support structures, and other similar structures, all as necessary accordance with the Contract Documents and as reasonably well conformity with the lines, grades, and dimensions set forth by the Engineer. This work shall consist of removing loose or broken material from and placing suitable extracted material in all areas, and disposing of excess material or other similar items.
This work shall include the construction and securing removal of grading and cribbing, or coförtment along with necessary pumping, sealing, and diverting of the excavated area, the furnishing, stockpiling, placing and compaction of any selected or imported material and around the completed structure.
Excavation for roadbeds, utility sewers, water mains, and their appurtenances, manholes, lateral, catch basins, conduits, utility structures, and such other related miscellaneous work are covered elsewhere in these Specifications and shall not be considered as structure excavation.

2-09.2 VACANT
2-09.3 CONSTRUCTION REQUIREMENTS
2-09.3.1 GENERAL REQUIREMENTS
2-09.3.1A STAKING, CROSS-SECTIONING, AND INSPECTING
The Contractor shall not begin excavating until after the Engineer has set stakes to locate and outline the structure and taken cross-sections to determine how much material to remove. The Engineer will occasionally inspect material taken from and material remaining in the excavation.
When any foundation excavation is completed, the Contractor shall notify the Engineer, and no concrete or other permanent structural material shall be placed therein until permission to proceed is given by the Engineer.
2-09.3.1B DEPTH OF EXCAVATION
The Contractor shall excavate foundation pits to the depth the Draftsman requires, or to any revised depth ordered by the Engineer.
2-09.3.1C REMOVAL OF UNSTABLE BASE MATERIAL
When the material at the bottom of an excavation is not stable enough to support the structure, the Contractor shall excavate below grade and replace the unstable material with gravel backfill.
Gravel backfill shall meet the requirements of Section 9-03.12. It shall be placed in layers not more than 6 inches thick with each layer compacted to 95 percent of the maximum density determined by the Compaction Control Test. Section 2-03.12(E).
2-09.3.1D DISPOSAL OF EXCAVATED MATERIAL
The material obtained from structure excavation shall be used for backfilling over and around the structures after they are complete. Material not required for this purpose shall be used in the construction of embankments, stockpiled per Section 5-03.10 if it is deemed unsuitable by the Engineer per Section 2-03.10. If it is not suitable for construction, or other foundation work required to support pump stations, heads, water supply work, access to the rocks, paving, rails, running walls, cribbing, sign support structures, and other similar structures, all as necessary accordance with the Contract Documents and as reasonably well conformity with the lines, grades, and dimensions set forth by the Engineer. This work shall consist of removing loose or broken material from and placing suitable extracted material in all areas, and disposing of excess material or other similar items.

2-09.3.2 EXCAVATION
Openings made for structures shall be backfilled with selected material from the structure excavation or from other excavations as the Engineer requires. The selected backfill material from the excavation shall be as defined in Section 2-03.10(C).
The Engineer shall require the Contractor to compact the selected material in accordance with Section 2-03.11 and or require the Contractor to use other material covered by the Contract, if such backfill shows work that does not differ greatly from what would otherwise have been required. The Contractor shall provide backfill material as specified in Section 2-03.1(C) if neither selected materials nor other excavations are available.
(1) Stockpiling. The Engineer may require the Contractor to stockpile gravel or crushed rock in usable material excavated for a structure. If this material meets the requirements for gravel backfill for walls it may replace gravel as well as abutment backfill.
If the Contractor stockpiles excavated material for use as backfill, it shall be protected with plastic sheeting or by some other method from contamination and weather damage. If the material becomes too wet or contaminated in the stockpile, the Contractor shall dispose of and replace it with an equal amount of suitable backfill.
(2) Compaction. Backfill from structure excavation shall be placed and compacted in keeping with these requirements:
(a) Backfill supporting roadbed or roadway embankments placed in horizontal layers no more than 6 inches thick with each layer compacted to 95 percent of the maximum density determined by the Compaction Control Test. Section 2-03.11(E).
(b) Gravel backfill for ditches placed in horizontal layers no more than 12 inches thick, with each layer compacted to at least 3 passes of a vibratory compactor approved by the Engineer.
(c) All other structure excavations backfilled placed in layers no more than 2 feet thick (600 mm), with each layer tampered and graded so that final settling will leave the backfill flush with surrounding ground.
(3) Timing. Backfill shall not be placed against any concrete structures and the concrete has attained 90 percent of its design strength and has cured for at least 14 days. When the structure is not so designed, the Engineer may require backfilling before the concrete has set and shown stress needed to be supported. The Engineer may order the Contractor to use lean concrete in backfilling around pipes and in front of abutments and walls.
If water pressure exists or surface water pressure in backfilling, the Contractor shall be required to pump or other similar measures as specified. Spaces excavated and not occupied by structures, piers, or other permanent structures shall be backfilled up to the surrounding ground with a sufficient allowance for settlement and the top surface of the backfill shall be neatly finished.
Special precautions shall be taken to prevent any wedging action against any embankments or fill. If the excavation has sloping sides, the slopes shall be broken up by stepping or other means; and, when backfilling begins before the backfill is placed. Fill placed around curbs, piers, or underground utilities shall be deposited on both sides to approximately the same elevation at the same time.
Backfill for walls shall conform to the requirements for Material Aggregate Type 17, placed in layers not to exceed 12 inches thick, and shall be compacted to 90% of maximum dry density. Compaction control tests shall be performed by the Contractor at the Engineer's option.
Backfill for foundation shall conform to the requirements for Material Aggregate Type 17, placed in layers not to exceed 12 inches thick, and shall be compacted to 90% of maximum dry density. Compaction control tests shall be performed by the Contractor at the Engineer's option.
(4) Excavation of open pits or performance of excavation without sheeting, cribbing, or chipping. If a slide occurs in an open pit, the Contractor shall remove the slide material. If the slide occurs in an open pit, the Contractor shall place up to a layer of gravel at least 6 inches thick. Before placing the gravel, the Contractor shall excavate to whatever grade the Engineer requires. This provision shall not apply to the building of concrete sewer. The Contractor may omit forms when the earth's sides of a footing excavation will stand vertically. In this case, the Contractor may excavate to the next line of dimensions of the footing and pour concrete against the undisturbed earth. If the hole is larger than the next line dimension, the Contractor shall bear the cost of the extra concrete.
DITCH AND CHANNEL EXCAVATION

2-9.5 PAYMENT
Compensation for the cost necessary to complete the work described in Section 2-9.5 will be made at the unit contract price bid only for the pay items listed and referenced below:

1. "Structure Excavation," slope of 1 foot or more in depth.
2. "Ditch and Channel Excavation," slope of less than 1 foot in depth.
3. "Ditch and Channel Excavation," slope of 1 foot or more in depth.

For works exceeding 1 foot in depth, the Contractor shall only be paid for the actual excavation performed, and the excess cost shall be the responsibility of the Owner.

The unit price for "Ditch and Channel Excavation," slope of 1 foot or more in depth, shall be the same as the unit price for "Ditch and Channel Excavation," slope of 1 foot or more in depth.

The Contractor shall be responsible for the cost of any additional work required for the completion of the work described in Section 2-9.5.

The Owner shall be responsible for the cost of any additional work required for the completion of the work described in Section 2-9.5.

The Unit contract price shall be the same as the unit price for "Ditch and Channel Excavation," slope of 1 foot or more in depth.

All costs not included in Section 2-9.5 are considered to be additional work necessary for the completion of the work described in Section 2-9.5.

The Contractor shall be responsible for the cost of any additional work required for the completion of the work described in Section 2-9.5.

The Owner shall be responsible for the cost of any additional work required for the completion of the work described in Section 2-9.5.

The Unit contract price shall be the same as the unit price for "Ditch and Channel Excavation," slope of 1 foot or more in depth.

All costs not included in Section 2-9.5 are considered to be additional work necessary for the completion of the work described in Section 2-9.5.

The Contractor shall be responsible for the cost of any additional work required for the completion of the work described in Section 2-9.5.

The Owner shall be responsible for the cost of any additional work required for the completion of the work described in Section 2-9.5.

The Unit contract price shall be the same as the unit price for "Ditch and Channel Excavation," slope of 1 foot or more in depth.

All costs not included in Section 2-9.5 are considered to be additional work necessary for the completion of the work described in Section 2-9.5.
Channel excavation: Includes all excavation in open ditches 8 or more feet wide at the bottom.

2-10.2 VACANT

2-10. CONSTRUCTION REQUIREMENTS

(a) Excavating and grading of the ditch shall be performed in accordance with the methods established in this section.

(b) Excavated material shall be placed and compacted in conformance with the methods established in this section.

2-10.3 MEASUREMENT

Bid items of work completed pursuant to Contract Documents shall be measured as provided in Section 1.09.2. Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein this Section. The Owner shall determine the amount of work performed on the project.

2-10.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 2 will be made at the unit contract prices bid only for the pay items listed or referenced below:

1. "Ditch Excavation," per cubic yard.

The unit contract price for "Ditch Excavation" and "Channel Excavation" shall be paid for excavating, loading, placing, or otherwise disposing of the material.

SECTION 2-11 TRIMMING AND CLEANSUP

2-11.1 DESCRIPTION

This work shall consist of trimming and clearing the entire ditch area, improving the quality, and grading the ditch, and shall be performed in accordance with the specifications set forth in this section.

2-11.2 VACANT

2-11.3 CONSTRUCTION REQUIREMENTS

The Contractor shall:

(a) Trim shoulders and ditches to produce smooth surfaces and uniform cross-sections that conform to the grades set by the Engineer.

(b) Open and close all channels, ditches, and gutters to ensure proper drainage.

(c) Dress the back slope of any ditch or borrow pit that will remain adjacent to the roadway. Round all the top of the back slope and dress the material evenly along its base.

(d) Remove and dispose of all weeds, brush, refuse, and debris that lie on the roadbed, shoulders, ditches, and slopes.

(e) Remove the loose rocks and gravel.

(f) Distribute evenly along the embankment any material not needed to bring the shoulders to the required cross-section.

The Contractor shall:

(a) Fill all the depressions (craters, gullies, etc.) to trim the shoulders of an existing or new embankment surface.

Section 3-01: Production from Quarry and Pit Sites

3-01.1 DESCRIPTION

This work shall consist of manufacturing and producing crushed and screened aggregates suitable for use in construction of roads, pavements, concrete, asphalt, treated base, crushed surfacing, asphalt base, gravel base, gravel backfill, gravel borrow, riprap, and blinding surface treatments of all descriptions.

The requirements specified shall apply whether the source is lead rock, limestone, gravel, sand, or any combination thereof.

3-01.2 MATERIALS

3-01.2.1 GENERAL SOURCE

3-01.2.1.A APPROVAL OF SOURCE

Material sources must be approved in advance of use in the work in accordance with the requirements of Section 3-04.

3-01.2.1.B STUMPING QUARRIES AND PITS

Stumping of quarries and pits shall consist of the removal of all stumps, roots, and other material preventing the efficient use of the quarry or pit site as a construction site.

3-01.2.1.C PREPARATION OF SITE

The material of the quarry or pit site to be used shall be cleared and grubbed, and the area from which material is to be taken shall be stripped of overburden as provided in Section 3-04.12.1. All combustible debris resulting from these operations shall be disposed of by the Contractor to the satisfaction of the Engineer.

3-01.2.1.D PRODUCTION REQUIREMENTS

3-01.2.1.D.1 SIZE SELECTION

All satisfactory, rock fragments, or boulders occurring in the source, up to and including those measuring 18 inches in the greatest dimensions, shall be utilized in the manufacture of crushed material.

If the grading or quality of raw material in sources used for the manufacture of products covered by this Section is such that the crushed or graded, or quality of the product specified cannot be obtained by utilizing the natural material, fixed portions of the raw material shall be rejected to the extent necessary to produce products meeting all requirements of these specifications.

Failure of the Contractor to meet the specifications required in the Project Manual shall not relieve the Contractor of the responsibility for rejecting the portions of the material if such becomes necessary to produce products meeting all requirements of these Specifications. Scaling shall be performed after the初级 quarry has been passed through the primary crusher.
3.02.2(1) VACANT

3.02.2(2) SITES

3.02.2(2A) CONTRACTOR-PROVIDED SITES

All borrow, quarry, and pit sites over three acres in size of denuded land or resulting in pit walls more than thirty feet high and steeper than one to one slope which are owned or furnished by the Contractor shall be reclassified in accordance with the conditions and requirements of an approved operating permit acquired from the Department of Natural Resources. When material is acquired exclusively for use on this Contract, the Seattle Engineering Department may approve the reclassification plan as allowed by the Surface-Mixed Land Reclamation Act of Washington and the rules and regulations adopted by the Department of Natural Resources.

When the Contractor obtains an operating permit from the Department of Natural Resources, evidence of such approval shall be furnished to the Engineer prior to any work within the site.

Ultimate reclamation plans are not required for borrow, quarry, or pit sites not meeting the above criteria or for stockpiles or waste sites. However, all sites shall be reclassified in the Department of Natural Resources, evidence of such approval shall be furnished to the Engineer prior to any work within the site.

Ultimate reclamation plans are not required for borrow, quarry, or pit sites not meeting the above criteria or for stockpiles or waste sites. However, all sites shall be reclassified in the Department of Natural Resources, evidence of such approval shall be furnished to the Engineer prior to any work within the site.

Compliance with the State Environmental Policy Act (SEPA) is required for sites involving more than 100 cubic yards of excavation or fill. If a road is to be constructed and reclassified as a site, the site shall be reclassified in the Department of Natural Resources, evidence of such approval shall be furnished to the Engineer prior to any work within the site.

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SECTION 4-04  BALLASTING AND CRUSHED SURFACING

4-04.1 DESCRIPTION

The work shall consist of constructing one or more courses of crushed aggregate material upon an existing roadway surface, or upon a subgrade properly prepared in accordance with Section 4-06. The courses shall be constructed by spreading and shaping the aggregate material in such a manner as to form a minimum desired thickness. The minimum amount of filler or in-place material, the courses shall compact into a dense and uniform mixture, and be constructed on a predetermined stone base in reasonably close conformity with the lines, grades, depth and cross sections indicated on the Drawings or established by the Engineer.

4-04.2 MATERIALS

Materials shall meet the requirements in the following Sections:

ROADWAY BALLAST

Material Aggregate Type 2

MINERAL BALLAST

Material Aggregate Type 13

MOTORCOUSE

Material Aggregate Type 2

STONE AND KEYSSTONE

Material Aggregate Type 1

MAINTENANCE ROCK

DUST PALLIATIVE SAND

DUST PALLIATIVE GIL

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4-04.3 MIXING

Unless otherwise specified, the Contractor may use either:

(a) Central Plant Mix Method. The surfacing material and water shall be mixed in an approved mixing plant as described in Section 4-04.3(c). The completed mixture shall be thoroughly mixed at the proper proportion established by the Engineer.

(b) Road Mix Method. After material for each layer of surfacing has been placed, the material shall be mixed until uniform throughout by the use of other equipment approved by the Engineer. Water to facilitate mixing and compacting shall be added as directed by the Engineer.

4-04.4(4) PLACING AND SPREADING

Unspecified otherwise on the Drawings, in street areas to be paved with asphalt concrete pavement, crushed surfacing shall be placed to a compacted depth of 6 inches consisting of a 2 inch top course of Material Aggregate Type 1 placed on a 4 inch base course of Material Aggregate Type 2. Surfacing of the first course of surfacing or ballasting shall begin at points nearest to the points of loading (or supporting) sheet. Each course shall be constructed continuously from the beginning point of the course unless otherwise directed by the Engineer. The first course of surfacing or ballasting material shall be placed on all available subgrade before placing the succeeding course. If the Engineer deems it necessary, a succeeding course shall be placed over a section of a previously placed course before the final completion of that course.

Crushed surfacing, base course and top course shall be constructed in layers not to exceed 4 inches in depth. Ballast shall be constructed in layers not to exceed 6 inches in depth. Each layer of surfacing and ballasting material shall be placed and spread by equipment approved for use by the Engineer. The surfacing and ballasting shall be spread by any method that will result in an even distribution of the material upon the roadway without perceptible separation in gradation. The material shall be spread and spreaded over a depth and surface uniformity which will permit compacting in a reasonably true line, grade, depth, course, and cross section without further shaping.

Should there occur during any stage of the placing and spreading operation a separation of the material from the material causing, in the opinion of the Engineer, serious lack of uniformity in the grade, depth, course, or cross section of the material, then the Engineer shall notify the Contractor to cease work upon request of the Engineer, make such changes in the project, and deliver the material as the Engineer shall direct.

Unless otherwise approved by the Engineer, there shall be a distance of not less than 1 foot nor more than 1/2 foot between the centers of the two courses, and at such time as the maximum combination of asphalt and ballast shall be placed. Uniform gradations of mineral aggregates shall be used for surfacing and ballasting.

Before placing any course, the preceding layer shall be properly backed out and all flake material and dust removed from the surface. For weather limitations, see Section 4-04.3(c).

4-04.3(b) SHAPING AND COMPACTION

Immediately following spreading and final shaping, each layer of the surfacing shall be compacted to at least 95 percent of the maximum density determined by the Engineer in accordance with Section 4-06.3 prior to the laying of the next succeeding layer of surfacing or pavement is placed.

The shaping and compaction shall be done to a density for each layer. A mist spray of water shall be applied as needed to replace moisture lost by evaporation. The completed layer shall have a smooth, tight, uniform surface free from the line, grade, and course indications shown on the Drawings or as established by the Engineer. The density testing will be required for the Engineer to determine the number of coverages required for the particular compaction equipment available. Each course of surfacing shall be compacted until the material does not creep under the
4.04 BALLASTING AND CRUSHED SURFACING

4.04.3(1) SHOULDER BALLOAST

Shoulder ballast shall be spread and compacted until the Shoulder Ballast shall be placed in such manner as to conform to the shoulder pavement has been completed, unless otherwise designated by the Engineer. Shoulder ballast shall be placed in such manner as to conform to the shoulder pavement shall be permitted to be compacted to a specified depth in one lift. Should the shoulder course on the roadway will not be permitted. Compaction shall be accomplished by making a minimum of three passes over the aggregate with a vibratory compactor of a type acceptable to the Engineer. The density requirements of Section 4.04.3(2) shall not apply.

4.04.3(2) APPLICATION OF DUST PALLATIVE

When required by the Drawings, in the Project Manual, or when directed by the Engineer, compacted crushed rock surfacing courses or roadways shall be given two or more applications of dust palliative oil to the limits specified. Dust palliative oil shall be C505 and shall be uniformly applied by an approved pressure-type distributor at the rate of 0.3 gallons of emulsion per square yard of surface to be treated. Before succeeding applications of dust palliative oil are applied, the preceding application shall have thoroughly dried, as approved by the Engineer.

Dust palliative oil shall not be applied on a wet surface or when the temperature is below 60 degrees F.

When directed by the Engineer, the Contractor shall furnish and place Type No. 6 and on newly oiled streets to such limits as designated by the Engineer to prevent trafficking of oil onto adjacent existing concrete pavement. Sand shall also be used when, in the opinion of the Engineer, the oil penetration is unsatisfactory and the final surface shall be true to the project grade and crown before proceeding with the surfacing or final paving.

4.04.3(3) RESURFACING OF OIL MAT AND GRAVEL SURFACES

The grader shall spread and roll the existing mat and gravel surfaces shall be scarfed and bladed to a minimum width of 21 feet until it has a uniform grade and cross-section with a section to Expressway crowns at the center line. No attempt shall be made to apply oil to the new surfaces, and for this purpose the operation is divided into 12 equal sections. The first section shall be bladed and bladed the entire roadway. Preparation work shall consist of scarifying the surface to a smooth, clean surface, free from oil, and flatness at a distance of 36 inches on the new surface. The scarification shall be removed if required by the Engineer, prior to the application of the sprayer. The final surfacing of the existing surfacing, all material that may have been displaced by traffic or otherwise shall be bladed into the newly scarified surfacing surface.

- 4.04.3(4) BULKING SURFACING

- 4.04.3(5) WEATHER LIMITATIONS

- 4.04.3(6) HAULING

- 4.04.3(7) MISCELLANEOUS REQUIREMENTS

- 4.04.3(8) HOURLY WORK

- 4.04.3(9) CONSTRUCTION REQUIREMENTS

- 4.04.3(10) ASHPOINT ADDITIVE

- 4.04.3(11) GRADING

- 4.04.3(12) ASHPOINT AGGREGATES

- 4.04.4 MEASUREMENT

- 4.04.5 PAYMENT

- 4.04.6 ASPHALT TREATED BASE

- 4.04.6.1 DESCRIPTION

- 4.04.6.2 MATERIALS

- 4.04.6.3 CONSTRUCTION REQUIREMENTS

- 4.04.6.3.1 ASPHALT MIXING PLANT

- 4.04.6.3.2 PREPARATION OF AGGREGATES

- 4.04.6.3.3 HEATING OF ASPHALT MATERIAL

- 4.04.6.3.4 MIXING

- 4.04.6.3.5 Hauling Equipment

- 4.04.6.3.6 SPREADING AND FINISHING

- 4.04.6.3.7 GENERAL

- 4.04.6.3.8 SUBGRADE PROTECTION COVERAGE

- 4.04.6.3.9 UNFINISHED WORK

- 4.04.6.3.10 TOPOGRAPHIC SURVEY

- 4.04.6.3.11 FINISHING OF THE WORK

- 4.04.6.3.12 REMOVAL OF WORKING SURFACES

- 4.04.6.3.13 FINISHING OF THE WORK

- 4.04.6.3.14 REMOVAL OF WORKING SURFACES

- 4.04.6.3.15 PROTECTION OF THE WORK

- 4.04.6.3.16 PROTECTION OF THE WORK

- 4.04.6.3.17 PROTECTION OF THE WORK
FINISH COURSE

The final surfacing course of the asphalt treated base section, excluding shoulders, whether constructed in one or more courses or over a protective layer, shall not depict at any point more than 3/8 inch from the bottom of a 10-foot straightedge laid in any direction on the surface on either side of the roadway crowns. Failure to meet this requirement will necessitate sufficient surface correction to satisfy the requirements of the Contract specification.

DENSITY

The asphalt treated base shall be compacted to a density of not less than 90 percent of the maximum theoretical density established for the mix by WSDOT Test Method 706. The density of the base shall be determined by means of tests on cores taken from the roadway or with the nuclear gauge in accordance with Section 504.2.050. The frequency of these test shall be at the discretion of the Engineer, but in no case shall it be less than one control lot for each normal day's production. The use of equipment which results in damage to the materials or produces substandard workmanship will not be permitted.

ANTI-SLIPPING ADHESIVE

An anti-slipping additive shall be added to the asphalt material in accordance with Section 504.2.040, when directed by the Engineer.

COMPACTION

The method of compaction shall be as specified in Section 504.2.030.

MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured as provided in Section 504.1.010. Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein or Section 504.4.010. Asphalt treated base will be measured by the ton in accordance with Section 504.4.010.

PAYMENT

Compensation for the cost necessary to complete the work described in Section 406 will be made at the unit contract price bid for the pay item listed or referenced below.

Contractor shall add a second course of asphalt treated base on a prepared subgrade to the base, grain, and cross sections required.

Payment for roadway excavation and subgrade preparation including excavation and disposal of unsuitable material shall be in accordance with applicable Sections.

DIVISION 5

SUBSEALING

SECTION 5-01 SUBSEALING

5-01.1 DESCRIPTION

This work shall consist of filling voids under existing cement concrete pavement by pumping a mixture of portland cement, poultice, and water under the slabs in accordance with these Specifications.

5-01.2 MATERIALS

Materials shall meet the requirements of the following Sections:

Portland Cement

Poultice

Water

5-01.3 CONSTRUCTION REQUIREMENTS

5-01.3.1 PROPORIONING MATERIALS

The standard mix design for subsealing is as follows:

1 part (by volume) portland cement Type I or II
2 parts (by volume) poultice (natural or artificial)
2.25 parts (by volume) water

Any deviation from the dry mix portion (portland cement and poultice) shall be approved as equal an expanding agent to offset shrinkage. The proportions shall be approved by the Engineer.

The Contractor shall add a liquid water reducer approved by the Engineer. The proportions shall be approved by the Engineer.

5-01.3.2 EQUIPMENT

All equipment used in performance of the work shall be subject to the approval of the Engineer. The Contractor shall be furnished with water, power, and highway rights of way necessary to construct the asphalt treated base on a right-of-way under the terms of the contract.

Equipment shall be equipped to operate in accordance with specifications and to be used for the work to the satisfaction of the Engineer. Equipment shall be kept in good working condition and operated in such a manner that out of round holes would not be produced.

The equipment shall consist of a cement injection pump and a high speed cement mixing machine. The cement mixing machine shall operate at a minimum speed of 1200 rpm and shall consist of a rotor rotating in close proximity to a static, creating a high shearing action and subsequent pressure release to make a homogeneous mixture. The equipment shall be accurately measured, and the water shall be balanced through a meter or scale with a totalizer for the day's consumption.

Wooden cylindrical plugs and other devices approved by the Engineer shall be provided to temporarily plug the application holes until the mixture has set. The plugs shall be slightly tapered on one end for ease in driving.

5-01.3.3 CONSTRUCTION

Subsealing shall not be done when the pavement is wet, or when water is present under the pavement. Application holes shall be drilled through the concrete base in the approximate pattern as shown in the Drawings. Application holes shall be approximately 1/2 inch in diameter and shall be perpendicular to the pavement surface. Without specific approval of the Engineer, no more application holes shall be drilled during a day's operation than can be filled or temporarily plugged during the same day. To prepare the cavity for injection of the subsealing mix materials, compressed air shall be blown through the application holes for not less than 15 seconds or more than 60 seconds, as determined by the Engineer. After the application holes are blown out and the mix is thoroughly wedged into the hole, the subsealing mix shall be pumped into the application hole until all cavities are filled, or until any one of the following occurs:

(a) A pavement slab or portion of a slab starts to rise.
(b) Subsealing mix extrudes from adjacent application holes, or along or around the longitudinal edges of the pavement.
(c) The Engineer orders application of subsealing mix stopped. After pumping is completed, the mixture shall not be removed until a worker with a wooden plug is standing by. Immediately upon removal of the mixture, the plug shall be inserted and firmly driven into the application holes.

Following the application and after it has set, the wooden plugs shall be removed and the application holes immediately filled with subsealing mix.

Subsealing shall be continued progressively through the entire project. Traffic shall not be allowed to use any subsealed area until the subseal has hardened.

In the event the Contractor determines that continued operations are prohibited because of no longer economic factors, the Contractor shall cease operations and move to a new location.

MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured as provided in Section 501.010. Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein or Section 501.010. Measurement for "Pavement Subseal" will be by the cubic foot (cubic yards of dry materials (portland cement and poultice) in bags before the addition of water or other additives.

The Contractor shall, before and during placement, make the work for the subseal complete and ready to be used by the Engineer. Measurement for "Pavement Subseal" shall be by each hole drilled completely through the concrete base, including that portion of asphalt concrete if such overcut exists at the drilling locations.

PAYMENT

Compensation for the cost necessary to complete the work described in Section 5-01 will be made at the unit contract prices bid only for the payment items listed or referenced below:

1) "Drill Hole for Subsealing," per each.
2) "Pavement Subseal," per cubic foot.

The unit contract price for "Drill Hole for Subsealing" shall include all costs for the work required to drill the holes as specified.

The unit contract price for "Pavement Subseal" shall include all costs for the work required to complete the subsealing operation as specified.
SECTION 5-02
BITUMINOUS SURFACE TREATMENT

5-02.1 DESCRIPTION

5-02.1(1) GENERAL

This work shall consist of constructing a single or multiple course, bituminous surface by treating existing crushed rock, screened sawdust or bituminous roadway surfaces with asphalt and covering with a mineral aggregate thoroughly compacted to the roadway to obtain a wearing surface with good riding and non-skid qualities. The bituminous surface treatment shall be constructed in reasonably close conformity with the lines and cross sections shown in the Drawings or established by the Engineer.

Roadway surfaces shall be classified as treated or untreated roadway surfaces. A treated surface is defined as a paved surface consisting of asphalt concrete, concrete concrete, brick, or seal coat. An untreated surface is defined as an unpaved surface which may consist of gravel, crushed rock or oil mat surfaces. Surfaces may be existing or new construction.

The method of treatment to be used on any particular project shall be bituminous surface treatment, Class B, unless otherwise specified.

5-02.1(2) BITUMINOUS SURFACE TREATMENT CLASS A

This method of treatment requires two applications of asphalt and three applications of aggregate as specified. The second asphalt application (bit-coat) shall be applied not less than ten days after the first asphalt application (prime-coat) for bituminous surfaces and not approved by the Engineer for asphaltine surfaces.

5-02.1(3) BITUMINOUS SURFACE TREATMENT CLASSES B, C, AND D

These methods require the placing of one application of asphalt and one or more sizes of aggregate as specified to an existing asphalt roadbed to seal and rejuvenate the surface and to produce a uniform roadway surface with good non-slip characteristics.

5-02.2 MATERIALS

Materials shall meet the requirements of the following Sections:

Asphalt (grade specified) 9-0
Aggregate 9-0
Asphaltic Additive 9-0
Aggregate 9-0

The grade of asphalt shall be Cemen-Emulsified Asphalt (CSB) or Cemen-Emulsified Asphalt (CSE) meeting the requirements of Section 9-04.1(6).

Mineral aggregate for Bituminous Surface Treatment Class A or B shall be Mineral Aggregate Type 24, Chip Rock, except as provided in Section 5-02.3.1.

When crushed asphalt is specified or ordered by the Engineer for Types A or C, or for BLT or SBT Class C, used in conjunction with SBT Class A, construction shall not begin until the test for unshrinkage specified has been determined. The Contractor shall allow a minimum of seven working days after the necessary aggregate, asphalt, and additive samples have been received in the Materials Laboratory for the necessary tests. Additional time will be required if the Contractor has requested more than one source of asphalt or additive be approved.

5-02.3 CONSTRUCTION REQUIREMENTS

5-02.3(1) EQUIPMENT

The equipment used by the Contractor shall include:

- A sprayer, tank and trailer, or other spray equipment, an asphalt distributor, and equipment for heating asphalt that shall be subject to approval by the Engineer before its use on the work.
- A tank to hold a capacity of not less than 7500 gallons, and shall be so designed, equipped, maintained, and operated so that asphalt and mineral aggregate of an even heat shall be uniformly applied as required at the rate of 7000 gallons per hour. It shall be equipped with a 1000 psi spray bar with extensions, pressure pump and gauge, volume gauge so located as to be observed easily by the Engineer from the ground, a telemeter to control accurately the speed and spread of asphalt, and two thermometers, one installed permanently in the tank to indicate temperatures of asphalt at all times. The power for operating the pressure pump shall be supplied by a power unit which will provide a uniform spray from each of the nozzles across the spray bar and extensions.
- Rollers shall be self-propelled pneumatically- or smoothly- wheel, each weighing not less than 10 tons.
- Spraying equipment shall be self-propelled, supported on at least four pneumatic tires, with an approved device for accurately metering and distributing the aggregate uniformly over the roadway surface.
- Brosen shall be motorized with a positive means of controlling vertical pressure.

Other equipment necessary to satisfactorily perform the work as specified herein or as designated by the Engineer, shall be subject to approval by the Engineer before its use on the work.

Additional units shall be placed on the work when, in the opinion of the Engineer, it is considered necessary in order to produce a uniform roadway surface, to meet specific project specifications, or to complete the work within the time specified.

All equipment shall be maintained in good working order to ensure satisfactory quality of work.

The right is reserved for the Engineer to disapprove any equipment that, in the opinion of the Engineer, is not capable of fulfilling the work as specified herein or which does not accomplish the work satisfactorily.

5-02.3(2) PREPARATION OF ROADWAY SURFACE

5-02.3(2A) UNTREATED SURFACES

Refer to Section S-04.1(3). No bitume will be allowed on the treated surface unless the prime coat of asphalt and aggregate is applied.

5-02.3(2B) TREATED SURFACES

Refer to Section S-04.1(3). Bitume shall be applied in accordance with Section S-04.1(3). All other aggregate shall be placed in accordance with Section S-04.1(3). No bitume will be allowed on the treated surface unless the prime coat of asphalt and aggregate is applied.

5-02.3(2C) SOIL RESIDUAL HERRICKING

Where shown in the Drawings, soil residual hercillie shall be applied in accordance with Section S-04.1(3). All other aggregate shall be placed in accordance with Section S-04.1(3). No bitume will be allowed on the treated surface unless the prime coat of asphalt and aggregate is applied.

The quantity of aggregate to be applied shall be such that the asphalt will be uniformly covered and will not pick up under traffic. The aggregate shall be cleared of all trash, debris, and other material from the treated surface. The Engineer may require the amount of asphalt to be applied that in his judgment will give the best results.

At any time during the progress of the work, the Engineer may order the use of other grades of asphalt materials in lieu of CSB if, in the Engineer's judgment, the results contemplated by the Specifications will thereby be further attained.

To ensure uniform distribution of asphalt prior to beginning work, the distributor bar shall be operated over a pit or out. To avoid laps and ridges at transverse junctions of separate applications of asphalt, the Contractor shall spread adjacent building paper over the treated surface to make sure that the asphalt will be functional normally when the untreated surface is reached.

The pattern of application of asphalt prior to beginning work, the distributor bar shall be operated over a pit or out. To avoid laps and ridges at transverse junctions of separate applications of asphalt, the Contractor shall spread adjacent building paper over the treated surface to make sure that the asphalt will be functional normally when the untreated surface is reached.

The pattern of application of asphalt shall be such as to provide proper coverage of crushed material within the times specified, provide proper widths to such dimensions as to facilitate the most satisfactory coverage with crushed cover issue, and provide lapage of adjacent applications. Asphalt shall be applied adjacent to intersections and driveways immediately ahead of, or immediately behind the adjacent longitudinal street application.

Onset time (steps) by the distributor shall be immediately covered by hand application with the same grade of asphalt.

Any use of asphalt shall cover no more area than can be covered within 3 minutes from the time of application, upon any part of the spread. Use of asphalt directed to the Engineer shall be spread toward the source of mineral aggregate to avoid injury to the treated surface. Asphalt shall be spread to the same as adequate supplies of mineral aggregate are on hand on the site. Where conditions as above exist, the application of asphalt shall extend 4 inches beyond the gutter line. Where concurrent work is in progress asphalt shall lap onto the gutter section, but shall not extend 2 inches. Where conditions of concurrent work exist, the application shall be placed as closely as possible to the vertical surface without excessive spillage onto the carriageway or past the curb and gutter exist, the distributor shall be equipped with a sanka board designed to prevent spillage.

All castings shall be covered with heavy building paper and weighted with a 100 pound weight.

Hand sprayers shall be used to apply asphalt around castings and along curbs and gutters.

5-02.4(2) CHANGE IN GRADES OF ASPHALT

As at any time during the progress of the work, the Engineer may order the use of other grades of asphalt materials in lieu of the grade specified in the Project Manual if the Engineer deems necessary as a result of the weather. The Engineer may, in his discretion, change the use of asphalt required to be furnished in accordance with the Specifications.

5-02.3(3) APPLICATION METHOD OF ASPHALT

Mineral aggregate shall be gathered and placed by the Contractor and spread evenly over the mineral aggregate or which causes segregation of the various sizes of aggregate particles, the Contractor shall be required to provide a sample to the Engineer in order to produce a uniform product. All work shall be performed to the satisfaction of the Engineer.

5-02.3(4) APPLICATION METHOD OF ASPHALT

Mineral aggregate shall be gathered and placed by the Contractor and spread evenly over the mineral aggregate or which causes segregation of the various sizes of aggregate particles, the Contractor shall be required to provide a sample to the Engineer in order to produce a uniform product. All work shall be performed to the satisfaction of the Engineer.

5-02.3(5) PATCHING AND CORRECTION OF DEFECTS

Omission by the distributor or damage to the treated surface of any coat shall be immediately covered by hand application with asphalt in accordance with the Requirements. Any material spilled shall be removed from the treated surface by the distributor. The Engineer may require the Contractor to make an additional application of one or both materials in accordance with the Specifications, or at the direction of the Engineer.

5-02.3(6) ADDITIONAL ASPHALT AND AGGREGATE

If the application of asphalt or aggregate, or both, is insufficient or unsuccessful for the satisfactory completion of the work, then the Engineer may require the Contractor to make an additional application of one or both materials in accordance with the Specifications, or at the direction of the Engineer.
5-02 BITUMINOUS SURFACE TREATMENT

5-02.01 MEASUREMENT

5-02.02 PAYMENT

5-02.03 PROTECTION OF STRUCTURES

5-02.10 UNFAVORABLE WEATHER

5-02.11 ANTI-STRIPPING ADDITIVE

5-03 COAL TAR PITCH EMULSION SEAL COAT

5-03.01 DESCRIPTION

5-03.02 MATERIALS

5-03.03 CONSTRUCTION REQUIREMENTS

5-03.04 MEASUREMENT

5-03.05 PAYMENT

5-03.06 MIXING SAND SLURRY

5-03.07 WEATHER LIMITATIONS

5-03.08 PREPARATION FOR USE

5-03.09 APPLICATION

5-04 COAL TAR EMISSION SEAL COAT

5-04.01 EQUIPMENT

5-04.02 MAINTENANCE

5-04.03 MATERIALS

5-04.04 CONSTRUCTION REQUIREMENTS

5-04.05 PAYMENT

5-04.06 MIXING SAND SLURRY

5-04.07 PREPARATION FOR USE

5-04.08 APPLICATION

5-04.09 TESTING AND INSPECTION

5-04.10 QUALITY CONTROL

5-04.11 QUALIFICATIONS AND CERTIFICATIONS

5-04.12 TRAINING AND CERTIFICATION

5-04.13 QUALITY ASSURANCE

5-04.14 QUALITY AUDITS

5-04.15 CONTRACTOR RESPONSIBILITY
The proportioning and timing devices shall be automatic to the extent that the only manual operation required is the proportioning and mixing of materials. For one batch shall be a single operation of a switch or valve.

The mixing plant shall be equipped with automatic proportioning and timing devices to monitor and control the weights of the separate components of aggregates and the water. The mixing plant timing device shall also control the position of the aggregate weigh hopper dump gate, the asphalt bucket discharge valve, and the mixer discharge gate.

Withdrawal from the aggregate bins and the discharge of the weigh hopper shall be so interconnected that the weigh hopper cannot discharge until the required quantity of aggregate from each bin has been deposited therein. The weigh hopper may be a single-compartment, individual weight control type, or of the divided compartment, prosect volume type. When the single compartment, individual weight control type is used, the automatic scale weight system shall discharge and weigh material from one bin at a time. When the prosect volume type weigh hopper is used, the automatic control system shall check the total weight of each aggregate batch and provision shall be made to allow the Engineer to check easily and quickly the individual aggregate weights at any time.

The timing lock devices shall be actuated by the opening of the aggregate weigh hopper dump gate. They shall lock the asphalt bucket discharge valve until preset dry mixing time is elapsed and shall lock the mixer discharge gate throughout the preset dry and wet mixing periods. The control of the timing shall be available and capable of being set at intervals of not more than 5 seconds throughout cycles up to 60 seconds.

The dial on the timing locks and automatic weighing controls shall be so arranged that the time interval and proportion control may be locked by the Engineer.

5.04.3(13) REQUIREMENTS FOR ROTARY DRUM PLANTS

In addition to the requirements listed under Section 5.04.3(13), rotary drum plants shall meet the following requirements:
(a) The plant shall have a feeder capable of uniformly introducing the aggregate into the drum. The aggregate feeder shall be capable of feeding the aggregate in such a manner as to prevent clogging, segregation, or other disturbances in the drum. The feeder shall be adjustable in such a manner as to prevent clogging and to provide a uniform distribution of aggregate into the drum.
(b) The feeder shall be capable of feeding the aggregate into the drum at a rate such that the aggregate enters the drum at a rate equal to the mixture output rate plus the aggregate feed rate, plus any other adjustments deemed necessary by the Engineer.
(c) The feeder shall be capable of adjusting the feed rate to maintain a uniform mixture of aggregate and asphalt mix.

5.04.3(14) REQUIREMENTS FOR CONTINUOUS MIX PLANTS

In addition to the requirements listed under Section 5.04.3(13), continuous mix plants shall meet the following requirements:
(a) The plant shall have a feeder capable of uniformly introducing the aggregate into the drum. The aggregate feeder shall be capable of feeding the aggregate in such a manner as to prevent clogging, segregation, or other disturbances in the drum. The feeder shall be adjustable in such a manner as to prevent clogging and to provide a uniform distribution of aggregate into the drum.
(b) The feeder shall be capable of feeding the aggregate into the drum at a rate such that the aggregate enters the drum at a rate equal to the mixture output rate plus the aggregate feed rate, plus any other adjustments deemed necessary by the Engineer.
ASPHALT CONCRETE PAVEMENT

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provide for an even distribution of loose material. The scarifier shall maintain continuous and unlimbed pavement contact and avoid gouging or cutting of the pavement surface. Complete scarified areas shall be rolled twice with a 9- or 12-ft smooth drum roller until any loose material is sealed by the asphalt binder.

5-04.3(5) PREPARATION OF STREET SURFACES

5-04.3(5)(A) GENERAL

Street surfaces shall be classified as treated or untreated surfaces. Treated surfaces shall be cement concrete, asphalt concrete, brick, seal coat or other bituminous surface treatments. Untreated surfaces shall be crushed rock, gravel, or mat surfaces.

The work of preparing existing street surfaces prior to the addition of one or more courses of asphalt concrete or other bituminous material shall be classified as "surface preparation" for treated street surfaces, and "roadway preparation" for untreated street surfaces.

5-04.3(5)(B) SURFACE PREPARATION - TREATED SURFACES

5-04.3(5)(B)(1) GENERAL

When an existing treated surface is to be used as a base for one or more courses of new asphalt concrete or other surfacing, the treated surface shall first be swept, cleaned, and patched as follows:

(a) Treated surfaces shall be swept with a power broom until free from dirt and other foreign matter. Hand brooms shall be used to clean omission of the power broom. Patty asphalt patches, grease droppings and other objectionable material shall be removed from the existing pavement.

(b) Excess asphalt joint filler shall be completely removed and premolded joint filler shall be removed to at least 1/4 inch below the surface of the existing pavement.

(c) When preparing existing uniform grade and cross section, all surface irregularities on the existing treated surface shall be corrected prior to placement of the new asphalt concrete or other bituminous surface treatment. Correction shall be by patching and if necessary, pressure or vacuum planting unless patching or heat-scarring is specified. Although patching and pre-planting may be necessary after patching, such work, after patching, shall be performed only when specified in the Contract Document or designated by the Engineer.

5-04.3(5)(B)(2) PRELEVELING

When a surface of the existing pavement or old base in lies of cross section shall be brought to a uniform grade and cross section by preleveling, unless some other method of correction has been specified in the Contract Documents.

As soon as the existing surface has been thoroughly cleaned, it shall be brought to the uniform grade and cross section by preleveling, unless some other method of correction has been specified in the Contract Documents. As soon as the existing surface has been thoroughly cleaned, it shall be brought to the uniform grade and cross section by preleveling, unless some other method of correction has been specified in the Contract Documents. As soon as the existing surface has been thoroughly cleaned, it shall be brought to the uniform grade and cross section by preleveling, unless some other method of correction has been specified in the Contract Documents. As soon as the existing surface has been thoroughly cleaned, it shall be brought to the uniform grade and cross section by preleveling, unless some other method of correction has been specified in the Contract Documents.

5-04.3(5)(B)(3) HEATER-SCARRING

When heater scarring is specified, the surface of the design course shall be scarrified to a uniform grade and cross section of 3/4 inch with sufficient compaction, and when necessary, sufficient compaction shall be provided to a depth of 3/4 inch by 9 pounds of scarrified material per square foot of scarrified roadway. As soon as the existing surface has been thoroughly cleaned, it shall be brought to the uniform grade and cross section by preleveling, unless some other method of correction has been specified in theContract Documents. As soon as the existing surface has been thoroughly cleaned, it shall be brought to the uniform grade and cross section by preleveling, unless some other method of correction has been specified in theContract Documents. As soon as the existing surface has been thoroughly cleaned, it shall be brought to the uniform grade and cross section by preleveling, unless some other method of correction has been specified in theContract Documents. As soon as the existing surface has been thoroughly cleaned, it shall be brought to the uniform grade and cross section by preleveling, unless some other method of correction has been specified in theContract Documents.

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**ASPHALT CONCRETE PAVEMENT**

5-04.3(3)J MIX DESIGN

The crushing operation has stabilized to the satisfaction of the Engineer; a representative sample shall be obtained from the stockpiled aggregate. A sample of the stockpiled blending sand, if needed, will also be required at this time. After the aggregate is stockpiled until a mix design is approved by the Engineer. The Contractor shall submit a separate mix design approved by the Engineer based on the requirements of Section 5-04.3(2.5). A separate mix design shall be required for each source of asphalt cement and aggregate.

The Contractor shall obtain the Engineer’s approval prior to changing the source of asphalt cement during the production of asphalt concrete. Replacing asphalt from different sources will not be permitted.

5-04.3(3)K MIXING

- The aggregate shall be combined in the order in the amount of each fraction of aggregate as specified in the direction of the Engineer. The asphalt material shall be measured or gaged and introduced into the mixture in the amount determined by the Engineer.
- The required amount of aggregate and asphalt material have been introduced into the paver, unless otherwise specified, the materials shall be mixed until a complete and uniform consistency and a thorough distribution of the asphalt material throughout the aggregate is ensured. Wet mixing time shall be sufficient to produce 65 percent coated particles as determined by WSDOT Test Method No. 714.
- When discharged, the temperature of the mix shall not exceed 250 degrees F or less than the temperature for mixes designed for asphalt concrete Class D shall not exceed 250 degrees F at the point of delivery at the rate of 0.10 (0.01 to 0.05) residual gallons per square yard. Unless otherwise approved by the Engineer, the relevant warm-up period prior to opening the roadway surface to traffic.
- When there are irregularities or unsatisfactory obstacles make the use of mechanical spreading and finishing equipment impractical, the paving may be done with other equipment or by hand.
- The placing of asphalt mixtures at night will not be permissible except by approval of the Engineer or specified in the Project Manual.
- Where the asphalt mixture is being produced by more than one asphalt plant, the material produced by each plant shall be placed by separate spreading and compacting equipment.

**ASPHALT CONCRETE PAVEMENT**

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5-04.3(3)E SOIL-RESIDENT HERBICIDE

Prior to installing asphalt sidewalks or sidewalks, the driveway and sidewalk substrate shall be treated with an application of an approved weed residual herbicide. The soil residual herbicide to be used shall not damage or have a detrimental chemical reaction to the asphalt concrete. Application of the herbicide shall be by a uniform spray in accordance with the manufacturer’s recommendations. Paving shall begin within 24 hours after application of the herbicide. Areas not paved within 24 hours and within 24 hours after application of the herbicide shall be treated with a second application of the herbicide.

**ASPHALT CONCRETE PAVEMENT**

5-04.3(3)E SOIL-RESIDENT HERBICIDE

Prior to installing asphalt sidewalks or sidewalks, the driveway and sidewalk substrate shall be treated with an application of an approved herb residual herbicide. The soil residual herbicide to be used shall not damage or have a detrimental chemical reaction to the asphalt concrete. Application of the herbicide shall be by a uniform spray in accordance with the manufacturer’s recommendations. Paving shall begin within 24 hours after application of the herbicide. Areas not paved within 24 hours and within 24 hours after application of the herbicide shall be treated with a second application of the herbicide.

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5.04 ASPHALT CONCRETE PAVING

The longitudinal joint in any one layer shall be offset from the immediately preceding layer a distance not less than 2 inches. All longitudinal joints constructed in the top layer shall be at a horizontal distance of at least 33% of the traveled way. However, on one-lane ramps a longitudinal joint may be constructed and subject to approval by the Engineer.

(o) The ramp must be open to traffic. If the hot mix is closed to traffic and a hot lap joint is constructed:

1. If a hot lap joint is allowed, two paving machines shall be used, a minimum average compounded speed of 60 percent of the maximum density shall be achieved throughout the traffic lane; and construction equipment shall not impact any uncompacted soil.

Immediately following the completion of the top paving course, move line joints where the new asphalt concrete abuts existing asphalt concrete pavements, portland cement concrete pavements, oil road surfacing, curbs and gutters, etc., shall be sealed with STE-1 asphalt per Section 5.04.3.1B.

5.04.3.1B CONNECTIONS WITH EXISTING FACILITIES

Where construction of new asphalt concrete pavement connects with an existing roadway surface, driveway, bridge, railway crossing, or other facility, the Contractor shall provide a smooth riding transition between the new existing surfaces. Such work may require the modification of the existing roadway profile by burning, plowing or milling in order to achieve the desired smooth riding transitions or may require other adjustment of the connections.

Where butt joints are required at the met lines of new construction and existing surfaces, the existing abutting pavement shall be trimmed by burning, plowing, milling or such other method as may be approved by the Engineer to assure a minimum of 2 inches of the old surface in the joint. Waste material resulting from this trimming or burning shall be disposed of by the Contractor. Butt joints shall be trimmed off at least 1-1/2 inches from the point of intersection.

5.04.3.1C VACANT

5.04.3.1D ASPHALT CONCRETE DRIVEWAYS

Asphalt driveways shall be constructed at the locations shown on the Drawings or as directed by the Engineer in accordance with Section 5.04.3.1D.

Unless indicated otherwise on the Drawings, the Contractor shall provide a 4-inch base course and asphalt surface on the compacted Asphalt Concrete, Class B and 4 Inch. Where compacted asphalt concrete is not specified on the Drawings or designated by the Engineer, the Contractor shall provide a 4-inch base and 2-1/2-inch asphalt surfacing with residual herbicide in accordance with requirements of Section 5.04.3.1E.

5.04.3.1E WEATHER LIMITATIONS

5.04.3.1F TEMPORARY PAVEMENT MARKING TAPE

Temporary pavement marking tape shall be installed wherever designated by the Engineer. All temporary pavement markings utilizing pavement marking tape shall be designated by the Engineer.

5.04.3.1G PRESSURE-SENSITIVE PAVEMENT MARKING TAPE

Pressure-sensitive pavement marking tape used on the existing roadway surface shall be installed at least 1-1/2 inches from the pavement current, or immediately subsequent to, the installation of permanent pavement markings. Pressure-sensitive pavement marking tape shall be removed from the road surface at any time in its use. Layout and marking in progress shall be made at a uniform rate of progress for the purpose of avoiding removal of the temporary striping while the temporary markings shall be the Contractor's responsibility. The Contractor shall be responsible for the layout for permanent lane markings as specified in Section 5.04.3.1H.

5.04.3.1H TEMPORARY PAVEMENT MARKING TAPE

Temporary pavement marking tape shall be removed at the request of the Engineer. Where a lane change of Sections 5.04.3.1G shall be used.

5.04.3.1I CHANGE IN GRADE OF ASPHALT Paving to Refer to Section 5.04.3.1I.

When the roadway being paved is open to traffic the following requirements shall apply:

5.04.3.1J JOINTS

The placing of the top or wearing course shall be as nearly continuous as possible, and the topping shall pass over the uncompacted end of the full thickness of the wearing course without any breaks. Where a transverse joint is being made in the wearing course, a 5 foot by 5 foot heavy temping board shall be used. The temping board shall be removed and the joint trimmed to a full thickness of the course prior to permanent paving of joint.

The material which is cut away shall be wasted and not used in the lift being laid against the fresh cut. Rollers or tampering bars shall be used to seal the joint.
CIMENT CONCRETE PAVEMENT

If the Engineer orders a change in grade of paving asphalt, all work shall be limited to the actual additional cost of the asphalt based on invoices from the supplier. If the difference in the cost and that of the original material specified is less than 1 percent of the smaller net weight, then all materials received subsequently shall be credited to the Contractor.

The additional cost shall be deducted from monies due the Contractor.

The unit contract price for "Paving Asphalt" shall include all costs for the work required to prepare the untreated roadway, including scarifying, blading, shaping, and compacting to remove irregularities and secure a uniform surface, and such other work as specified in Section 504.313C, except prime coat treatment which will be paid in accordance with Section 502.

The unit contract price for "Surface Preparation, Paving Asphalt" shall include all costs for the work required to prepare the untreated roadway, including scarifying, blading, shaping, and compacting to remove irregularities and secure a uniform surface, and such other work as specified in Section 504.313C, except prime coat treatment which will be paid in accordance with Section 502.

All costs for the removal of temporary marking tape specified in Section 504.317C shall be at the Contractor's expense.

SECTION 505 CEMENT CONCRETE PAVEMENT

505.1 DESCRIPTION

This work shall consist of constructing Portland cement concrete pavements in streets and alleys on a prepared subgrade and base as specified in these Specifications and in conformity with the lines, grades, and thicknesses as shown on the drawings and in accordance with these Specifications and Standard Plan No. 809 and 810.

505.2 MATERIALS

Materials shall meet the requirements of the following Sections:

Portland Cement

Fine Aggregate

Course Aggregate

Water

Reinforcing Bar

Tie Bar

Dowel Bar

Joint Filler

Curbing Materials and Admixtures

Joint Sealant/Filter

Spaay Seeding

The concrete mix for street pavement and alleys shall be Class 5 (1-1/2), unless otherwise specified in the Drawings or the Project Manual.

Concrete mixes incorporating fly ash may be utilized for all classes of concrete, unless otherwise noted in the Project Manual. Mix proportions will be subject to approval by the Engineer and may be modified by the terms of Section 923.9.

505.3 CONSTRUCTION REQUIREMENTS

505.3.1 PROPORIONAL MATERIALS

The class of concrete for each structural unit refers to the nominal number of sacks of cement per cubic yard. Claims of this designation does not constitute a guarantee of yield. The Figure in parentheses indicates maximum admixed water. For example: C1 5 (1-1/2) is a 5 sack mix with 1-1/2 inch maximum size coarse aggregate.

H,E, indicates high early-strength cement and may be required by the Engineer for any of the reasons below.

With approval of the Engineer, the Contractor may use higher proportions of coarse aggregate.

Air-entrained concrete shall be used, unless otherwise provided for in the Project Manual.

The volume of air in freshly mixed concrete shall conform to that specified in Table 505.7, which follows:

Air CONTENT OF FREELY MIXED CONCRETE

<table>
<thead>
<tr>
<th>Mix</th>
<th>Course Aggregate</th>
<th>继承</th>
<th>Fine Aggregate</th>
<th>继承</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1/2 and 2</td>
<td>3</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>I</td>
<td>3/4 and 1</td>
<td>6</td>
<td>2.1</td>
<td>4.6</td>
</tr>
<tr>
<td>I</td>
<td>3/4 and 1</td>
<td>7.5</td>
<td>2.1</td>
<td>4.6</td>
</tr>
</tbody>
</table>

If the measured air content is found above or below the values specified in the table, the Contractor shall immediately make changes in mixing or materials as will be necessary to comply with the requirements for air content.
CEMENT CONCRETE PAVEMENT

(a) Batching plant and equipment:

1. General: The batching plant shall include bins, weighing hoppers, and scales for the fine aggregate and coarse aggregate. The capacity of concrete batch plant shall be equivalent to 100 pounds of gravel. The plant shall be properly sealed and vented to prevent dusting during operation. The batching plant shall be equipped with a suitable nonreversible batch counter which will correctly indicate the number of batches proportioned.

2. Bins and hoppers: Bins with adequate separate compartments for fine aggregate and for each size of the coarse aggregate shall be provided in the batching plant.

(b) Scales: Plant and truck scales shall meet the requirements of Section 109.2.

(c) The batching plant shall be equipped to proportion aggregates and bulk cement by means of automatic weighing devices of approved type.

3. Metal rails:

1. General: Concrete may be mixed at a batching plant or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's plate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

2. Batching plant: Mixing shall be in an approved mixer capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the specified mixing period. The mixer shall be equipped with an audible alarm warning device which will automatically lock the discharge lever when the drum has been charged and release it at the end of the mixing period. The device shall be equipped with a bell and a visible warning device adjusted to give a clearly audible signal each time the lock is released.

3. Water content:

- 4.0
- 4.25
- 4.5
- 5.0
- 5.5
- 6.0
- 6.5
- 7.1

S-05.02 CONSISTENCY (SLUMP REQUIREMENTS)

The materials shall be mixed with sufficient water to prevent a stiff concrete which will hold its shape when deposited upon the subgrade. Concrete placed during wet weather shall be mixed with sufficient water to produce a very stiff mixture. The consistency shall be such that separation of集内容的母语是中文。
5-05.37/3 CEMENT CONCRETE PAVEMENT

5-05.37/3A CONCRETE PAVEMENT

Concrete may be placed, spread, and compacted between diaphragms or by the strip method with the aid of a strip method power at the Contractor's option, unless a specific method is required by the Engineer. Gas expansion of localized concrete construction joints. Should the Contractor be allowed to pace more than 5 operations for the placement of the concrete, an additional opportunity shall be planned at a minimum of 1000 square feet of placement. The amount of concrete to be placed shall be unslipped not exceeded 8 inches. The speed of the澼cond mixing and placing units located within the specific thickness of the pavement section and a minimum distance equal to the pavement thickness to be specified 1000 square feet per minute. The amplitude of vibration shall be sufficient to be perceivable on the surface of the concrete along the entire length of the vibration set and at a distance of 110 feet. The frequency of vibration or amplitude shall be varied proportionally with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a conditioner or other suitable device for measuring and indicating the actual frequency of vibrations.

- The concrete shall be held at a uniform consistency, having a slump as specified in Section 5-06.32D. The slump-pit form shall be operated as nearly a continuous forward movement as possible and all operations of spreading, rolling, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paving laid to a minimum. If the speed at which it is necessary to keep the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No machine surface shall be applied to the machine, except that which is specified from the manufacturer.

Regardless of the method or machinery used to construct concrete pavements, the specifications of this section shall be provided on the job location. For example, the speed of the vibratory equipment shall be not less than 1000 square feet per minute. The amplitude of vibration shall be sufficient to be perceivable on the surface of the concrete along the entire length of the vibration set and at a distance of 110 feet. The frequency of vibration or amplitude shall be varied proportionally with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a conditioner or other suitable device for measuring and indicating the actual frequency of vibrations.

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5-05.37/3C PLACING CONCRETE WITH REINFORCING STEEL OR WIRE MESH

Concrete shall be placed in two courses. The first course shall be struck off at the elevation established for reinforcing steel or wire mesh. Immediately prior to placing the concrete, the reinforcing steel or wire mesh shall be brought to a fairly even surface by means of a template conforming to the depth of the re-inforcement. Reinforcement should be placed on the bottom course before the concrete attains initial set. No more than 45 minutes shall elapse between the placing of the first course and the placement of the second course.

The concrete of the strip form shall be free of dirt, mill scale, oil, grease, or other foreign material that may impair bond. Steel, coated with rust, may be used if the solutions are not deep or loose coated.

Successful mats of steel or wire mesh shall be securely lapped together and tied so that longitudinal bars will lap 40 diameters and transverse bars will lap 12 diameters.

Reinforcement shall be laid as a continuous mat. Continuity shall be maintained along the expansion joints. Steel shall terminate within four inches of the joint.

Concrete may be placed in lieu of a mat acceptable to the Engineer is used to position and secure the reinforcement at the design location in the slab. If the concrete is placed in two courses where reinforcement is used, all dirt, sand, or that which collects on the base course shall be removed before the top course is placed.

Other requirements for placing and fastening reinforcing steel shall be specified in Section 5-06.324D.

5-05.37/3D COMPACTING CONCRETE

5-05.37/3D1 GENERAL

Concrete shall be compacted by vibrational means. Complete consolidation shall be required along all forms and adjoining pavements by such means as will prevent gravel pockets along the edges of the finished pavement. Any gravel pockets or depressions remaining after removing the forms shall be repaired by the Contractor. Where concrete is to be used in conjunction with the paving slab, the concrete for the integral curb shall be placed at such time as will make the top section of the curb to be consolidated, finished, and bonded to the pavement slab while the concrete is plastic.

Where curb is required, and such curb is not being placed integrally with the pavement slab, dowels shall be placed in the pavement slab as detailed on Standard Plan No.415 410, 412, and 413, or as specified in Section 5-05.46. Prior to placing concrete around manholes, catch basins, valve chambers, etc., a temporary cover lining below the rim of the ring casing shall be provided to prevent the concrete from flowing into them.

5-05.37/3D2 PLACING CONCRETE AT THROUGH JOINTS

Concrete placement around through joints shall be such that the through joint assembly will not be disturbed and that it will remain in a straight line perpendicular to the subgrade, as shown on the Standard Plans. The concrete shall then be vibrated along the entire length of the joint to consolidate the concrete and leave no rock pockets anywhere at the joint. If any rock pockets are exposed, they shall be repaired.

5-05.37/3D3 PLACING CONCRETE WITH REINFORCING STEEL OR WIRE MESH

Concrete shall be placed in two courses. The first course shall be struck off at the elevation established for reinforcing steel or wire mesh. Immediately prior to placing the concrete, the reinforcing steel or wire mesh shall be brought to a fairly even surface by means of a template conforming to the depth of the re-inforcement. Reinforcement should be placed on the bottom course before the concrete attains initial set. No more than 45 minutes shall elapse between the placing of the first course and the placement of the second course.

The concrete of the strip form shall be free of dirt, mill scale, oil, grease, or other foreign material that may impair bond. Steel, coated with rust, may be used if the solutions are not deep or loose coated.

Successful mats of steel or wire mesh shall be securely lapped together and tied so that longitudinal bars will lap 40 diameters and transverse bars will lap 12 diameters. Reinforcement shall be laid as a continuous mat. Continuity shall be maintained along the expansion joints. Steel shall terminate within four inches of the joint.

Concrete may be placed in lieu of a mat acceptable to the Engineer is used to position and secure the reinforcement at the design location in the slab. If the concrete is placed in two courses where reinforcement is used, all dirt, sand, or that which collects on the base course shall be removed before the top course is placed.

Other requirements for placing and fastening reinforcing steel shall be specified in Section 5-06.324D.

5-05.37/3E INTERNAL VIBRATION

Except when aliphatic pavements are used internal vibration shall be performed in accordance with Section 5-06.32E. Internal vibration shall be performed in accordance with Section 5-06.32E.
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5-05.3/010 VIBRATING SCREW CONCRETE PAVEMENT CONSTRUCTION

The type of vibrating screw which the Contractor proposes to use with the vibratory roller or beam, shall be subject to approval by the Engineer. Upon request by the Engineer a test section of pavement shall be placed for the purpose of demonstrating the capabilities of the screed to satisfactorily compact and strike off the concrete to a level acceptable to the Engineer by adjusting the time interval between placing of concrete and the sawing of joints. After the schedule has been approved, the sawing shall proceed as a continuous operation day and night until all joints have been completed.

Two or more sawing units may be required to accomplish the sawing in order to minimize random cracking. Sneaky equipment shall be on the job to ensure continuous sawing as specified regardless of any breakdowns of equipment.

Where curing membrane is used, the area disturbed by sawing of joints shall be reexposed immediately upon completion of the sawing operation and care shall be exercised to prevent the curing compound from getting into the grooves. Joint sealing compound shall not adhere to concrete if curing compound is present.

The depth of sawed longitudinal or transverse contraction joints shall be a minimum of 1/3 of the pavement thickness.

The concrete saw shall be powered adequately to perform the required cutting. It shall cut a uniform plane to the required depth and not less than 1/8 inch nor more than 1/4 inch in width. The Contractor will be expected to arrange his schedule of sawing joints, including initial sawing, at the required intervals so that every possible effort is made to control cracking by the use of judiciously spaced and timed sawed joints. In the event random cracks occur, they shall be repaired to the satisfaction of the Engineer. The Contractor shall provide at least one saw blade in good working order for lateral continuous sawing as specified regardless of any breakdowns of equipment.

5-05.3/309 CONTRACT JOWNTS

In laydown of concrete, the joints shall be placed as shown on drawings where required by the Engineer. The joint alignment must be at right angles to the pavement center line and the joint shall be continuous across the slab to each edge. It shall then be filled level with the pavement surface with joint sealing meeting the requirements of Sections 5-05.92(L).

The joint sealant material shall be heated and placed in complete accordance with the manufacturer's instructions. Burned material will be rejected. The through joint groove shall be dry at the time of pouring the sealing compound.

5-05.3/30J JOINT LOCATION

5-05.3/30R TRANSVERSE JOINTS

Standard spacing of transverse contraction joints along straight sections of roadway between expansion joints or between intersections or other irregular areas, shall be at intervals of 15 feet across the full width of the pavement at the right angles to the center line of roadway. Where the spacing between through expansion joints are not in even multiples of 15 feet for transverse joints, the best several spaces approaching the expansion joint or header shall be varied by shortening the spaces, as directed by the Engineer. On horizontal curves the spacing of 15 feet shall be doubled on the edge of the pavement and at right angles to the center line.

When paving adjacent to existing pavement, joints shall be placed to match joint locations in the existing pavement. Where the existence of existing pavement is not known, intermediate transverse joints shall be constructed when directed by the Engineer.

For intersections and other irregular areas, the arrangement of expansion joints shall be made to conform with standard intersection patterns, or as directed by the Engineer. Where lines of any one irregular pattern formed by contraction joints in intersections shall not exceed 25 square feet and the greatest dimensions thereof shall not exceed 12 feet.

When paving a second lane adjacent to the previously paved lane, the contraction joints shall be matched with the former, except on the edge where the least dimension between transverse joints of the resultant panel would be less than 12-1/2 feet.

Where uncontrolled cracks are existing in the first lane, they shall not be matched with the companion slabs in the second lane. Should the uncontrolled cracks in the existing paved lane be too frequent or in random locations and their direction in the second lane not in conformity with the new joints, then in such cases the two lanes shall be completely separated by 3-inch joint material extending from the surface to one inch below the bottom of the concrete being placed. Reinforcing steel, or other approved joint material, may be required by the Engineer in lieu of the 3-inch joint material to control cracking, cracks in the new pavement.
CEMENT CONCRETE PAVEMENT

The finishing machine shall be moved over the pavement as many times as necessary to give the pavement a smooth finish, typically with the finishing machine on the densest area of the course to correct any minor surface irregularities. Finishing operations are subject to strict control by the Engineer, and shall be performed to his satisfaction.

5-05.3.11D EDGING
Before the final finishing is completed and before the concrete has set, the final edge will be edged as indicated below:

5-05.3.11E FINAL FINISH
The pavement surface, after edging, shall be given a uniform, gritty texture true in grade and cross-section. The final finish shall be accomplished by one of the methods described hereon, or as otherwise directed by the Engineer to achieve the specified surface texture.

5-05.3.11F CURING
The concrete shall be cured at least 14 days in contact with the pavement and the width of the pavement subdivision shall be dugged around over the pavement surface. The turfing drag shall be wet and clean in use. The turfing drag shall be left on the pavement surface between dragging operations.

5-05.3.11G BREAK FINISH
After edging, the pavement shall be broomed transversely with a fiber or wire brush of a type approved by the Engineer.

5-05.3.11H CONCRETE FINISHING
Concrete shall be cut in accordance with the following methods of finishing:

5-05.3.11J CURING METHODS
5-05.3.11J.1 GENERAL
Immediately after the finishing operations have been completed, the wet concrete shall be covered and protected against exposure to the weather as follows:

5-05.3.12 SURFACE SMOOTHERNESS
The surface smoothness shall be checked with a straightedge 10 feet long, mounted on a long handle to permit the smoothness inspector to remain at a distance of more than 5 feet from the surface of the pavement. The inspector shall be placed in one position. At the conclusion of the finishing operation, the surface of the pavement shall not vary by more than 1/16 inch in 10 feet on any section of the course tangent to the centerline, and not more than 1/8 inch in 10 feet on any section of the course transverse to the centerline. In all cases the 1/16 inch shall be in the direction parallel to the centerline. The transverse slope of the finished pavement shall be uniform to a degree that no variation in elevation shall exceed 1/16 inch is present when tested with a 10 foot straight edge laid in a direction perpendicular to the center line.

In no case shall the grade in the gutter be such that it will allow pooling of water. If the surface smoothness of the pavement after curing is found to exceed the tolerance permitted, the high spots shall be ground until they meet tolerances. If the surface tolerances cannot be met satisfactorily by grinding, the pavement shall be removed and be replaced in conformity with theSpecifications.

When cement concrete pavement abuts bridges or other pavement constructed under another contract, the finished pavement parallel to the bridge rails shall be finished to a grade equal to that at various points, exclusive of the day the concrete is placed, or until the pavement is in contact with the bridge. The various spaces, exclusive of the day the concrete is placed, shall be used. Use of equipment or methods which do not meet these standards shall be discontinued until the Contractor can revise and demonstrate changes in construction operations that will meet the requirements of the Specifications.

5-05.3.13 CURING
5-05.3.13A CURING PERIOD
Regardless of the curing method used, the Contractor shall maintain the curing protection and prevent water damage from any cause for at least 14 days or until the concrete has attained a compressive strength of the various mixtures, exclusive of the day the concrete is placed, or until the pavement is in contact with the bridge rail.

Type II Portland Cement Concrete Pavement
High-Early-Strength Cement Concrete Pavement

5-05.3.13B CURING METHODS
5-05.3.13B.1 GENERAL
Immediately after the finishing operations have been completed and the pavement is covered and protected, the final finishing and edging shall be accomplished as follows:

5-05.3.13B.2 GENERAL
All curing materials shall be free of all substances which are considered to be hazardous to health or injury. Any curing materials placed in or on the surface of the pavement directly underneath the curb section shall be covered with a protective cover to protect that area from the curing agent when the pavement is unopened.

5-05.3.14 CURING
5-05.3.14A CURING PERIOD
Regardless of the curing method used, the Contractor shall maintain the curing protection and prevent water damage from any cause for at least 14 days or until the concrete has attained a compressive strength of the various mixtures, exclusive of the day the concrete is placed, or until the pavement is in contact with the bridge rail.

Type II Portland Cement Concrete Pavement
High-Early-Strength Cement Concrete Pavement

5-05.3.14B CURING METHODS
5-05.3.14B.1 GENERAL
Immediately after the finishing operations have been completed and the pavement is covered and protected, the final finishing and edging shall be accomplished as follows:

5-05.3.14B.2 GENERAL
All curing materials shall be free of all substances which are considered to be hazardous to health or injury. Any curing materials placed in or on the surface of the pavement directly underneath the curb section shall be covered with a protective cover to protect that area from the curing agent when the pavement is unopened.

5-05.3.14C CURING
5-05.3.14C.1 GENERAL
Immediately after the finishing operations have been completed and the pavement is covered and protected, the final finishing and edging shall be accomplished as follows:

5-05.3.14C.2 GENERAL
All curing materials shall be free of all substances which are considered to be hazardous to health or injury. Any curing materials placed in or on the surface of the pavement directly underneath the curb section shall be covered with a protective cover to protect that area from the curing agent when the pavement is unopened.

5-05.3.14D CURING
5-05.3.14D.1 GENERAL
Immediately after the finishing operations have been completed and the pavement is covered and protected, the final finishing and edging shall be accomplished as follows:

5-05.3.14D.2 GENERAL
All curing materials shall be free of all substances which are considered to be hazardous to health or injury. Any curing materials placed in or on the surface of the pavement directly underneath the curb section shall be covered with a protective cover to protect that area from the curing agent when the pavement is unopened.

5-05.3.14E CURING
5-05.3.14E.1 GENERAL
Immediately after the finishing operations have been completed and the pavement is covered and protected, the final finishing and edging shall be accomplished as follows:

5-05.3.14E.2 GENERAL
All curing materials shall be free of all substances which are considered to be hazardous to health or injury. Any curing materials placed in or on the surface of the pavement directly underneath the curb section shall be covered with a protective cover to protect that area from the curing agent when the pavement is unopened.

5-05.3.14F CURING
5-05.3.14F.1 GENERAL
Immediately after the finishing operations have been completed and the pavement is covered and protected, the final finishing and edging shall be accomplished as follows:

5-05.3.14F.2 GENERAL
All curing materials shall be free of all substances which are considered to be hazardous to health or injury. Any curing materials placed in or on the surface of the pavement directly underneath the curb section shall be covered with a protective cover to protect that area from the curing agent when the pavement is unopened.

5-05.3.14G CURING
5-05.3.14G.1 GENERAL
Immediately after the finishing operations have been completed and the pavement is covered and protected, the final finishing and edging shall be accomplished as follows:

5-05.3.14G.2 GENERAL
All curing materials shall be free of all substances which are considered to be hazardous to health or injury. Any curing materials placed in or on the surface of the pavement directly underneath the curb section shall be covered with a protective cover to protect that area from the curing agent when the pavement is unopened.

5-05.3.14H CURING
5-05.3.14H.1 GENERAL
Immediately after the finishing operations have been completed and the pavement is covered and protected, the final finishing and edging shall be accomplished as follows:

5-05.3.14H.2 GENERAL
All curing materials shall be free of all substances which are considered to be hazardous to health or injury. Any curing materials placed in or on the surface of the pavement directly underneath the curb section shall be covered with a protective cover to protect that area from the curing agent when the pavement is unopened.

5-05.3.14I CURING
5-05.3.14I.1 GENERAL
Immediately after the finishing operations have been completed and the pavement is covered and protected, the final finishing and edging shall be accomplished as follows:

5-05.3.14I.2 GENERAL
All curing materials shall be free of all substances which are considered to be hazardous to health or injury. Any curing materials placed in or on the surface of the pavement directly underneath the curb section shall be covered with a protective cover to protect that area from the curing agent when the pavement is unopened.

5-05.3.14J CURING
5-05.3.14J.1 GENERAL
Immediately after the finishing operations have been completed and the pavement is covered and protected, the final finishing and edging shall be accomplished as follows:

5-05.3.14J.2 GENERAL
All curing materials shall be free of all substances which are considered to be hazardous to health or injury. Any curing materials placed in or on the surface of the pavement directly underneath the curb section shall be covered with a protective cover to protect that area from the curing agent when the pavement is unopened.
CEMENT CONCRETE PAVING

0-503.3(1)(B) WHITE PIGMENTED CURING COMPOUND

White pigmented curing compound meeting the requirements of Section 92.3 shall be applied to the entire 2 inch exposed surface of the concrete with an approved mechanical spray machine. The spray fog shall be protected from wind and direct sunlight by an adequate shield. It shall be applied uniformly at a rate of one gallon to more than 120 square feet.

The compound shall be applied with equipment of the pressure tank or pump type equipped with a feed tank agitator which ensures continuous agitation of the compound during spraying operations. The nozzle shall be of the low pressure type with a spray pattern to properly contain the compound.

The curing compound shall not be applied during or immediately after rainfall. If it becomes necessary to have the pavement uncovered in order to distribute the curing compound, the pavement shall be covered with polyethylene sheeting which shall remain in place until weather conditions are favorable for the application of the curing compound.

In the event that risks fall on the newly coated pavement before the film has dried sufficiently to resist damage, or in the event of damage to the film from any cause, the Contractor shall apply a new coat of curing compound in one or two applications to the affected area at the rate which, in the opinion of the Engineer, will result in a film of curing which is equivalent to that specified in the original coat.

2. Consistency of curing compound shall be distributed on the job in a manner to enable the Engineer to determine the rate of application being used at any time. All curing compound placed in the spray tanks shall be withdrawn directly from the manufacturer's original containers bearing the manufacturer's name, brand, and lot number.

3. If the curing compound in the spray tank, shall be thoroughly agitated by means of compressed air or equivalent means by the equipment used in the original containers are uniformly suspended. The compound shall not be permitted to settle at any time.

4. The compound shall be applied at the rate of 1 gallon per 120 square feet. The compund shall be applied uniformly to the asphalt or concrete base or the entire length of the lane.

5. The compound shall be applied immediately after the concrete has been finished and before any other operations are commenced. The surface shall be free of dirt, dust, and any other material that may interfere with the curing compound.

6. The compound shall be applied with equipment of the pressure tank or pump type equipped with a feed tank agitator which ensures continuous agitation of the compound during spraying operations. The nozzle shall be of the low pressure type with a spray pattern to properly contain the compound.

7. The curing compound shall not be applied during or immediately after rainfall. If it becomes necessary to have the pavement uncovered in order to distribute the curing compound, the pavement shall be covered with polyethylene sheeting which shall remain in place until weather conditions are favorable for the application of the curing compound.

8. In the event that risks fall on the newly coated pavement before the film has dried sufficiently to resist damage, or in the event of damage to the film from any cause, the Contractor shall apply a new coat of curing compound in one or two applications to the affected area at the rate which, in the opinion of the Engineer, will result in a film of curing which is equivalent to that specified in the original coat.

9. Consistency of curing compound shall be distributed on the job in a manner to enable the Engineer to determine the rate of application being used at any time. All curing compound placed in the spray tanks shall be withdrawn directly from the manufacturer's original containers bearing the manufacturer's name, brand, and lot number.

10. If the curing compound in the spray tank, shall be thoroughly agitated by means of compressed air or equivalent means by the equipment used in the original containers are uniformly suspended. The compound shall not be permitted to settle at any time.

11. The compound shall be applied at the rate of 1 gallon per 120 square feet. The compund shall be applied uniformly to the asphalt or concrete base or the entire length of the lane.

12. The compound shall be applied immediately after the concrete has been finished and before any other operations are commenced. The surface shall be free of dirt, dust, and any other material that may interfere with the curing compound.

CEMENT CONCRETE PAVING

0-503.3(14) COLD WEATHER WORK

When the air temperature is expected to reach the freezing point during the day or night and the pavement has not cured for 50 percent of the time specified in Section 505.3(3A), the concrete shall be protected from freezing. The Contractor shall provide additional protective measures for the concrete. A ready mix concrete manufacturer shall be responsible for the quality and strength of the concrete cured. Any concrete injured by frost action or freezing shall be removed and replaced by the Contractor in accordance with the specifications.

0-503.3(15) CONCRETE PAVEMENT CONSTRUCTION IN ADJACENT LANES

Refer to Section 505.3(3A).

0-503.3(16) PROTECTION OF PAVER

The Concrete Paver shall be protected from the pavement and its environment by any damage. Protection shall include the paver from exposure to the weather or any other conditions that may impair the performance or quality of the concrete. The concrete shall be protected from moisture and any other conditions that may impair the performance or quality of the concrete.

0-503.3(17) OPENING PAVEMENTS TO TRAFFIC

Unless otherwise approved in writing by the Engineer, the Contractor shall not open new concrete constructed and cured concrete pavement to traffic, including construction equipment, until a minimum period of 24 hours from the time the pavement has cured. The concrete pavement shall be protected from moisture and any other conditions that may impair the performance or quality of the concrete.

0-503.3(18) BRIDGE APPROACH SLABS

The reinforced concrete bridge approach slabs shall be constructed at the locations shown in the Drawings or as stated by the Engineer and in accordance with the Contract Documents.

The approach slabs shall conform to the requirements of Section 540 except that the concrete shall be Class A mix conforming to the requirements of Section 602, and may be accepted by any method. The approach slabs shall be cast in accordance with the contract documents.

The finished and cured bridge approach slabs shall be free from any deviation exceeding 2/16 inch under a 3/8 inch scale surface and parallel to the centerline of the approach slabs. The face of the slab shall be smooth and free from any deviation exceeding 2/16 inch under a 3/8 inch scale surface. The face of the slab shall be free from any deviation exceeding 2/16 inch under a 3/8 inch scale surface. The face of the slab shall be smooth and free from any deviation exceeding 2/16 inch under a 3/8 inch scale surface.

0-503.3(20) UNFINISHED CONCRETE PAVEMENT

Concrete pavement, which is intended as a base for an asphalt wearing course, shall be constructed to all requirements of Section 505 with the following exceptions:

(a) The surface of the concrete base shall be 10 feet long. The surface of the concrete base, if base compacted, may be 12 feet long and shall be compacted to an elevation as determined by the Engineer.

(b) The concrete shall be protected from scouring and abrading by operators, trucks, and other construction equipment on mats, tiles, or other protective devices approved by the Engineer. Accumulation of sand, gravel, stones, or other debris on the new pavement shall be removed daily. Concrete pavement protected from scouring and abrading by operators, trucks, and other construction equipment on mats, tiles, or other protective devices approved by the Engineer.

(c) Contraction joints shall be constructed as follows:

(1) A weakened plane shall be made in the concrete pavement every 15 feet to match existing concrete pavement as designed by the Engineer.

(2) The weakened plane shall be protected with a joint cover to a minimum depth of 2 inches.

(d) Bridge approach slabs shall be cut by the Engineer with a joint cover to be placed completely through the curbs at the point where the weakened plane intersects the curb.
5-05 CEMENT CONCRETE PAVING

5-05.52(21) SIDE FORMS

When specified or approved by the Engineer, side forms may be used for pavement construction.

Side forms shall be a height of not less than the specified depth of pavement, and thickened edge where applicable, and shall be of ample strength to resist deformation. They shall be provided with adequate devices for secure setting so that when in place they shall withstand, without visible sagging or settlement, the weight, impact, and vibration of the finishing machines. The forms shall be free from warps, bends, or kinks.

Forms shall be drilled in advance of being placed to take advantage for bars where these are specified.

Forms shall remain in place at least 12 hours after the concrete has been placed and shall be cleared and oiled each time they are used. Curing compound shall be applied to the concrete immediately after the forms are removed.

The alignment and grade conditions of the forms shall be checked and the necessary corrections made by the Contractor immediately before placing the concrete. When any form has been disturbed or any subordinate bearer has become unstable, the form shall be green and recontoured.

Forms may be of wood or metal or any other material at the option of the Contractors, provided the forms as constructed result in a pavement of specified thickness, cross section, grade, and subgrade.

Forms shall be adequately supported to prevent deflection or movement and will result in concrete pavement conforming with the Drawings and Specifications. The top of the forms above the finished grade shall not be more than 1/4 inch in 10 feet and the alignment of forms shall be within 1/4 inch in 10 feet. The forms shall be of sufficient height to support concrete in any event of a unforeseeable overload, and the concrete is sufficiently set to withstand removal without danger of distortion or warping. When forms are removed the expansion of the concrete will contract, the edges of the concrete shall be smooth, and the forms shall be prepared for curing compound. All forms shall be cleared, oiled, and examined for defects before they are used again.

5-05.52(22) REMOVAL OF DEFECTIVE PAVEMENT SLABS

Broken slabs, random cracks, awarowing cracks, slabs with displaced joints, cracks and spalls along joints, or slabs that have been replaced or repaired as specified and shall be accomplished in such a manner as to eliminate disturbance to the serviceable pavement behind.

Pavement slabs containing multiple cracks through the full depth of the slab, separating the slab into two or more parts shall be entirely removed and replaced. Pavement slabs containing single diagonal cracks intersecting the transverse and longitudinal joints within 1/2 inch of the width and length of the slab from the corner shall be removed by replacing the smaller portion of the slab.

When constructing and finishing cement concrete pavement, the Engineer may, on a case by case basis, require the Contractor to place additional concrete over the surface of the existing pavement or to make other repairs to abating private property. Such extra concrete shall be placed and compacted to the thickness and direction specified by the Engineer. Additional thickness for such ramps shall not exceed 3 inches above the original planned concrete surface at any point.

5-05.52(23) EDGE AND SUPPORT WALL

Where shown on the Drawings, the Contractor shall construct the edge as detailed on Standard Plan No. 402, the support wall as detailed on Standard Plan No. 800, except that the ally wall shall be placed to the face of the curb. After removal of forms, all lips and edges where form boards have met shall be removed with a sharp tool or stone. Blocks or concrete slabs and the holes filled with 1/2 mortar and dusted to an even upholstered condition. If in

the opinion of the Engineer a satisfactory surface has been obtained, no further finishing shall be done. If, however, the surface is not considered satisfactory, the surfaces shall be thoroughly washed with water and a 1:1 mortar applied with brush and rolled into the surface. The heels and edges after the initial set, the surface shall be rapped with a dump sack.

5-05.52(23) CURB WALL

Curb wall shall be constructed as indicated on Standard Plan No. 801. Deformed steel bars shall be in accordance with ASTM Designation A615 Grade 60.

5-05.52(24) CONCRETE UNDERPINNING

Where designated by the Engineer, existing concrete foundation left above grade shall be supported with concrete underpinning.

5-05.52(25) WATER

Water for pavement construction will be furnished as provided in Section 4.07. Refer to Section 4.05.

5-05.54 MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured as provided in Section 4.05.1. Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein this Section.

Measurement for pavement or pavement base will be by the square yard of concrete in place, including the area underneath curbs. No deduction will be made for cuttings in pavement.

Measurement for thickness edge will be by the linear foot as measured along the edge at any point outside the kerf. Thickness of concrete underlining will be by cubic yard placed as computed by the Engineer.

Reinforcing steel shown on the Standard Plans and required for ties of the pavements, slabs on curb, and curbs and gutters, and around castings will not be measured.

Measurement for edge wall, support wall and curb wall will be per cubic yard of concrete based on net lines indicated on the Standard Plan.

Steel required for pavement reinforcement as specified in Section 5.05.20(2) will be measured by the pound of steel reinforcement in place.

Measurement for pavement compound for all construction will be in accordance with Section 5.04.

5-05.55 PAYMENT

Compensation for the cost necessary to complete the work described in Section 5.05 will be made at the unit contract prices listed below for the pay items listed or referenced below:

1. Curbwall, Cement Concrete (Class), HES, Thickness,* per cubic yard.
2. Curbwall, Cement Concrete (Class), HES, Thickness,* per linear foot.
3. Sidewalk, Concrete Concrete (Class), HES, Thickness,* per linear foot.
4. Sidewalk, Thickness Edge (18 inch x 3 inch) per linear foot.
5. Underlining, Cement Concrete (CL 5.0 4.0), per cubic yard.
6. Wall, Cement Concrete, Edge, Type 403, per cubic yard.
7. Wall, Cement Concrete, Support, Type 806, per cubic yard.
8. Wall, Cement Concrete, Type 801, per cubic yard.
9. Steel Reinforcing Bar, Grade 46, per pound.

The unit contract price for "Pavement, Cement Concrete (Class), Thickness" and "Pavement, Cement Concrete (Class), HES, Thickness," and "Pavement Base, Cement Concrete (Class), Thickness," shall include all costs for the work of the specified class and thicknesses of pavement, including construction joints, contraction joints, through joints, saw cutting, keyways, cutting, removing, and installing when required, see bars and dowels bars as specified in Section 5.05.30(1).

All costs for temporary pavement marking work as specified in Section 5.05.30(7) shall be included in the unit contract price bid for "Pavement, Cement Concrete (Class), Thickness."

The unit contract price for "Pavement, Thickness Edge (18 inch x 3 inch)") shall include all costs for the work required to construct the thickness edge including the concrete.

The unit contract price for "Underlining, Cement Concrete (Class), CL 5.0 4.0") shall include all costs for the work required including furnishing and placing the underlining and reinforcing steel and excluding reinforcing.

The unit contract price for "Wall, Cement Concrete, Edge, Type 403") shall include all costs for the work required to construct the wall as shown on the Drawings and as specified. Excavation for the edge wall shall be considered incidental to the wall and no separate payment will be made.

The unit contract price for "Wall, Cement Concrete, Support, Type 806") shall include all costs for the work required to construct the wall as shown on the Drawings and as specified. Excavation for the edge wall shall be considered incidental to the wall and no separate payment will be made.

The unit contract price for "Steel Reinforcing Bar, Grade 46") shall include all costs for the work required to install the reinforcing steel as specified in Section 5.05.20(3).

Steel required for construction if the concrete is reinforced the Engineer shall be required to consider incidental to the wall and no separate payment will be made.

The unit contract price for "Steel Reinforcing Bar, Grade 60") shall include all costs for the work required to install the reinforcing steel as specified in Section 5.05.20(3).

Steel required for pavement reinforcement as specified in Section 5.05.20(2) shall be measured by the pound of steel reinforcement in place.

The unit contract price for "Steel Reinforcing Bar, Grade 50") shall include all costs for the work required to install the reinforcing steel as specified in Section 5.05.20(3).

Steel required for pavement reinforcement as specified in Section 5.05.20(2) shall be measured by the pound of steel reinforcement in place.

The unit contract price for "Steel Reinforcing Bar, Grade 60") shall include all costs for the work required to install the reinforcing steel as specified in Section 5.05.20(3).

Steel required for pavement reinforcement as specified in Section 5.05.20(2) shall be measured by the pound of steel reinforcement in place.

All costs for the work required to repair defective pavement slabs as specified in Section 5.05.22(2) shall be the responsibility of the Owner.

5-06 VACANT

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SECTION 5-07 PAVEMENT PATCHING

5-07.1 DESCRIPTION

This work shall consist of the patching of various types of pavement and the performance of which shall be in accordance with these Specifications and as shown on Standard Plan No. 604 and 406.

5-07.2 MATERIALS

All materials shall conform to the requirements specified for material in other sections of these Standard Specifications, such as Sections 402 and 506.

Asphalt concrete pavement patch shall be Class B meeting the requirements of Section 5-04.

Asphalt for temporary pavement patch shall be MC 250 meeting the requirements of Section 5-04. Mineral aggregate used in the MC 250 asphalt concrete mix shall meet the same requirements as the aggregates used in Asphalt Concrete Class B.

Cement concrete pavement patch shall be Class 6.5 (1-1/2) H.E.S. meeting the requirements of Section 5-04.

Crushed rock for surfacing and shoulders shall meet the requirements of Mineral Aggregate Types 1 and 2 in accordance with Section 5-02.

5-07.3 CONSTRUCTION REQUIREMENTS

5-07.3(1) GENERAL

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.

The placing and compaction of the trench backfill, and the preparation and compaction of the subgrade shall be in accordance with the requirements of the various applicable sections of these Specifications.

Before the patch is constructed all pavement cuts shall be braced so that the marginal lines of the patch will form a rectangle with straight edges and vertical faces. The use of a concrete saw will not be required unless so indicated in the Project Manual.

The class of concrete used in patches will depend upon the urgency of opening the street to traffic. The class of concrete shall be as specified in the Project Manual. Cutting concrete as specified in Section 5-05.3(10) shall be placed on the concrete immediately after finishing.

Proper signs, barricades, lights and other warning devices, as may be required by the Engineer, shall be maintained all 24 hours of the day until the patch is completed and ready for traffic.

On all public works contracts, the Contractor shall perform all work required to backfill the excavations made under existing pavements and to restore pavement cuts with patching in accordance with these Specifications unless otherwise provided in the Project Manual.

Compaction of the subgrade shall be completed prior to the required patching. Compaction shall be to 98% maximum density as determined by the methods specified in Section 3-03.3(0).

5-07.3(2) CEMENT CONCRETE PATCHING

After the subgrade for the pavement has been constructed and compacted to line and grade, the cement concrete pavement patch shall be placed, compacted and struck off to the grade of the adjacent pavement in accordance with the permanent provisions of Patching Section 5-04. Through joints, dummy joints shall be placed and edge directed. The surface shall be finished and brushed with a fiber broom.

Approved curing compound shall be placed on the finished concrete immediately after finishing.

5-07.3(2) CEMENT CONCRETE PAVING RESURFACED WITH ASPHALT CONCRETE

Streets which have rigid type pavements surfaced with asphalt concrete shall be patched as shown on Standard Plan No. 604 and 406, or as otherwise specified. The cement concrete portion of the patch shall be Class 6.5 (1-1/2) H.E.S. The thickness shall match the existing rigid base or 9 inches, whichever is greater. The top surface of the concrete shall match the top surface of the existing rigid base; in no case shall the top of the concrete be higher than the top of the existing rigid base. Brush finishing will not be required. Joints shall be placed if directed by the Engineer. Curing shall be accomplished with STEI asphalt emulsion diluted with water as directed by the Engineer.

Asphalt concrete or bituminous mix shall not be placed until 3 days after the cement concrete has been placed unless otherwise permitted by the Engineer. The edges of the existing asphalt pavements and cuttings shall be pointed with STEI special tack emulsion immediately before placing the asphalt patching material. The asphalt concrete pavement shall then be placed, leveled, and compacted to conform to the adjacent paved surface. Immediately thereafter, all joints between the new and original asphalt pavement shall be pointed with STEI asphalt emulsion and be covered with dry paving sand before the asphalt emollients. Tackling and sealing of asphaltic concrete shall be in accordance with the requirements of Section 5-04.

5-07.3(2) ASPHALT CONCRETE ON GRANULAR BASE

After the subgrade has been prepared as shown on Standard Plan No. 604 and 406 and compacted as directed by the Engineer, asphalt concrete pavement Class B or Class F shall be placed to a thickness of 4 inches, not less than the existing pavement depth, or to a minimum of 2 inches, whichever depth is the greater, and compacted as specified in Section 5-07.2(0).

Restoration of asphalt concrete roadway pavement on granular base (non-rigid pavement) shall consist of Mineral Aggregate Type 1 and 2, to a compacted depth of 6 inches consisting of a 6-inch top course of Mineral Aggregate Type 1 placed on a 4-inch base course of Mineral Aggregate Type 2. Pavement, Asphalt Concrete C I 8", shall be compacted to a thickness equal to the thickness of the adjacent pavement or 2 inches, whichever is greater.

Restoration of MC 250 granular roadways, or seal coats, on a granular base shall consist of "Mineral Aggregate Type 2" to a compacted thickness of 3/4 inch. "Pavement, Asphalt Concrete C I 8", shall be compacted to a thickness of 3 1/2 inches. Restoration of asphaltic driveways shall be the same as specified above for MC 200 pavements.

All shoulders on speed roads, disturbed during the course of construction, shall be restored with bituminized and placing of Mineral Aggregate Type 1, to a compacted thickness of 2 inches and width up to 4 feet as directed by the Engineer. Only crushed rock shoulder shall be used in the shoulders.

5-07.3(3) INTERSECTION ROADWAY SURFACES

Existing crushed rock surfacing shall be restored with Mineral Aggregate Type 1, to a compacted depth of 4 inches within the trench as directed by the Engineer. Finishing shall be constructed as specified in Section 5-04.3(2).

Payment for "Pavement, temporary asphalt" shall include reimbursement for removal of temporary asphalt patches and shoulders.

The costs for additional MC 250 and crushed surfacing material required to maintain temporary pavement patches after the initial installation shall be borne by the Contractor.
SECTION 6-01 GENERAL REQUIREMENTS

6-01.1 DESCRIPTION
This section shall consist of work relating to structural and incidental items used in any or all types of existing or proposed structures. These provisions supplement the detailed Specifications supplied for any given structure. These provisions apply only when relevant and when they do not conflict with the Drawings or Project Manual.

6-01.2 FOUNDATION DATA
Foundation data, when shown in the Drawings or Project Manual, have been obtained from test boring, test pits or other sources and were obtained only to guide the Engineer in planning and designing the project. These data reasonably represent the best information available to the Engineer concerning conditions and materials at the locations actually noted at the test sites at the time the investigations were made.

6-01.3 CLEARING THE SITE
The Contractor shall clear the entire site of the proposed structure to the limits shown by the Engineer and in accordance with Section 6-02.

6-01.4 APPEARANCE OF STRUCTURES
To achieve a more pleasing appearance, the Engineer may require the Contractor to adjust the height and alignment of bridge railings, barriers, and structural details.

6-01.5 ERECTION METHODS
Before beginning to erect any steel structure, and/or prestressed concrete structure, the Contractor shall provide the Engineer with a plan describing the methods he intends to use. (The Drawings or Project Manual may require a similar plan for other structures.) The erection procedure shall be determined by the fabricator prior to being submitted to the Engineer.

The plan shall provide complete details for all steps of the erection process. For example, complete details would include on drawings the length and distance from beam, tying, gusset, deadend, lifting devices and attachments to the bridge members, sequences in erection, location of beams and gussets, crane capacities, locations of lifting points on bridge members, and weights of bridge members.

If a method requires drawings to describe it clearly, the Contractor must include them in the plan. These drawings shall be prepared by or under the direction of a Professional Engineer, licensed under Title 15 SCW, State of Washington, and shall be in accordance with the drawings. The drawings shall note all assumptions, dimensions, material properties, and other data used in making the structural analysis. The Contractor shall provide copies of design calculations for approval. Any material detail retained to the Contractor for correction shall be resubmitted to and approved by the Engineer before construction begins.

The plan and detail drawings shall be submitted for approval as prescribed in Section 6-02.

6-02.2 CONSTRUCTION REQUIREMENTS

6-02.2.3 CONSTRUCTION FEATURES

To ensure that beams shall be notched and notched, the Contractor shall obtain all cement for the structure from the same manufacturer as used in the drawings. The Engineer will require the Contractor to provide plans that include the details and specifications of the notched joints.

6-02.1 PREMIXED JOINT FILLER

When the Drawings call for premixed joint filler, the Contractor shall furnish it with details of tests of the joint filler, and tested samples of the joint filler as required by the Engineer. If the Engineer requires the Contractor to furnish any of the abovementioned materials, he shall be responsible for their quality and performance.

6-02.2.1 CONSTRUCTION MATERIALS

The following materials shall be used in the construction of the structure in accordance with the Specifications:

- Concrete
- Steel
- Wood
- Masonry
- Brick
- Stone

6-02.2.2 PROPORTIONING MATERIALS

6-02.2.3(2) GENERAL

The Bridge design strength for each class of concrete listed in Section 6-02.2(3) is shown below. The Contractor shall use the same or equivalent proportions for construction, but he shall not exceed the amounts shown below. The table below also provides a guideline for concrete with specified gravity of 2.57 or 2.14 for the aggregate. The weight of the mix shall be such as to be used per cubic yard of concrete. Actual amounts may vary from those shown, because the Engineer will adjust the mix to correct for actual batch specific gravity, moisture content, or may require proper consistency, workability, and correct cement content.

6-02.2.3(3) CLASS OF CONCRETE

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
<th>Proportioning</th>
<th>Specific Gravity</th>
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<td>A</td>
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<td>2.57</td>
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<tr>
<td>B</td>
<td>High Strength</td>
<td>0.62</td>
<td>2.14</td>
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<tr>
<td>C</td>
<td>Ultra High</td>
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</tr>
</tbody>
</table>

6-02.3 CONSTRUCTION REQUIREMENTS

6-02.3.1 CLASSIFICATION OF STRUCTURAL CONCRETE

Unless specified otherwise, the Contractor shall use Type II and/or Type V cement in all concrete. The concrete to be used in various parts of the structure is noted in the Drawings and generally follows these guidelines:

- Classes A: Used for internal structure, such as floors, walls, and ceilings.
- Classes B, C, D: Used for external structure, such as beams, columns, and arches.
- Classes E, F: Used for special applications, such as fireproofing or soundproofing.

6-02.3.2 CONCRETE STRUCTURES

- Class A: Used for internal structure, such as floors, walls, and ceilings.
- Class B: Used for external structure, such as beams, columns, and arches.
- Class C: Used for special applications, such as fireproofing or soundproofing.

6-02.3.3 CONCRETE MATERIALS

- Materials shall meet the requirements of the following Sections.

- Materials shall be used in accordance with the Specifications.
CONCRETE STRUCTURES

6-02.35(3) RETEMPERING
Concrete shall be mixed only in such quantities as are required for immediate use and shall be used while fresh batching material has taken place. Any concrete having initial set before placing and finishing shall be wasted and not used for the work. Re-working of concrete (combing with water or other materials) will not be allowed.

6-02.3(3) CONSISTENCY
Slump tests shall follow WPOT Test Method No. 804. For vibrated concrete, the maximum slump shall be 3 inches for all concrete except for columns, crossbeams, and diagonals. For vibrated concrete in columns, crossbeams, and diagonals, the maximum slump shall be 4 inches. The maximum slump for nonvibrated concrete shall be 7 inches.

If the right consistency cannot be achieved, a water-reducing admixture may be used provided the batch meets the slump limit and complies with proportions required in Section 6-02.3(2).

6-02.3(6) PLACING CONCRETE

6-02.3(6)(a) GENERAL
The Contractor shall not place concrete:
(a) On frozen or excessively ground or subgrade
(b) Against or on ice-coated forms, reinforcing steel, structural steel, conduits, precast members, or construction joints;
(c) Under rainy conditions; placing of concrete shall be stopped before the quantity of surface water is sufficient to affect or damage surface finish or cause a pond up or wash of the concrete surface.
(d) Any foundation until the Engineer has approved the depth and character;
(e) Until the Engineer has approved it and the placement of any reinforcing in it;
(f) In any area where vibration from nearby work (drilling or piling, etc.) may harm the concrete’s character;
(g) In any area where vibration makes the concrete have a compressive strength of at least 1,000 psi.

When a foundation excavation contains water, the Contractor shall pump it dry before placing. If this is impossible, an appropriate water barrier shall be placed that complies with Section 6-02.3(6)(b). This seal shall be thick enough to resist any splits.
All foundations and forms shall be maintained with water just before the concrete is placed. Any standing water on the foundation or in the form shall be removed.

The Contractor shall place concrete in the forms as soon as possible after placing (never later than 1 1/2 hours after the concrete is added to the mix). The concrete shall always be plastic and workable. For this reason, the Engineer may reduce the mix-time/place-time even further. Concrete placement shall be continuous, with no interruption longer than 20 minutes between adjoining layers. Each layer shall be placed and consolidated before the preceding layer takes initial set. After initial set, the forms shall not be jarred, and projecting ends of reinforcing bars shall not be disturbed.
In girder or walls, concrete shall be placed in horizontal layers 1 1/2 to 2 feet deep. Consolidation shall leave no line of separation between layers. In each part of a form, the concrete shall be deposited near its final position as possible.

Any method for placing and consolidating shall not segregate aggregates or displace reinforcing steel. Any method shall be approved by the Engineer and impervious concrete with smooth faces or exposed surfaces. Placement is not set before placing and finishing shall be wasted and not used for the work. Re-working of concrete (combing with water or other materials) will not be allowed.

To prevent aggregates from separating, the length of any concrete passing to transport concrete shall not exceed 500 feet. If the mix needs protection from sun or rain, the Contractor shall cover the belt.

Use of a concrete pump requires a reserve pump or other backup equipment at the site to prevent missed deadlines from breakdown.
If the concrete will drop more than 5 feet, it shall be conveyed through a hopper or other approved conduit.
If the form slopes, the concrete shall be leveled through approved conduit is kept from sliding down one side of the form. No aluminum conduits or trestles shall be used to pump or place concrete.

Below placing concrete for roads shall on steel plates, the Contractor shall release the falsework under the bridge and let the pump swing freely on its support. Concrete in flat slab bridges shall be placed in one continuous operation for each span or series of continuous spans.
Concrete for roadway slabs and the stems of beams or -beams shall be placed in separate operations if the stem of the beam or girder is more than 3 feet deep. First the beam or girder stem shall be filled to the bottom of the slab. Roadway slab concrete shall not be placed until enough time has passed to permit the earlier concrete to solidify (at least 12 hours). If stem depth is 2 feet or less, the Contractor may place concrete in one continuous operation if the Engineer approves. In this case, placing and finishing shall be completed during daylight.
Between expansion or construction joints, concrete in beams, girders, roadway slabs, piers, columns, walls, and traffic barriers, pedestrian barriers, etc., shall be placed in a continuous operation.
No traffic or pedestrian barriers shall be placed until after the roadway and sidewalks slabs are complete for the entire structure.
No concrete barriers shall be placed until the falsework has been released and the roadway slabs are complete. Concrete barriers shall not be placed until after the roadway slab has reached a compressive strength of at least 3,000 psi.

The Contractor shall construct traffic and pedestrian barriers by the slab method. However, the barrier may not extend more than 1/4 inch from the road surface. The Contractor shall maintain and keep in good repair the falsework that is part of the roadway slab.

If an unsatisfactory barrier is constructed, the Contractor shall not place the unsatisfactory barrier and take corrective action before proceeding.
When placing slabs under the roadway, the Contractor shall ensure that the road on the falsework remains symmetrical and uniform.

If the Engineer approves otherwise, arch rails in open spaned structures shall be placed in sections. Small key sections between large sections shall be placed after the large sections have struck.

6-02.3(6)(b) WEATHER AND TEMPERATURE LIMITS TO PROTECT CONCRETE
As is placed, the concrete shall not be exposed to the weather temperatures of 40 and 90 degrees F and shall never exceed 90 degrees F. To keep the concrete within this temperature range, the Contractor shall use one or more of these methods: shading or cooling aggregate piles (upholing these piles with water is not allowed); refrigerating mixing water; or replacing all or part of

6-02.35(5) CONCRETE STRUCTURES

The mixing water with crushed ice, provided the ice is completely melted by placing time.
If the concrete would probably exceed 90 degrees F using normal methods, the Engineer may require approved temperature-reduction measures taken before the placing begins.
If the temperature exceeds 90 degrees F, the Contractor shall use water spray or other approved methods to cool all concrete-contact surfaces to less than 90 degrees F. These surfaces include forms, reinforcing steel, steel beam flanges, and any others that touch the mix. Water-cooling admixtures shall be used to ensure compliance with slump and water quantity requirements.
The Contractor shall reduce the time between mixing and placing to a minimum and shall not permit mixer trucks to remain in the sun while waiting to discharge concrete. Cooler, conveyors, and pump lines shall be shaded.
If bridge roadway slabs are placed where air temperature exceeds 90 degrees F, the Contractor shall:
(a) Cover the top layer of reinforcing steel with clean, wet burlap immediately before concrete placement;
(b) Sprinkle cool water on the forms and reinforcing steel just before the placement if the Engineer requires it;
(c) Finish the concrete slab without delay; and
(d) Provide at the site water-immersion equipment to be used if needed after finishing to prevent plastic cracks.

When the evaporation rate at the concreting site is 0.20 pounds per square foot of surface per hour or more determined from Table 6-02.3(6)(c), the Contractor shall surround the fresh concrete with an enclosure. This enclosure shall protect the concrete from wind blowing across its surface until the curing compound is applied. If wetting deck concrete that is 80 degrees F or hotter, the Contractor shall install approved equipment to protect the surface from relative humidity and wind velocity.
The Contractor assumes all risks connected with the placing of concrete during cold weather. The Contractor shall provide a written procedure of cold weather concreting for the Engineer for review and approval. Permission given by the Engineer shall be set.

The Contractor shall provide all necessary equipment that will in no way prevent the Engineer from inspecting the work. The Contractor shall ensure acceptance of the work by the Owner. The Contractor shall perform all operations under such conditions prove unsatisfactory in any way, the Engineer shall have the right to reject the work although the plan and the work was carried out with his permission.

The Engineer may require the Contractor to provide and maintain a recording thermometer near the concreting site. During freezing or near-freezing weather, data from this thermometer shall be readily available to the Engineer.
The Contractor shall not mix nor place concrete while the air temperature is below 25 degrees F, unless the water or aggregates (or both) are heated to at least 70 degrees F. The aggregate shall not exceed 150 degrees F. If the water is heated to more than 150 degrees F, it shall be mixed with the aggregates before the cement is added. Any replacement and methods shall heat the materials evenly and shall not alter or prevent the required amount of air entrainment.
The Contractor may warm stockpiled aggregates with dry heat or steam, but not by applying flame directly or under direct contact. If the aggregates are in bins, steam or water coils or other heating methods may be used if aggregate quality is not affected. Live steam heating is not permitted on or through aggregates in bins. If using dry heat, the Contractor shall increase mixing time enough to permit the super-dry aggregates to absorb moisture.

Any concrete placed in air temperatures below 25 degrees F shall be immediately surrounded with a heated enclosure. Air temperatures within the enclosure shall be maintained between 20 and 90 degrees F and the relative humidity shall be above 80 percent. These conditions shall be maintained for a minimum of 7 days or the core period required by Section 6-02.3(6)(a), whichever is longer. The Contractor shall keep adding moisture 24 hours before removing the heat. Extra protection shall be provided for areas especially vulnerable to freezing (such as exposed top surfaces, corners and edges, this section, and concrete placed into steel forms).
If weather forecasts predict air temperatures below 35 degrees F during the 7 days just after the concrete placement, the Contractor may place the concrete only if he protects it by surrounding with a heated enclosure. Concrete shall not be placed on frozen ground or on already hardened or frozen forms.
6-02.306C **PLACING CONCRETE IN WATER**

If the4979Dor89352 require a concrete seal, the Contractor shall place the concrete underwater inside a watertight.collected, tube, or caisson. (No concrete other than that used for seals may be placed in or underwater.) Seal concrete shall be placed in a compact mass in still water. It shall remain undisplaced and in still water until fully set. While seal concrete is being deposited, water elevation inside and outside the caisson shall remain equal to prevent any flow through the seal in either direction. The caisson shall be vented at the vent elevation shown in the Drawings. The thickness of the seal is based upon this vent elevation.

The seal shall be at least 18-inches thick unless the Drawings show otherwise. The Engineer may change the seal thickness during construction which may require redesign of the footing and the pier shaft or column. Although seal thickness changes may result in the use of more or less concrete, reinforcing steel, and concrete, payment will remain as originally defined in unit contract prices.

To place seal concrete underwater, the Contractor shall use a concrete pump or tremie. The tremie shall have a hopper at the top that empties into a watertight tube at least 10 inches in diameter. The discharge end of the tube on the tremie or concrete pump shall include a device to seal out water while the tube is first filled with concrete. Tube supports shall permit the discharge end to move freely across the entire work area and to drop rapidly to slow or stop the flow. One tremie may be used to concrete an area up to 16 feet per side. Each additional tremie of this size requires one additional tremie.

Throughout the underwater concrete placement operation, the discharge end of the tube shall remain submerged in the concrete and the tube shall always contain enough concrete to prevent water from entering. The concrete placement shall be continuous until the work is completed, resulting in a seamless, uniform seal. If the concrete operation is interrupted, the Engineer may require the Contractor to prove by core drilling or other tests that the seal contains no voids or horizontal joints. If testing reveals voids or joints, the Contractor must repair them or replace the seal.

Concrete placed underwater shall be Class D or DX mix and shall be proportioned for a maximum slump of 7 inches. The length and width of sections of footing being poured shall not exceed 15 ft for each tremie-used.

6-02.306D **Dewatering Concrete**

After a concrete seal is constructed, the Contractor shall pump the water out of the caisson and place the rest of the concrete in the dry. This pumping shall not begin until the seal has set enough to withstand the hydrostatic pressure normally at least 3 days for greywater and at least 10 days for soils containing lignite. The Engineer may extend these waiting periods to ensure structural integrity or to meet a condition of the operating permit.

If weightless cells are used to maintain hydrostatic pressure at the bottom of the seal, the Contractor shall anchor them to the foundation seal. Any method used (such as down or keys) shall transfer the entire weight of the cell to the seal. Pumping from the inside of any foundation enclosure shall be done in a way that does not cause any change of concrete being carried away. No pumping shall be done during or for 24 hours after concrete placement unless done from a suitable pumping system separated from the concrete work by a watertight wall.

6-02.306E **Point of Acceptance**

Determination of concrete properties for acceptance will be made based on samples taken to most nearly represent the condition of the concrete as placed in the forms. Any placement system which, in operation, alters the specified properties of the concrete will require sampling at the discharge from the placement system.

It shall be the Contractor's responsibility to provide adequate and representative samples of the fresh concrete in a location designated by the Engineer for the testing of concrete properties and making of cylinder samples. Samples shall be provided as directed in Sections 106.1 and 106.2.

When mutually agreeable to the Owner and the Contractor, samples may be taken at a location other than the point of discharge. The alteration of concrete properties in passage through the placement system shall be recognized in analyzing results of such samples and in determining acceptance of the fresh concrete.

6-02.307 **Concrete Exposed to Seawater**

If sea water will contact a completed concrete structure, the Contractor shall:

(a) Mix the concrete for at least 2 minutes.
(b) Control water content to produce concrete that will be as impermeable as possible.
(c) Compact the concrete as the Engineer may require, avoiding the formation of any stone pockets.
(d) Place only clean, rust-free reinforcement bars in the concrete.
(e) Coat form surfaces heavily with oil and any approved form-release agent.
(f) Leave forms intact for at least 30 days after concrete placement (longer if the Engineer requires) to prevent sea water from contacting the concrete.
(g) Leave the surface of concrete as is when it comes from the forms.
(h) Provide special handling for any concrete plus used in sea water to avoid even slight contamination.
(i) Avoid sharp corners in concrete work.

The Engineer shall decide the range of disintegration possible by exposure to sea water. This range shall extend from a point below the level of extreme low tide up to a point above the level of extreme high tide. Wave action and other conditions will also affect the Engineer's decision on this range. Unless the Engineer approves otherwise, the Contractor shall not locate construction joints within this range. All concrete within this range shall be poured in the dry.

6-02.308 **Concrete Exposed to Alkaline Soils or Water**

The requirements for concrete in sea water shall also apply to concrete in an alkaline soils or water. In addition, the Contractor shall:

(a) Mix the concrete at least 30 days (longer if possible) before allowing soil or water to contact it directly.
(b) Vibrate each batch of concrete immediately after it has been placed in the forms, using enough vibrating tampers to do this effectively.
(c) Hand tamp, if necessary, to produce smooth, dense, outside.
6.02.3(3) VIBRATION OF CONCRETE

The Contractor shall supply enough vibrators to consolidate the concrete (except that placed underground) according to the requirements of this section. Each vibrator must:

(a) Be designed to operate while submerged in the concrete;
(b) Vibrate at a rate of least 7,000 pulses per minute, and;
(c) Receive the Engineer's approval on its type and method of use.

Immediately after concrete is placed, vibration shall be applied in the fresh batch at the point of deposit. In doing so, the Contractor shall:

(a) Space the vibrators evenly, no further apart than twice the radius of the effective radius of the vibration;
(b) Ensure that vibration intensity is great enough to visibly affect a mass of fresh slump concrete across a radius of at least 12 inches;
(c) Insert the vibrators slowly at a depth that will effectively vibrate the bottom of each form;
(d) Protect partially hardened (non-plastic) concrete by preventing the vibrators from penetrating it or making contact with steel that exists in it;
(e) Not allow vibration to continue in one place long enough to form pools of hardened concrete; and
(f) Continue vibration long enough to consolidate the concrete thoroughly, but not long enough to segregate it and allow the vibrators slowly when the process is complete.

6.02.3(10) ROADWAY SLABS

6.02.3(10)(A) GENERAL

(a) The Contractor shall have 5 to 10 working days before placing concrete to discuss construction details, selecting a joint, and equipment to be used. Those attending shall include:

- The Engineer
- The Project Engineer and his key inspection assistants.
- At least one person from the General Contractor, and
- At least one person from the Concrete Contractor, and
- At least one person from any additional contractor for road and for vertical concrete in the grade. The Contractor shall immediately adjust the machine if it fails to consolidate or smooth the concrete acceptably. If performance is not acceptable, the Engineer may reject the entire batch of concrete. The Contractor may use hand-operated strike-boards only when the Engineer approves the special conditions and equipment.

6.02.3(10)(B) CONCRETE STRUCTURES

(a) Keep both ends of the strike-board on the slab at all times during the process;
(b) Filling up to 18 inches of concrete in front of the cutting edge across the entire width of the placement apparatus before the apparatus is removed;
(c) Make smooth passes with the strike-board (without bouncing) from the cutting edge to the surface to create a surface that is true and ready for final finish; and
(d) Leave a 3/8 inch fillet of mortar on the concrete surface after the last pass of the strike-board.

Workers shall complete all post-screeding operations without walking on the concrete. This may require work bridges spanning the full width of the slab.

After removing the screed support, the Contractor shall:

- Fill the voids with concrete (not mortar).
- Remove the strike-board, and
- Float the surface with a wooden float to achieve a surface that does not vary more than 1/16 inch under a 10-foot straightedge. An edging tool shall be used to finish all sideward edges and expansion joints. The final surface shall have a granular texture that will not sink when wet.

6.02.3(10B) FINISHING BRIDGE APPROACH SLABS

The reinforced concrete bridge approach slab shall conform to the requirements of Section 9.06 except that the concrete shall be Class B mix. The finished and cured bridge approach slabs shall be finished by cutting a joint under a 10-foot straightedge placed parallel and perpendicular to the centerline of the roadway.

6.02.3(11) CEMENT CURBING

6.02.3(11)(A) GENERAL

After placement, concrete surfaces shall be cured as follows:

(a) Sidewalls, curb face, and curb top--cure with covering compound cured with white reflective type sheeting, or by use of existing surface, and
(b) Sidewalls and sidewalks and floors of substructures--cure with covering compound cured with white reflective type sheeting, or by use of existing surface.

The Contractor may provide continuous moisture by covering a curing blanket followed by wet burlap, or wet covering with a white reflective type sheeting, or by use of existing surface.

On slabs, the Contractor shall apply two coats of an epoxy (or equivalent) curing compound that complies with Section 9.23.0 to the fresh concrete and the slab shall be applied immediately after finishing as soon as the visible bleed of water from the concrete is no longer visible. Application of the second coat shall run for 8 hours to that side. The Contractor shall hold at least 1 gallon per 100 square feet and shall obscure the original color of the concrete. If any curing compound sticks on construction joints or reinforcing steel, the Contractor shall clean it off before the next pour.

Normally, the Contractor shall use white, pigment cured compound, applied to thoroughly just before and during application. If other materials are desired to be used, the Contractor shall obtain the Engineer's approval.

The Contractor shall supply back-up spray equipment, enough workers, and a bridge from which they will apply the curing compound. The Engineer may require the Contractor to demonstrate (at least 1 day before the pour) that the crew and equipment can apply the compound in a professional manner.
602.11.4 BURRING AND FINISHING CONCRETE TRAFFIC AND PEDESTRIAN BARRIERS

The Contractor shall supply enough water and workers to cure and finish concrete barriers as required in this Section.

Fixed-Form Barrier

After finishing and curing a barrier (while the forms remain in place), the Contractor shall:

1. Brush the top surface with a fine bristle brush.
2. Cover the top surface with heavy, quilted blankets; and
3. Spray water on the blankets at intervals sufficient to keep them thoroughly wet for at least 3 days.

After removing the forms, the Contractor shall:

1. Remove all lisp and edges with sharp tools or chisels;
2. Fill all holes with mortar;
3. Type up corners of openings;
4. Remove concrete projecting beyond the true surface by stringing or gridding; and
5. Cover the barrier with heavy, quilted blankets (but not blankets).

6. Keep the blankets continuously wet for at least 7 days.

The Contractor may do the finishing work described in items 6 through 8 above during the second week after the barrier is kept covered except when necessary to complete the immediate work area. Otherwise, no finishing work may be performed more than 7 days after pouring.

After the 7-day curing period, the concrete is removed from the form, and the barrier is combed. The Contractor shall use combs to remove all mortar in the forms and the concrete at the top of the barrier. The barrier shall then be covered with straw or dry sand for at least 7 days.

No curing compound shall be used on finished concrete barriers. The finished surface of the concrete barrier shall be even in color and texture.

602.11.11 BURRING AND FINISHING CONCRETE TRAFFIC AND PEDESTRIAN BARRIERS

The Contractor shall supply enough water and workers to cure and finish concrete barriers as required in this Section.

Fixed-Form Barrier

After finishing and curing a barrier (while the forms remain in place), the Contractor shall:

1. Brush the top surface with a fine bristle brush.
2. Cover the top surface with heavy, quilted blankets; and
3. Spray water on the blankets at intervals sufficient to keep them thoroughly wet for at least 3 days.

After removing the forms, the Contractor shall:

1. Remove all lisp and edges with sharp tools or chisels;
2. Fill all holes with mortar;
3. Type up corners of openings;
4. Remove concrete projecting beyond the true surface by stringing or gridding; and
5. Cover the barrier with heavy, quilted blankets (but not blankets).

6. Keep the blankets continuously wet for at least 7 days.

The Contractor may do the finishing work described in items 6 through 8 above during the second week after the barrier is kept covered except when necessary to complete the immediate work area. Otherwise, no finishing work may be performed more than 7 days after pouring.

After the 7-day curing period, the concrete is removed from the form, and the barrier is combed. The Contractor shall use combs to remove all mortar in the forms and the concrete at the top of the barrier. The barrier shall then be covered with straw or dry sand for at least 7 days.

No curing compound shall be used on finished concrete barriers. The finished surface of the concrete barrier shall be even in color and texture.
CONCRETE STRUCTURES

6-02.3.1 Installation

Where indicated on Drawings, the Contractor shall install the proper seals in a neat, workmanlike manner, and to the satisfaction of the Engineer. For ease of installation, the air temperature should be below 60°F. As at grade or downslope locations, the installation procedures shall be as follows:  
(a) Locate 1/2 inch diameter hole and drill through seal as shown, using a standard twist drill. 
(b) Cut the lower section of seal to 1/2 inch diameter hole as shown. 
(c) Complete seal installation following normal sealing procedures.

The seal surface to be bonded shall be cleaned with licence or approved solvent prior to application. A continuous bond to the concrete shall be achieved. This bond shall be immediately prior to seal installation. Adhesive shall not be applied below 60°F. Cure at grade or downslope locations, the installation procedures shall be as follows:  
(a) Locate 1/2 inch diameter hole and drill through seal as shown, using a standard twist drill. 
(b) Cut the lower section of seal to 1/2 inch diameter hole as shown. 
(c) Complete seal installation following normal sealing procedures.

All services to concrete shall show a smooth, dense face after the forms are removed. If it is porous, the Contractor shall bear the cost of patching and replacing it. The Contractor shall close and refresh any stained or discolored surfaces that may have resulted from bad work or from construction delays.

Subsections B, C, and D (below) describe three classes of surface finishing. The Contractor shall comply with these procedures unless the Engineer otherwise specifies. 

6-02.3.14-4b CLASS 3 SURFACE FINISH

The Contractor shall apply a Class 3 finish to all rebel bases, curbs, traffic barrier, pedestrian barrier, and ornamental concrete members. Class 1 surface finish requires the same treatment as Class 2 (below) but also includes the finishing steps outlined in Section 6-02.3.14-1b.

6-02.3.14-1c CLASS 2 SURFACE FINISH

The Contractor shall apply a Class 2 finish to:  
(a) All surfaces on the superstructures at highway grade crossings and railroad underpasses that are not covered by the finished sidewalks and curb lines between sidewalks, or near horizontal basement bolts of box girders, or inside vertical surfaces of girders, or reinforcement in steel forms. 
(b) All finished ground surfaces of bridges, piers, abutments, spans, retaining walls, and abutment walls. 
(c) All inside surfaces, vertical or sloping, of all superstructures (excluding the undersurfaces of all finished pavement surfaces that overhang outside girders or box girders). 
(d) All surfaces of open spandrel arch rings, spandrel columns, and abutment towers.

The Contractor shall follow steps (a) through (b) below. 
(a) Cover the area to be finished with a concrete water barrier. 
(b) Brush or roll the concrete with water. 
(c) Leave concrete to dry until it is compacted, worked into the small air holes and other crevices in the face of the concrete.
CONCRETE STRUCTURES

6-02

(a) Place great or a compacted layer of fine material under the subfil which it will rest on earth or coarse sand and gravel.

(b) Provide the Engineer with a sample of any site materials used or any other material required by the contract.

(c) Allow up to 5 working days for the Engineer's approval before allowing the use.

When using moulds, the Contractor shall prepare in advance for the possibility of removing. After placing concrete, if the falsework settles more than 1/2 inch, the Contractor shall provide to the bottom the 1.5 tubes to 2.0 diameter plus any anticipated settlement.

(b) Cut shall be in the joints and, if necessary, others shall be in the concrete work as permitted by the Engineer.

If a water distribution system is to be placed in the falsework, the Contractor shall adjust for its added weight.

Roadway deck forming systems may require bracing, strutting, or ties between the girder to adequately support the load. Bracing shall be placed at a distance from the girder as required by the Engineer.

If the falsework is to support any concrete or structural element, the Contractor shall be responsible for its structural integrity.

5-02.3.17C FRICION COLLARS, BRACKETS, SAND JACKS, AND SIMILAR DEVICES

An independent testing laboratory must establish the load capacity and deflection of the devices tested. The Contractor shall not be responsible for any deflections or movements.

6-02.3.17D BRACING

(a) The Contractor shall brace falsework laterally and longitudinally as required by the Engineer.

(b) The falsework shall be braced at least 1/2 inch from the concrete.

(c) The falsework shall be braced at least 1/2 inch from the concrete and base of the structure.

6-02.3.17F CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17G CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17H CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17I CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17J CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17K CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17L CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17M CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17N CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17O CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17P CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17Q CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17R CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17S CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17T CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17U CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17V CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17W CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17X CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

6-02.3.17Y CONCRETE STRUCTURES

(a) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(b) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.

(c) The grout shall be placed at the midpoint between the diaphragm and shall be at least 1/2 inch in diameter.
CONCRETE STRUCTURES

6.02.17(

Any form support for a roadway slab that rests on a plate girder slab shall be placed within 6 inches of the girder web centerline. The Contractor shall not weld any part of the form to the girder unless the Engineer permits.

If the Engineer permits bolt holes in the web to support the forms, the Contractor shall fill the bolt holes with fully compacted ASHHTO M 164 beads. Each bolt head shall be placed on the inside of the girder web.

6.02.3(17)(n) FINISHING MACHINE SUPPORT SYSTEM

Before using any finishing machine, the Contractor shall obtain the Engineer's approval of detailed drawings that show the system proposed to support it. The Contractor shall not attach this (or any other) equipment support system to the sides or suspend it from any girder unless the Employer permits. The Engineer will not permit such a method if it will unduly alter stress patterns or create too much stress in the girder.

6.02.3(17)(p) RESTRICTED OVERHEAD CLEARANCE SIGN

When erecting scaffold that restricts overhead clearance above a railroad track, the Contractor shall immediately (as soon as the restriction occurs) place restricted overhead clearance signs. Sign details are shown in WSDOT Standard Plan No. 9-01.

6.02.3(17)(q) REMOVAL OF FALSEWORK AND FORMS

The Contractor shall not remove forms or falsework unless the Engineer approves. The Engineer will decide, on the basis of post-placement curing conditions, the exact number of curing days that shall elapse before form removal. If the Engineer does not decide otherwise, the Contractor may remove forms (from the time of the last pour) form support in accordance with the table below:

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<th>Percent of Design Strength</th>
<th>Curing Days</th>
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6.02.3(17)(r) PLACING Anchor Bolts

The Contractor shall comply with the following requirements in setting anchors bolts in pier, abutments, or piers:

6.02.3(17)(s) BRIDGE BEARINGS

The Contractor shall use rubber bearing that meet the lower contact surface of classificatory bearing pads to the structure.

6.02.3(17)(t) STEEL EXPANSION BEARINGS

To all expansion bearings, sliding or rolling, the Contractor shall:

6.02.3(22) DRAINAGE OF SUBSTRUCTURE

The Contractor shall use weep holes and gravel backfill that complies with Section 940.12(20) to drain all material behind retaining walls, abutments, sheeting, and tile walls. The Contractor shall install sufficient drainage with weep holes placed as low as possible. Gravel shall be placed below the bottom of the wall. The tile drainage shall be required in Section 206.32. In addition, 2 the Drawings require grout, tile, or other drainage devices to be installed.

If conditions are not installed behind the wall or abutment, all backfill within 18 inches of weep 1 hole shall comply with Section 940.12(20). Unless the Drawings require otherwise, all other backfill behind the wall or abutment shall be gravel backfill for walls.

6.02.3(23) OPENING TO TRAFFIC

The Contractor shall furnish a bar bit and bending diagram to the Engineer for approval prior to fabrication. Various steel reinforcing bars, including those in crossbeams, shall be bent according to the bar bit sheets of the plans. The Contractor shall bend these bars as required to conform to the configuration in bar bit and as detailed in the Drawings.

6.02.3(24) A FIELD BENDING

If the Drawings call for field bending of steel reinforcing bars, the Contractor shall bend bars as required to conform to the configuration in bar bit and as detailed in the Drawings.

6.02.3(24) B FIELDS REINFORCEMENT BARS

If the Drawings call for field bending of steel reinforcing bars, the Contractor shall bend bars as required to conform to the configuration in bar bit and as detailed in the Drawings.
6-02 CONCRETE STRUCTURES

In applying heat for field-bonding steel reinforcing bars, the Contractor shall:
(a) Use a method that will avoid damag~ to the concrete;
(b) Excavate any concrete 6 inches around the heated bar.
(c) Keep the temperature at not less than 120°F.
(d) Use a chart that provides the required minutes for bonding steel to reach the desired temperature.
(e) Remove all excess concrete and wash with water to cool the surface.
(f) Cool the bar sufficiently before initiating the next step of the bonding process.

6-02.2(20) REINFORCING STEEL

In welding reinforcing steel to concrete, the Contractor shall:
(a) Use qualified welders who are familiar with the welding process.
(b) Use approved welding procedures and equipment.
(c) Use approved welding consumables.
(d) Use welding procedures that are consistent with the specifications of the project.
(e) Use qualified inspection personnel to monitor the welding process.
(f) Use approved welding records.

6-02.2(23)4 CONCRETE STRUCTURES

(a) Bonding of concrete:
(i) Use a bonding agent that will ensure a strong bond between the concrete and the reinforcing steel.
(ii) Use a bonding agent that is compatible with the concrete and the reinforcing steel.
(iii) Use a bonding agent that is approved by the project inspector.
(iv) Use a bonding agent that is free from contaminants that could affect the bond.
(v) Use a bonding agent that is applied in accordance with the manufacturer's instructions.

(b) Bonding of steel:
(i) Use a bonding agent that will ensure a strong bond between the reinforcing steel and the concrete.
(ii) Use a bonding agent that is compatible with the reinforcing steel and the concrete.
(iii) Use a bonding agent that is approved by the project inspector.
(iv) Use a bonding agent that is free from contaminants that could affect the bond.
(v) Use a bonding agent that is applied in accordance with the manufacturer's instructions.

6-02.3(24) PROTECTION OF MATERIALS

The steel reinforcement shall be protected from damage by:
(a) Covering it with a protective sheet or wrap.
(b) Applying a coating of a protective material.
(c) Using a protective barrier or shield.
(d) Using a protective cover or enclosure.

6-02.3(25)4 PLACING AND FASTENING

The steel reinforcing bars shall be placed and fastened in accordance with the following:
(a) Place the bars at the correct depth and spacing.
(b) Use approved fasteners that are compatible with the reinforcing steel.
(c) Use approved fasteners that are approved by the project inspector.
(d) Use approved fasteners that are free from contaminants that could affect the bond.
(e) Use approved fasteners that are applied in accordance with the manufacturer's instructions.

6-02.3(25)4 WELDING REINFORCING STEEL

(a) Welding of reinforcing steel shall be performed by approved welders.
(b) Use approved welding processes and procedures.
(c) Use approved welding equipment and consumables.
(d) Use approved welding records.
(e) Use approved welding inspections.

6-02.3(25)4 MECHANICAL SPACES

(a) Bonding of mechanical spaces shall be performed by approved bonding agents.
(b) Use approved bonding processes and procedures.
(c) Use approved bonding equipment and consumables.
(d) Use approved bonding records.
(e) Use approved bonding inspections.

6-02.3(25)4 ADDITIONAL REQUIREMENTS

(a) The Contractor shall comply with all applicable codes and standards.
(b) The Contractor shall provide a written plan for the bonding process.
(c) The Contractor shall keep a record of all bonding operations.
(d) The Contractor shall submit a report to the project inspector.
(e) The Contractor shall provide training for all bonding personnel.

6-02.3(25)4 INSPECTION

(a) Inspections shall be performed by approved inspectors.
(b) Inspections shall be conducted in accordance with the project specifications.
(c) Inspections shall be documented in accordance with the project specifications.
(d) Inspections shall be reported to the project inspector.
(e) Inspections shall be reviewed by the project inspector.
Before splicing, the Contractor shall provide the Engineer with the following information for each shipment of splice material:

(a) The type or series identification (and heat treatment lot number) of the splice material.
(b) The grade and size of bars to be spliced.
(c) A manufacturer's catalog with complete data on material and installation details.
(d) A written statement from the manufacturer that the material is identical to that used by the Engineer in testing and approving the system design.
(e) A written statement from the Contractor that the system and materials will be installed according to the manufacturer’s instructions and all requirements of this specification.

All splices shall meet these criteria:

(a) Tension splices shall develop at least 130 percent of the yield tensile strength specified for the spliced bar.
(b) The ultimate tensile strength of the splice shall exceed that of the other parts of the completed splice.

6.8.0.3(24)H JOINT TEST CONTROL

As the work progresses, the Engineer may require the Contractor to provide a splice sample (thermal or mechanical) to be used in a job control test. The operator shall create this sample as described in Section 6.8.0.3(24)(d) and test it using the same size in tension as being spliced in the work. The sample shall be tested in accordance with the requirements of specification 504.4, and in addition to all other sample splices required for qualification. The Engineer will require no more than two satisfactory samples on any project with fewer than 300 splices and no more than one satisfactory sample per 100 splices on any project with more than 300 splices.

6.8.0.4(24)EPOXY-COADED STEEL REINFORCING BARS

This work is the furnishing, fabricating, coating, and placing epoxy-coated reinforcing bars as shown in the Drawings. All epoxy-coated bars shall comply with the requirements of Section 504.6. Fabrication may occur before or after coating.

The Contractor shall prepare epoxy-coated bars from damage using padded or semimetallic slugs and strips free from dirt or grit. To prevent abrasion from bending or reaming, the Contractor shall fit hundred bars with a straight-back, multiple supports, or a platform bridge. Hundred bars shall not be dropped or dragged. During storage or field handling, bars shall not rest on wood or padded cradles. The Contractor may substitute other methods for protecting the bars if the Engineer approves. If the Engineer determines the coated bars have been badly damaged, they will be rejected.

Metal clips or supports shall be coated with epoxy for another inert coating (if the Engineer approves). The Contractor may use other supports preferred by the Engineer's approval. Plastic-coated steel bars approved by the Engineer shall be protected and coated bars from being damaged during placement.

The bars shall be placed in the Drawings and held firmly in place in the slots and placing of the concrete. In order to prevent any bars from being interlocked at the locations, the Contractor may specify areas that will not be interlocked. Areas, up to and inclusive, shall be a 0.5 in. or 1.0 in. or 1.5 in. or 2.0 in. by 36 in. by 36 in. The interval between installing coated bars and coating the deck, the Contractor shall specify. To prevent the coating from damaging other materials the Contractor shall specify. After removal, these materials will be removed from the deck.

6.8.0.5(24) PROTECTION OF EXPOSED REINFORCEMENT

From manufacture to encasement in concrete, all reinforcing bars shall be protected against dirt, grease, damage, rust, and all corrosives. If the steel has been damaged by either the production process or the transportation, the Manufacturer may reject the bar and give the Contractor directions as to what to do.

Significant damage may occur any opening in the coating that exposes the steel in an area that exceeds:

(a) 1/2 inch square (1/4 inch square or 1/4 inch in diameter or the equivalent).
(b) 0.003 in. (1/8 inch square or 1/8 inch in diameter) when the opening is within 1/4 inch of the bar to the nearest 1/8 inch.
(c) 0.006 in. (2/16 inch square or 0.5 inch square) in any area in any 1-foot length of bar.

The Contractor shall patch significant damaged areas with Engineer-approved patches. A joint list of damages on the Drawings shall be provided by the Engineer. All damages on the Drawings shall be free and clean of any surface contaminants. Patching shall be done before the concrete is placed.

For Series 14 girder, reinforcing steel is situated in the end block area in accordance with the Drawings. Any changes made to the Drawings shall be shown to the Engineer and approved in writing.

For Series 14 girder, reinforcing steel is situated in the end block area in accordance with the Drawings. Any changes made to the Drawings shall be shown to the Engineer and approved in writing.

6.8.0.6(24) CURING

While side forms remain in place, the top of the girder shall be kept continuously wet, without the use of water. Once the concrete has reached a compressive strength of 3,000 psi, all curing shall be completed by the Contractor. The Engineer shall be notified immediately if it is not cured as specified.

The Contractor shall keep the concrete moist for at least 28 days. When the concrete is cured, the Contractor shall not make any further change in the concrete or any other part of the structure.

6.8.0.7(24) CASTING AND SHOP DRAWINGS

The drawings show design conditions for prestressed girders. Deviations from prestressing details shown in the Drawings will not be acceptable to the Engineer or the Contractor at any time. For Series 14 girder, reinforcing steel is situated in the end block area in accordance with the Drawings. Any changes made to the Drawings shall be shown to the Engineer and approved in writing.

Before casting girders, the Contractor shall provide 4 copies of the fabrication drawings to the Engineer for approval. If held down due to weather conditions, this approval must also be approved before fabrication. Only steel side forms will be used. No spliced forms shall be used on the bottom and end wall clear and all forms shall be removed. Approval of Shop Drawings means only that the Engineer accepts the methods and materials. Approval does not imply correct dimensions.

Unless the Drawings permit, no welds will be permitted on steel bars within prestressed girders. Once the prestressing steel has been installed, no welds or grinding works shall be made on the bars or the steel is the girder.

The Contractor may form circular blockouts in the top girder flanges to receive latteworx hanger rods. These blockouts shall:

(a) Not exceed 1 inch in diameter, and
(b) Be spaced no more than 6 inches apart longestwise on the girder.
(c) Be located more than 3 inches from the outside edge of the top flange on Series 4 through 10 girders (more than 6 inches for Series 14 girder).

The circular blockout shall be located in the webs of the prestressed concrete girders to support brackets for roadway slab. The blockout in the webs shall be not more than 1 inch in diameter, spaced at 6 in. by 6 in. for Series 4 through 10 girders (more than 6 inches for Series 14 girder).

Consult with the Engineer for approval prior to girder fabrication. The girders shall be designed for at least the same load carrying capacity as the girders shown in the Drawings. The Contractor shall demonstrate that the load carrying capacity has been increased by the increase in the prestress steel reinforcement shall be the same as shown in the Drawings.

6.8.0.8(24) CURING

While side forms remain in place, the top of the girder shall be kept continuously wet, without the use of water. Once the concrete has reached a compressive strength of 3,000 psi, all curing shall be completed by the Contractor. The Engineer shall be notified immediately if it is not cured as specified.

The Contractor shall keep the concrete moist for at least 28 days. When the concrete is cured, the Contractor shall not make any further change in the concrete or any other part of the structure.

6.8.0.9(24) CASTING AND SHOP DRAWINGS

The drawings show design conditions for prestressed girders. Deviations from prestressing details shown in the Drawings will not be acceptable to the Engineer or the Contractor at any time. For Series 14 girder, reinforcing steel is situated in the end block area in accordance with the Drawings. Any changes made to the Drawings shall be shown to the Engineer and approved in writing.

Before casting girders, the Contractor shall provide 4 copies of the fabrication drawings to the Engineer for approval. If held down due to weather conditions, this approval must also be approved before fabrication. Only steel side forms will be used. No spliced forms shall be used on the bottom and end wall clear and all forms shall be removed. Approval of Shop Drawings means only that the Engineer accepts the methods and materials. Approval does not imply correct dimensions.

Unless the Drawings permit, no welds will be permitted on steel bars within prestressed girders. Once the prestressing steel has been installed, no welds or grinding works shall be made on the bars or the steel is the girder.

The Contractor may form circular blockouts in the top girder flanges to receive latteworx hanger rods. These blockouts shall:

(a) Not exceed 1 inch in diameter, and
(b) Be spaced no more than 6 inches apart longestwise on the girder.
(c) Be located more than 3 inches from the outside edge of the top flange on Series 4 through 10 girders (more than 6 inches for Series 14 girder).

The circular blockout shall be located in the webs of the prestressed concrete girders to support brackets for roadway slab. The blockout in the webs shall be not more than 1 inch in diameter, spaced at 6 in. by 6 in. for Series 4 through 10 girders (more than 6 inches for Series 14 girder).

Consult with the Engineer for approval prior to girder fabrication. The girders shall be designed for at least the same load carrying capacity as the girders shown in the Drawings. The Contractor shall demonstrate that the load carrying capacity has been increased by the increase in the prestress steel reinforcement shall be the same as shown in the Drawings.
CONCRETE STRUCTURES

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6-02.25/GF FINISHING
The Contractor shall apply a Class 2 finish, as defined in Section 6-02.15, to all of the surfaces of all girders located at final placement of all the concrete.

6-02.25/GF TOLERANCES
The Engineer may reject any girder not fabricated within the tolerances listed below. Actual acceptance or rejection will depend on how the Engineer believes a defect outside these tolerances will affect the structure's strength or appearance.

6.02.25/GF SHIPPING
No prestressed girders shall be shipped until cylinder tests show that the girders have reached the compressive strength required in its design. These test cylinders shall be made of the same concrete and cured under the same conditions as the girder being shipped. No bulb tee girder shall be shipped for at least 7 days after concrete placement. No other girder shall be shipped for at least 10 days after concrete placement. Girder support during shipping shall meet these requirements:

Supported Within This Distance From Either End
Series 4 and 8 and all

3 feet

3 feet

Series 14

5 feet

If the Contractor wishes to use other locations, they shall be approved by the Engineer in accordance with Section 6-02.25/GF. The Contractor shall maintain records and calculations showing concrete stresses in the girders will not exceed the stresses listed below:

6.02.25/H STORAGE AND HANDLING
During handling, each girder shall always be kept plumb and upright. It shall be lifted only by the lifting struts at both ends. If a long girder, the Contractor shall check it for any tendency to tilt. The ends of the girder must be placed on the sides to prevent it from settling as it is handled and set in place. This method of handling is often used on the top flanges of the girders. Stirrups shall be braced and tied in place as specified in the Drawings. The lateral bracing shall be in place during all handling and shall be removed only after the girder has been set in place and has been pinned with asphalt overlay.

6.02.25/H ALIGNMENT
At four separate times, the Contractor shall check the horizontal alignment of both top and bottom flanges of the girder:

1. After removing the girder from the casting bed, (2) during storage, (3) before the girder is shipped to the job site, and (4) after placing concrete into the structural diaphragms. Each check shall be made by measuring the distance between each flange and a chord that extends from the center of the girder to the column of the girder. The Contractor shall perform and record each check in the presence of the Engineer at a time when the alignment of the girder is not affected by temporary differences in surface temperature.

CONCRETE STRUCTURES

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For long-term storage of girders with initial horizontal curvature, the Contractor may wedge one side of the bottom flange of the girders to control deflection. The Contractor shall use a chord that extends end to end of the girder. (For example, on a 1000 ft girder, 10 times 1/6 inch would yield a maximum allowable offset of 1/14 inch.)

Immediately after the girder is removed from the casting bed, no girder flange shall be offset more than 1/8 inch per 10 feet of girder. The offset shall be transferred from a chord that extends from the end to the girder. This tolerance shall be measured at 4 points, with the maximum allowable difference being 1/14 inch.
CONCRETE STRUCTURES

6.02.3.25.1 STRENGTH

Concrete strength shall be measured on test cylinders cast from concrete poured into the girder. These cylinders shall be cured under temperature and humidity conditions similar to those for the girder, and shall be placed in the same position as the girder. The average of three test cylinders will be considered as the compressive strength of the concrete. The average of test cylinders shall be at least 60% of the specified compressive strength.

6.02.3.25.0 GIRDERS DEFLECTION

The deflection of the girder shall not exceed the maximum limit specified by the design. The maximum deflection shall be calculated as follows:

\[ \text{Deflection} = \frac{5wL^4}{384EI} \]

where:
- \( w \) is the weight of the girder and its superimposed load,
- \( L \) is the length of the girder,
- \( E \) is the modulus of elasticity of the concrete,
- \( I \) is the moment of inertia of the girder.

6.02.3.26 CAST-IN-PLACE Prestressed CONCRETE

6.02.3.26.0 GENERAL

Cast-in-place prestressed concrete shall be Class A mix (unless the Drawings show otherwise). It shall be air-entrained, but shall not contain air-entraining cement.

6.02.3.26.1 PRESTRESSING

The prestressing force shall be equal to the sum of the dead load, service load, and 10% of the live load. The prestressing force shall be applied to the concrete at the time of the prestressing operation. Once the prestressing steel is installed, no welding shall be done to the steel. If welding is necessary, it shall be done before the prestressing steel is removed.

6.02.3.26.2 ANCHORAGE

The anchorage shall be designed to resist the prestressing force and to prevent the concrete from cracking. The anchorage shall be located at the ends of the girder, and shall be designed to ensure that the prestressing force is transmitted to the concrete.

6.02.3.26.3 SHOP DRAWINGS

Before casting the structural elements, the Contractor shall submit drawings for approval to the Engineer. These drawings shall include details of the reinforcing steel, the concrete, and the anchorage system. The drawings shall be submitted at least 2 weeks before the start of the casting operation.

CONCRETE STRUCTURES

6.02.3.26.4 Construction of the proposed anchorage devices shall meet the requirements listed in 6.02.3.10,

(a) Bearing Type Anchorage

(b) The proposed bearing stress on the concrete shall be at least 0.8 of the allowable bearing stress.

6.02.3.26.5 Construction of the proposed anchorage devices shall meet the requirements listed in 6.02.3.10,

(a) Bearing Type Anchorage

(b) The proposed bearing stress on the concrete shall be at least 0.8 of the allowable bearing stress.

6.02.3.26.6 Construction of the proposed anchorage devices shall meet the requirements listed in 6.02.3.10,

(a) Bearing Type Anchorage

(b) The proposed bearing stress on the concrete shall be at least 0.8 of the allowable bearing stress.
CONCRETE STRUCTURES

6-02 DETAIL DRAWINGS

Drawings. The concrete strength shall be determined in accordance with procedures as outlined in ASHTM C 109. Estimating Concrete Pressure Strength by the Modified Method. 

6-02.330G ESTIMATING CONCRETE PRESSURE STRENGTH BY THE MODIFIED METHOD

The Contractor shall maintain a set of three现场ers separately tested or tested together in one test block. The results shall be kept in a file of the strength, work with each number of the test block. Measurable permanent distortion is defined as a distortion across the face of the test block when a nominal 510 kg load is used with a nominal 0.1 inch per as a reference and is measured after the test is released. The test block shall be acceptable with regard to concrete failure if the following criteria are satisfied: 

a. No concrete cracks with a load of 40 percent of the ultimate strength of the post-tensioning reinforcement.

b. When concrete cracks with a test load of 70 percent of the ultimate strength of the post-tensioning reinforcement does not exceed 0.015 inch.

c. After 48 hours of the ultimate strength of the post-tensioning reinforcement and releasing the test load, the maximum width of cracks does not exceed 0.015 inch.

Before installing the anchorage device, the Contractor shall submit a Manufacturer’s Certificate of Compliance for the anchorage device in accordance with Section 9-063.

6-02.330D CONCRETE PRESSURE STRENGTH BY THE MODIFIED METHOD

The Contractor shall maintain a set of three现场ers separately tested or tested together in one test block. The results shall be kept in a file of the strength, work with each number of the test block. Measurable permanent distortion is defined as a distortion across the face of the test block when a nominal 510 kg load is used with a nominal 0.1 inch per as a reference and is measured after the test is released. The test block shall be acceptable with regard to concrete failure if the following criteria are satisfied: 

a. No concrete cracks with a load of 40 percent of the ultimate strength of the post-tensioning reinforcement.

b. When concrete cracks with a test load of 70 percent of the ultimate strength of the post-tensioning reinforcement does not exceed 0.015 inch.

c. After 48 hours of the ultimate strength of the post-tensioning reinforcement and releasing the test load, the maximum width of cracks does not exceed 0.015 inch.

Before installing the anchorage device, the Contractor shall submit a Manufacturer’s Certificate of Compliance for the anchorage device in accordance with Section 9-063.

6-02.330G METAL CONDUCT

The Contractor shall maintain a set of three现场ers separately tested or tested together in one test block. The results shall be kept in a file of the strength, work with each number of the test block. Measurable permanent distortion is defined as a distortion across the face of the test block when a nominal 510 kg load is used with a nominal 0.1 inch per as a reference and is measured after the test is released. The test block shall be acceptable with regard to concrete failure if the following criteria are satisfied: 

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c. After 48 hours of the ultimate strength of the post-tensioning reinforcement and releasing the test load, the maximum width of cracks does not exceed 0.015 inch.

Before installing the anchorage device, the Contractor shall submit a Manufacturer’s Certificate of Compliance for the anchorage device in accordance with Section 9-063.

6-02.330G CONCRETE PRESSURE STRENGTH BY THE MODIFIED METAL CONDUCT

The Contractor shall maintain a set of three现场ers separately tested or tested together in one test block. The results shall be kept in a file of the strength, work with each number of the test block. Measurable permanent distortion is defined as a distortion across the face of the test block when a nominal 510 kg load is used with a nominal 0.1 inch per as a reference and is measured after the test is released. The test block shall be acceptable with regard to concrete failure if the following criteria are satisfied: 

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6-02.330G CONCRETE PRESSURE STRENGTH BY THE MODIFIED METAL CONDUCT

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Before installing the anchorage device, the Contractor shall submit a Manufacturer’s Certificate of Compliance for the anchorage device in accordance with Section 9-063.

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CONCRETE STRUCTURES

and to resist injection pressures adequately to prevent leakage during injection.

The epoxy resin system for crack injection shall be a Type I, Grade 1 systems conforming to ASTM C681 except for the following requirements:

- Not more than 20 minutes Minimum
- Viscosity: 700 Centipoises Maximum
- Shrinkage: Not Required
- Density: Unspecified for consistency
- Maximum

The injection equipment shall have the capability of

dispersing the mixed adhesive at pressures up to 300 psi and

sustaining that pressure.

2.6.2.3(3) CONCRETE CRACK INJECTION

CRACKS IN EXISTING CONCRETE

Cracks in existing concrete shall be repaired by epoxy injection where indicated on the drawings.

The contractor shall submit a written proposal to the Engineer for the repair of the concrete. The proposal shall include:

- A description of the cracks to be injected
- A detailed plan showing the injection points
- A list of materials and equipment to be used
- A schedule for the repair work
- A guarantee against the repair

The repair shall be carried out in accordance with the following steps:

1. The crack shall be cleaned with a wire brush to remove all loose material.
2. The crack shall be dried with a vacuum cleaner.
3. A clean, dry surface shall be prepared using a dryshot or similar material.
4. Epoxy resin shall be injected into the crack using a low-pressure injection pump.
5. The injection shall continue until the Crack is completely filled.
6. The excess epoxy shall be removed with a chisel or grout tool.

2.6.2.3(4) MEASUREMENT

The measurements shall be taken after the crack injection has cured, and the surface shall be cleaned as required. The measurements shall be recorded and shall include:

- The width of the crack
- The depth of the crack
- The length of the crack

These measurements shall be compared with the original measurements to determine the effectiveness of the repair.

2.6.2.3(5) SUBMITTAL

The contractor shall submit the following documents for approval along with the bid:

- A shop drawing showing the proposed repair
- A material list for the epoxy resin
- A certificate of analysis for the epoxy resin

2.6.2.3(6) COMPLETION

The repair shall be completed in accordance with the following:

- The surface shall be cleaned with a wire brush to remove all epoxy residue.
- The surface shall be sealed with a concrete sealer.
- The surface shall be painted with a sealer to provide a protective coating.

2.6.2.3(7) RECORDS

The records shall include:

- A detailed report of the repair work
- A list of materials used
- A photograph of the completed repair

These records shall be submitted to the Engineer for approval.
SECTION 6-03  STEEL STRUCTURES

6-03.01 DESCRIPTION

This work includes finishing, fabricating, erecting, cleaning, and painting steel structures and the structural steel parts of associated structures.

6-03.02 MATERIALS

Materials shall meet the requirements of the following sections:

1. Structural Steel and Related Materials
2. Paints
3. Nuts
4. Hardened Washers
5. Direct Tension Indicators
6. Structural steel shall be classified as:
   - Structural carbon steel (to be used whenever the Drawings do not specify another classification)
   - Structural low alloy steel, and
   - Structural high strength steel.

Unless the Drawings or Project Manual states otherwise, the following shall be classified as structural carbon steel:
- Thicker: 5/8" or greater
- Thinner: 5/8" or less

6-03.03 SPECIFICATIONS

TABLE 6-03.03

<table>
<thead>
<tr>
<th>AASHTO Thickness</th>
<th>Absorbed Test Frequency</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>(In.)</td>
<td>(Galv.)</td>
<td>(Galv.)</td>
</tr>
<tr>
<td>M 185</td>
<td>t4</td>
<td>15</td>
</tr>
<tr>
<td>M 227 5/8</td>
<td>t4</td>
<td>15</td>
</tr>
<tr>
<td>M 227 3/4</td>
<td>t4/2/5</td>
<td>20</td>
</tr>
<tr>
<td>M 253</td>
<td>t4/2/5</td>
<td>20</td>
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<tr>
<td>M 253 3/4</td>
<td>t4/2/5</td>
<td>20</td>
</tr>
<tr>
<td>M 253 11/2</td>
<td>t4/2/5</td>
<td>20</td>
</tr>
<tr>
<td>M 344</td>
<td>t4/2/5</td>
<td>20</td>
</tr>
</tbody>
</table>

Sampling and testing shall comply with AASHTO T 243.

The test temperature listed in Table 1 shall be reduced for AASHTO M 222 or M 232 material when the yield strength shown in the certified test report exceeds 65 ksi. For each 10 ksi by which the fraction thereof above 60 ksi, the temperature shall be reduced by 15 degrees from that shown in the table.

The Contractor shall submit for the Engineer's approval a written plan for visibly marking the material so that it can be traced. These marks shall remain visible at least through the fit-up of the main load-carrying tension members. The marking method shall permit the Engineer to verify:
1. Material specification designation
2. Heat number, and
3. Manufacturer's lot number.

For steel in main load-carrying tension members and in tension components of any member, the Contractor shall include the heat numbers on the reproduceable copies of the as-built Shop Drawings.
6.03

6.03.3 CONSTRUCTION REQUIREMENTS

6.03.3(1) NOTICE OF ROLLING

Five working days before rolling work begins, the Contractor shall notify the Engineer in writing of the dates and at the hours when it will be done. No material shall be rolled until the Engineer gives written notice to proceed.

6.03.3(2) FACILITIES FOR INSPECTION

The Contractor shall provide all facilities the Inspector requires to inspect material and workmanship. Inspectors shall be given safe and free access to all areas in the mill and shop.

6.03.3(3) INSPECTORS AUTHORITY

The inspector may reject materials or workmanship that does not comply with these Specifications. In any dispute, the Contractor may appeal to the Engineer whose decision shall be final.

By its inspection at the mill and shop, the Owner intends only to facilitate the work and preventerrors. This inspection shall not relieve the Contractor of any responsibility for identifying and replacing defective material or workmanship.

6.03.3(4) REJECTIONS

Even if the Inspector accepts materials or finished members, the Owner may later reject them if defective. The Contractor shall remove and replace or make good any rejected materials or workmanship.

6.03.3(5) MILL ORDERS AND SHIPPING STATEMENTS

The Contractor shall furnish to the Owner, or otherwise as specified in the Orders, all copies of mill orders and shipping statements as the Engineer requires.

6.03.3(6) WEIGHTING

Structure steel used shall not be weighted unless the Drawings or Project Manual require it. When weighted, it may not be more than 10% under or over. The Contractor shall furnish to the Owner all copies of the calculations or weight slips as the Engineer requires. If scale weights are used, the Contractor shall record separately the weights of all tools, materials, and equipment.

6.03.3(7) SUBMITTALS

6.03.3(7)1 SHOP DRAWINGS

The Contractor shall submit for approval all shop detail drawings in accordance with 6.03.3-3, except that for grade separation structures which carry a railway over a highway, 4 additional sets are required for each railroad company involved. Sheets returned for correction shall be corrected, and the required number of corrected sheets shall be submitted for approval. No material shall be fabricated until shop detail drawings have been approved by the Engineer.

In approving Shop Drawings, the Owner accepts only the dimensioning and tolerances of the details as shown on the drawings. The Contractor shall furnish the Project Engineer one set of reproducible copies of the as-built Shop Drawings for each railroad company involved. The drawings shall conform to the dimensions and tolerances designated in the Shop Drawings. The reproductions shall be clear, suitable for microfilming, and on permanent material.

Sheets for all Shop Drawings shall conform to the size requirements of Section 5.03.3 of these Specifications.

6.03.3(8) SUBSTITUTIONS

The contractor shall not substitute sections that differ from Drawings dimensions unless the Engineer approves in writing that the Contractor requests and receives approval to substitute heavier members, such substitution shall be at no additional cost to the Owner.

6.03.3(9) HANDLING, STORING, AND SHIPPING OF MATERIALS

Markings applied at the mill shall distinguish structural low alloy steel from structural carbon steel. The fabricator shall keep the 2 classes of steel carefully separated. Before fabrication, all material stored at the fabricating plant shall be protected from rust, dirt, oil, and other foreign matter. The Owner will accept rusted material.

After fabrication, all material awaiting shipment shall be subject to the same storage requirements as fabricated material.

All structural steel shall arrive at the job in good condition. As the Engineer requires, steel damaged by salt water shipment shall be thoroughly cleaned by high pressure water flushing, chemical cleaning, or sandblasting, and repainted with the specified shop coat.

All material shall be stored so as to prevent rust and loss of small parts. Flat material shall not rest on the ground or in water but on skids or platforms.

The loading, transporting, unloading, and piling of the structural steel material shall be conducted in such a manner that the metal will be kept clean and free from injury from rough handling. Field assembly of structural steel must be performed by the Contractor. The Contractor shall use methods and equipment as shown in the drawings and be trained in the use of the equipment. Any member slightly bent or twisted shall be corrected before it is placed. The Owner will reject any member with any substantial bending or twisting damage.

Girders sections shall be handled so as to prevent damage to the girders. If necessary, the Contractor shall provide temporary supports to prevent buckling during erection.

6.03.3(10) STRAIGHTENING BENT MATERIAL

If the Engineer permits in writing, plates, angles, other shapes, and built-up members may be straightened by straightening methods. Straightening methods shall not fracture or injure the metal. Data required by the Engineer shall be straightened mechanically. A limited amount of localized heat may be applied only if carefully controlled. In no case shall any member be further straightened by heat-straightening procedure in writing.

All material shall be free from all stress and external forces except those that result from the mechanical pressure used by the heat.

After straightening, the Contractor shall inspect the member for flaws using the procedure described in 6.03.3(11). The Owner will reject any material showing cracked bends and kinks.

The procedure for heat straightening of universal mill (UM) plates shall be performed by the contractor or equipment approved by the Owner.

6.03.3(11) WORKMANSHIP AND FINISH

Workmanship and finish, the Contractor shall furnish the Project Engineer one set of reproducible copies of the as-built Shop Drawings for each railroad company involved. The drawings shall conform to the dimensions and tolerances designated in the Shop Drawings. The reproductions shall be clear, suitable for microfilming, and on permanent material.

Steel structures shall be free from cracks, splits, and other defects. Shall be free from rust, dirt, oil, and other foreign matter. The Owner will accept rusted material.

After fabrication, all material awaiting shipment shall be subject to the same storage requirements as fabricated material.

All structural steel shall arrive at the job in good condition. As the Engineer requires, steel damaged by salt water shipment shall be thoroughly cleaned by high pressure water flushing, chemical cleaning, or sandblasting, and repainted with the specified shop coat.

All material shall be stored so as to prevent rust and loss of small parts. Flat material shall not rest on the ground or in water but on skids or platforms.

The loading, transporting, unloading, and piling of the structural steel material shall be conducted in such a manner that the metal will be kept clean and free from injury from rough handling. Field assembly of structural steel must be performed by the Contractor. The Contractor shall use methods and equipment as shown in the drawings and be trained in the use of the equipment. Any member slightly bent or twisted shall be corrected before it is placed. The Owner will reject any member with any substantial bending or twisting damage.

Girders sections shall be handled so as to prevent damage to the girders. If necessary, the Contractor shall provide temporary supports to prevent buckling during erection.

6.03.3(12) EDGE FINISHING

All rolled, sheared, and flame-cut edges shall be true to line and free of rough corners and projections. Corners along exposed edges shall be radiusd to a radius of 1/16 inch or greater. Sheared edges on material more than 5/8 inch thick shall be planed back by at least 1/8 inch. The following standards for surface roughness and edge hardens shall apply to the named parts of main leading-carrying tension members or tension components of flanged members:

1. Surface roughness of flange components—rolled, sheared, and flame-cut shall not exceed 250 micro inches as defined by ANSI specifications. On flame-cut edges, this roughness may be obtained after cutting by grinding or other approved means.
2. Surface roughness of other rolled, sheared, and flame-cut edges shall not exceed 1,000 micro inches.
3. Structural members M 225 and M 325 plates after flame-cutting shall meet the requirements outlined in Appendix A, "Testing ROCKWELLS Hardness of Flame- Cut Edges" (as a part of the contract). The Contractor shall reject any member with any substantial hardness of plate edges through preheating, postheating, or control of the burning process as the steel manufacturer recommends and the Engineer approves.

6.03.3(13) PLANNING OF HEARING SURFACES

Ends of columns that bear on base and cap plates shall be milled to true surfaces and accurate bevels. When specified, top and base plates of columns and the plate sides of girders and trusses shall have full contact with the underside of the members and be straightened, planed, or corrected in some other way to produce accurate, even bearing surfaces for good contact, bearing surfaces that will contact other metal surfaces shall be planed or milled. Surfaces at edges of flanges or base plates that will contact masonry shall be roughly finished.

On all column girders, the cut of the plate shall be in the direction of expansion.

6.03.3(14) ARBUTING JOINTS

All end members shall be annealed by being heated uniformly to the proper temperature, then cooled slowly and evenly in the furnace. At all stages, the temperature of the bars shall be under full control.

Slight bends on secondary steel members may be made without heat. Crimped steel members will not anneal.

6.03.3(15) END CONNECTION ANGLES

On floorbeams and stringers, end connection angles shall be flush with each other and set accurately in relationship to the position and length of the member. Unless the Drawings require it, end connection angles shall not be finished. If, however, finish assembly requires them to be milled, milling shall not reduce thickness by more than 1/16 inch.

6.03.3(16) BUILT MEMBERS

The various pieces forming one built member shall be straight and cladding, true to detailed dimensions, and free from twist, bends, open joints, or other defects.

When fabricating curved girders, localized heat or the use of mechanical force shall not be used to bend the girders forges stress on into parallel to the girders webs.

6.03.3(17) HANG HOLES

Hand holes, whether punched or cut with burning torches, shall be true to size and shapes shown in the Drawings. Edges shall be true to line and ground smooth.

6.03.3(18) LACING BARS

Unless the Drawings state otherwise, ends of lacing bars shall be easily rounded.

6.03.3(19) PLATE GIRDERS

6.03.3(20) WEB PLATES

If web plates are spiked, clearance between plate ends shall not exceed 1/8 inch.

6.03.3(21) VACANT

6.03.3(22) EYEBARS

Eyebars shall be straight, true to line, and free from twists or hobs in the neck or head and free from any other defect that would reduce their strength. Heads shall be formed by upsetting, rolling, or other approved methods. Depth, shape, and the method designated by the manufacturer may determine the shape of bar heads if the Engineer approves. Head and neck thickness shall not overlap by more than 1/16 inch. Welds shall not be made in the body or head of any bar.

Each eyebar shall be properly annealed and carefully straightened before it is bored. Heads shall be so precisely located that a pint of bars for the same trans plate the pins may be inserted completely without driving. All eyebars made for the same locations in trusses shall be interchangeable.

6.03.3(23) ANNEALING

All eyebars shall be annealed by being heated uniformly to the proper temperature, then cooled slowly and evenly in the furnace. At all stages, the temperature of the bars shall be under full control.

Slight bends on secondary steel members may be made without heat. Crimped steel members will not anneal.

6.03.3(24) PINS AND ROLLERS

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6-03 STEEL STRUCTURES

6-03.32(4A) GENERAL

Pins and rollers shall be made of the class of forged steel to be used. They may be turned accurately to the specified dimensions, smooth and straight, and at right angles to the axis of the member. Pins shall be parallel with each other unless the Drawings state otherwise. A finishing cut shall always be made. The distance between holes shall not vary from detailed dimensions by more than 1/32 inch. In tension members, this distance shall be measured from outside to outside of holes in compression members, inside to inside.

6-03.32(4C) PIN CLEARANCES

Each pin shall be 1/32-inch smaller in diameter than its hole. All pins shall be numbered after being fitted into their holes as the assembled member:

6-03.32(5B) WELDING AND REPAIR WELDING

All welding and repair welding shall comply with:
(a) The AWS Structural Welding Code D1.1/80.
(b) The Third Edition (1981) of the AASHTO Standard Specifications for Welding of Structural Steel Highway Bridges, and
(c) The requirements described in the remainder of this section which shall govern over the above.

Welding of structural steel will be permitted only to the extent shown in the Drawings. No welding, including tack and welding of any auxiliary welds shall be done in the shop or field unless the location of the welds is shown on the approved Shop Drawings or the Welding Drawings or the Drawings as otherwise specified.

Welding procedures shall be submitted for approval with Shop Drawings. The procedures shall specify the type of equipment to be used, electrode selection, preheat and interpass temperature and details. When the procedures are not preapproved by AWS or AASHTO, evidence of qualification tests shall be submitted.

Welding shall not begin until after the Contractor has obtained the甲方的approval of Shop Drawings as required in Section 6.03.32(5F). These Shop Drawings shall include procedures for welding, assembly, and any heat-straightening or heat-currying. Welding shall not begin until after the Contractor has obtained the approval of Shop Drawings as required in Section 6.03.32(5F). These Shop Drawings shall include procedures for welding, assembly, and any heat-straightening or heat-curving.

6-03.32(6) TABLE 2

<table>
<thead>
<tr>
<th>Thickness (t) of Thickest Part</th>
<th>Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot;</td>
<td>120</td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>150</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>200</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>250</td>
</tr>
</tbody>
</table>

All web and flange plates, bearing stiffeners, bearing plate, and heavy sections (as required when welded) shall be presented in at least 200 degrees F.

If groove welds (bevel or flat) are to be inspect ed, they may be repaired no more than twice. If a third failure occurs, the Contractor shall:
(a) Trim the members, if the Engineer approves, at least 1/2 inch or
(b) Replace the member at no expense to the Owner.

6-03.32(7B) WELDING INSPECTION

The Contractor’s welding inspection procedures, techniques, and inspector qualifications shall comply with:
(a) The AWS Structural Welding Code D1.1/80, and

Inspection of welds shall be as follows:
(a) Visual Inspection:
(b) Radiographic Inspection:
(c) Magnetic Particle Inspection:

6-03.32(8) REAR AND DRILLED HOLES

(a) For each groove weld at edge plates shall be given a 100 percent dye-penetrant or magnetic-particle inspection.

After the Contractor has completed his welding inspection, the Contractor shall allow the Engineer sufficient time to perform quality assurance ultrasonic welding inspection. The Engineer must maintain the radiographs and the radiographic inspection report in the shop until the last joint to be radiographed in that member is accepted by the radiographer representing the Contractor. Within two days following the acceptance, the Contractor shall mail the film and two copies of the radiographic inspection report to the Engineer.

6-03.32(9) REAR AND DRILLED HOLES

Screw threads shall be U.S. Standard, and shall fit closely in the nut.

6-03.32(10) HIGH STRENGTH BOLT HOLES

In submerged-arc welding, flux shall be oven-dried at 350 degrees F for at least 2 hours, then stored in sealed boxes at 250 degrees F or more. If stored at 212 degrees F or more, they may be stored in sealed boxes with 4 hours after removal from a drying or storage oven, flux shall be resealed before use.

Pressure testing drilling structures shall comply with the minimums in Table 2 below:

6-03.32(11) GENERAL

At the Contractor’s option under the conditions described in this Section, holes may be drilled or tapped in the drilled or reamed and drilled or reamed, drilled, or drilled and reamed, or bored and reamed. Drilling equipment shall never be used to enlarge or widen holes. The size of the holes shall be determined by the specifications.

The hole for each high strength bolt shall be 1/16-inch larger than the nominal diameter of the bolt.

In forming any connection, thefabriator may drill holes full size after assembly in all connections and splices in the main members of trusses, arches, continuous beam spans, beams, towers, plate girders, box girders, and rigid frames.

Holes may be drilled full size as assembled to a steel template for splices of rolled beam stringers that continue over flanges or crossframes.

Holes shall be reamed full size to a stand template or reamed full size while assembled for end connections of rolled beam stringers and floorbeams or crossframes.

If steel templates are used to ream or drill full-size connection holes, the templates shall be positioned and aligned with extreme care and bolted firmly in place. Templates for matching matching members or the opposite faces of one member shall be duplicates. Templates for connections on the parts or members shall be located with such accuracy that matchmarks are not needed.

Ball holes in crossframes, gussets, lateral ties, and other secondary members may be punched or drilled full size from the solid while assembled.

6-03.32(12) BURNT HOLE DEFECTS

(a) All welds in which the diameter shall not exceed punch diameter by more than 1/16 inch. Any hole requiring reworking to adjust the hold shall be reamed. All holes shall be cut with clean, true punch or reamed edges. The Owner will reject components having poorly machined holes.

6-03.32(13) DRILLED HOLE DEFECTS

Holes in steel shall be drilled with twist drills, or with bushing reamers, in production. The punch shall be passed over the member. Reamers and drills shall be directed mechanically, on center. Connecting parts that require reamed or drilled holes shall be assembled and held securely as the holes are formed, then matched before disassembly. The Contractor shall provide the Engineer a diagram showing these outlines, and details. The Contractor shall provide components having poorly machined holes.

Burr on outside diameters of the holes shall be removed. If the Engineer requires, the Contractor shall disassemble parts to remove burrs.

6-03.32(14) NUMERICALLY CONTROLLED DRILLED CONNECTIONS

When any holes are described in Section 6.03.32(15), the fabricator may use numerically controlled (N/C) drilling or punching equipment if it meets the requirements in this Section.

The Contractor shall submit for approval a detailed outline of proposed N/C procedures. This outline shall:
(a) Provide a sufficient number of instructions and procedures to ensure accurate, quality work.
(b) Provide detailed instructions for the machine operator.

6-03.32(15) GENERAL

The Contractor’s options on equipment, materials, and methods shall be described in Section 6.03.32(15) of the specifications. The Contractor may use any equipment, material, and method selected, provided it meets the requirements in this Section.

The Contractor shall submit for approval a detailed outline of proposed N/C procedures. This outline shall:
(a) Be sufficient to ensure accurate, quality work.
(b) Be sufficient for the machine operator.

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STEEL STRUCTURES

6-03

(b) Indicate the specific members of the structure to be detailed, punched, hole sizes, locations of theklm index and other reference points, makeup of check plates, nailing, etc. All other information needed to describe the process fully.

N/C holes may be drilled or punched to size through individual pieces, or may be drilled through any combination of stacked plates.

When the Engineer requires, the Contractor shall demonstrate that the N/C procedure consistently produces holes and connections meeting the requirements of these Specifications.

6-03.327/F ACCURACY OF PUNCHED, SUBPUNCCHED AND SUBDRILLED HOLES

After shop assembly and before reaming, all punched, subpunched, and subdrilled holes shall meet the following standard of accuracy. At least 75 percent of the holes in each connection shall permit the passage of a cylindrical pin 1/8 inch in diameter but smaller than the hole size. The pin shall pass through at right angles in the face of the member without drifting. All holes shall permit passage of a pin 3/16 inch smaller in diameter than nominal hole size. The Owner will reject any piece that fails to meet these standards.

6-03.327/F ACCURACY OF REAMED AND DRILLED HOLES

At least 85 percent of all holes in a connection of reamed or drilled holes shall show an offset greater than 1/32 inch between adjacent thicknesses of metal. No hole shall have an offset greater than 1/16 inch.

Connections to be reamed shall also be for accuracy locating the template relative to the millred or scuffed outs of the members. Template shall have hardened steel loading inserted into each hole. These bushings may be omitted, however, if the thickness of the member is 1/8 inch or less or if it is specified that the template be used no more than 5 times, and (2) that use will produce no unacceptable wear.

Each template shall be at least 1/4 inch thick. It is necessary, therefore, that the member be reamed to prevent backing and misalignment as holes are formed.

6-03.327/G FITTING FOR BOLTING

Before drilling, reaming, and bolting begins, all parts of a member shall be assembled, well aligned, and drawn firmly together. If necessary, assembled pieces shall be taken apart to permit removal of any burns or scratches produced as the holes are formed. The member shall be free from bends, bows, and other deformation.

In every instance, the fitting for bolting shall be such as to enable the member to fit the bolt snugly, but not so close as to require any assembly epoxies or adhesives. The Contractor shall obtain the Engineer's approval of the assembly and any erection methods before work begins.

STEEL STRUCTURES

The Contractor shall not load structural steel for shipment until the shop is completely assembled. No painting shall be done after the steel has been loaded for shipment.

Contact rework of broken stud or connection connections shall be described in the proposal.

(a) Painted with the shop coat when the structure is to be coated with inorganic zinc silicate paint, but
(b) Painted with any shop coat of vinyl pretreatment, Form No. A-54-14, when the structure is to be coated with a paint other than inorganic zinc silicate.

If the contact surfaces of a bolted connection coated with inorganic zinc silicate paint has been kept free from dirt, oil, grease, and other foreign matter, it may be field bolted without further preparation. If it is contaminated, the surface shall be sandblasted just before final bolting.

All contact surfaces of bolted connections coated with other than inorganic zinc silicate paint shall be cleaned by sandblasting just before final bolting.

Any sandblasting done before final field bolting shall comply with SSPC Specifications for Commercial Blast Cleaning (SSPC-SP6). 6-03.330/B WEATHER CONDITIONS

The Contractor shall apply paint only when air and metal are 40 degrees F or warmer. Major painting on a structure shall not begin unless the weather is forecast to remain above 40 degrees F for at least 48 hours after painting starts. Minor painting of spots and small areas may be done any time the air and metal meet temperature requirements.

In open yards or on erected structures, the metal shall not be painted while hot enough to blister the paint.

Paint shall never be applied on damp metal. Any metal painted under cover in damp or cold weather shall remain covered until dry or until weather conditions permit open exposure.

6-03.330/C APPLICATION

All paint shall be brushed on unless the Project Manual call for another method or if it is done in a professional manner by competent painters. The paint film shall meet the minimum thickness specified in Section 607.35D.

6-03.330/D ERECTION MARKS

Erection marks to permit identification of members in the field shall be painted on previously painted surfaces.

6-03.330/E MACHINE FINISHED SURFACES

As soon as possible and before they leave the shop, machine-finished surfaces on all shop-fabricated sections, columns, N/C, expellers, and columns bases shall be covered with grease. After erection and welding, the shop-finished surfaces and paint specified. All surfaces of iron and steel members milled to smooth the surfaces and of machine-finished surfaces should be milled to smooth the surfaces and of machine-finished surfaces should be milled to smooth the surfaces and of machine-finished surfaces should be milled to smooth the surfaces.

Dirt or scale on shop-finished surfaces may be milled smooth in the shop, cleaned, and painted as specified. All machine-finished surfaces shall be left in the condition they are milled to smooth the surfaces. After erection and welding, the shop-finished surfaces and machine-finished surfaces may be milled smooth in the shop, cleaned, and painted as specified. All machine-finished surfaces shall be left in the condition they are milled to smooth the surfaces. After erection and welding, the shop-finished surfaces and machine-finished surfaces may be milled smooth in the shop, cleaned, and painted as specified. All machine-finished surfaces shall be left in the condition they are milled to smooth the surfaces.

While in the shop, machine-finished surfaces and inaccessible surfaces of roper or play-type bearings shall be milled to smooth the surfaces.

Machine-finished surfaces shall be milled to smooth the surfaces. After erection and welding, the shop-finished surfaces and machine-finished surfaces may be milled smooth in the shop, cleaned, and painted as specified. All machine-finished surfaces shall be left in the condition they are milled to smooth the surfaces. After erection and welding, the shop-finished surfaces and machine-finished surfaces may be milled smooth in the shop, cleaned, and painted as specified. All machine-finished surfaces shall be left in the condition they are milled to smooth the surfaces.

6-03.331 ALIGNMENT AND CAMBER

Before beginning field bolting, the Contractor shall:

(a) Establish a correct grade and alignment,
(b) Install guide plates of edges (ends of floorbeams), and
(c) Use linear tape to check the structure for alignment.

6-03.331/A GENERAL

Within 8 hours after the sandblasting required in Section 6-03.329, all structural steel shall be painted with one shop coat of the paint specified in the Proposal.

6-03.331/B SHOP painter

The Contractor shall not load structural steel for shipment until the shop is completely assembled. No painting shall be done after the steel has been loaded for shipment.

Contact rework of broken stud or connection connections shall be described in the proposal.

(a) Painted with the shop coat when the structure is to be coated with inorganic zinc silicate paint, but
(b) Painted with any shop coat of vinyl pretreatment, Form No. A-54-14, when the structure is to be coated with a paint other than inorganic zinc silicate.

If the contact surfaces of a bolted connection coated with inorganic zinc silicate paint has been kept free from dirt, oil, grease, and other foreign matter, it may be field bolted without further preparation. If it is contaminated, the surface shall be sandblasted just before final bolting.

All contact surfaces of bolted connections coated with other than inorganic zinc silicate paint shall be cleaned by sandblasting just before final bolting.

Any sandblasting done before final field bolting shall comply with SSPC Specifications for Commercial Blast Cleaning (SSPC-SP6).

6-03.331/B WEATHER CONDITIONS

The Contractor shall apply paint only when air and metal are 40 degrees F or warmer. Major painting on a structure shall not begin unless the weather is forecast to remain above 40 degrees F for at least 48 hours after painting starts. Minor painting of spots and small areas may be done any time the air and metal meet temperature requirements.

In open yards or on erected structures, the metal shall not be painted while hot enough to blister the paint.

Paint shall never be applied on damp metal. Any metal painted under cover in damp or cold weather shall remain covered until dry or until weather conditions permit open exposure.

6-03.331/C APPLICATION

All paint shall be brushed on unless the Project Manual call for another method, or if it is done in a professional manner by competent painters. The paint film shall meet the minimum thickness specified in Section 607.35D.

6-03.331/D ERECTION MARKS

Erection marks to permit identification of members in the field shall be painted on previously painted surfaces.

6-03.331/E MACHINE FINISHED SURFACES

As soon as possible and before they leave the shop, machine-finished surfaces on all shop-fabricated sections, columns, N/C, expellers, and columns bases shall be covered with grease. After erection and welding, the shop-finished surfaces and paint specified. All surfaces of iron and steel members milled to smooth the surfaces and of machine-finished surfaces should be milled to smooth the surfaces. After erection and welding, the shop-finished surfaces and machine-finished surfaces may be milled smooth in the shop, cleaned, and painted as specified. All machine-finished surfaces shall be left in the condition they are milled to smooth the surfaces. After erection and welding, the shop-finished surfaces and machine-finished surfaces may be milled smooth in the shop, cleaned, and painted as specified. All machine-finished surfaces shall be left in the condition they are milled to smooth the surfaces. After erection and welding, the shop-finished surfaces and machine-finished surfaces may be milled smooth in the shop, cleaned, and painted as specified. All machine-finished surfaces shall be left in the condition they are milled to smooth the surfaces. After erection and welding, the shop-finished surfaces and machine-finished surfaces may be milled smooth in the shop, cleaned, and painted as specified. All machine-finished surfaces shall be left in the condition they are milled to smooth the surfaces.

While in the shop, machine-finished surfaces and inaccessible surfaces of roper or play-type bearings shall be milled to smooth the surfaces.

Machine-finished surfaces shall be milled to smooth the surfaces. After erection and welding, the shop-finished surfaces and machine-finished surfaces may be milled smooth in the shop, cleaned, and painted as specified. All machine-finished surfaces shall be left in the condition they are milled to smooth the surfaces. After erection and welding, the shop-finished surfaces and machine-finished surfaces may be milled smooth in the shop, cleaned, and painted as specified. All machine-finished surfaces shall be left in the condition they are milled to smooth the surfaces.
TABLE 3

<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Minimum Bolt Tension (kips)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4</td>
<td>20</td>
</tr>
<tr>
<td>3/16</td>
<td>20</td>
</tr>
<tr>
<td>5/32</td>
<td>30</td>
</tr>
<tr>
<td>7/64</td>
<td>30</td>
</tr>
</tbody>
</table>

Tightening may be done by either the turn-end or the direct-tension indicator method (each described in detail below). In other method, the nut shall be turned tight while the bolt is removed from the system. Each bolt shall have a hardened washer under the nut. However, the tightening may be done by the turn-end method in the absence of any other methods.

(1) Direct-Tension Indicator Method: The bolt torque indicator shall be placed under the nut with the projecting face of the indicator on a hardened flat washer placed between the bolt and the nut. After the bolt has been turned tight, the nut shall be tightened until all gap opening is removed. If the gap opening is more than 50 percent of the gap opening in the bolt indicator measure 0.005 inch (0.13 mm) of gap opening shall be 0.000 inch for unpressed structures. When tightening the nut, hold the bolt head with a hand wrench to prevent turning.

To ensure that this tightening method is followed, the Contractor shall inspect as the Contractor installs and tightens all bolts. In the presence of the Engineer, the Contractor shall inspect all bolts with a tester gauge.

6-03.3-303 HOEING INSPECTION

(1) Hoeing Inspection Process: The Hoeing Inspection Process is as follows:

(a) Hoeing Inspection Process: The Hoeing Inspection Process is as follows:

(b) Check the alignment of all bolts.
(c) Check the tightness of all bolts.
(d) Check the gap opening of all bolts.
(e) Check the alignment of all bolts.
(f) Check the gap opening of all bolts.

6-03.3-304 PLACING EXPANSION BEARING PLATES

Steel structures, pipes, and liners shall be placed in expansion bearing plates. The Contractor shall adjust to ensure the expansion behave at a normal temperature of 64 degrees F. Adjustment for any inaccuracy required shall be made after the specific bearing plate is placed.

6-03.3-305 SETTING ANCHOR BOLTS

Anchor bolts shall be placed in the following steps:

(a) Measure elevations at proper points along the slope.
(b) Place steel weight connectors with the weight minimum 10 degrees.
(c) Furnish the Contractor with new dead load connection details.
(d) Adjust the top of the deck on the slope.
(e) Place the top of the deck on the slope.

6-03.3-306 MEASUREMENT

Bolt lengths shall be measured using a tape measure. The minimum length shall be the sum of the bolt length and the gap opening. The gap opening shall be measured using a feeler gauge. The gap opening shall not exceed 0.005 inch.

6-03.3-307 CASTING, STEEL FORGINGS, AND MISCELLANEOUS METALS

Castings, steel forgings, and miscellaneous metals shall be in accordance with the requirements of Section 405.

6-03.4-308 ENGINEER'S APPROVAL

The Engineer's approval shall be obtained before any machining, welding, or other work is done on the structures.
6.03 STEEL STRUCTURES

6.03.05 PAYMENT
Compensation for the cost necessary to complete the work described in Section 6.03 will be made at the unit contract prices bid for the items listed or referenced below:
1. Structural Carbon Steel, per pound.
2. Structural Low Alloy Steel, per pound.
3. Structural High Strength Steel, per pound.
4. Cast or Forged Steel, lump sum or per piece.
5. Cast, Malleable, or Ductile Iron, lump sum or per pound.

6.04 CONSTRUCTION REQUIREMENTS

6.04.31 STORAGE AND HANDLING MATERIAL
At the work site, the Contractor shall store all timbers and lumber, including finish, rough, and under and around these plans shall have been removed before the lumber is stacked. Lumber shall be stored on supports at least 36 inches above the ground. It shall be piled to shed water and prevent warping.

Treated timber shall:
2. Be stored in closed and stacked piles in a well-ventilated area.
3. Be covered against the weather if the Engineer requires it.
4. Be handled with care to avoid dropping, striking, breaking, or splitting the timber.
5. Be allowed to remain on rope or chain slings (without use of cast, pines, pansies, hooks, or pole jacks).

6.04.32 WORKMENSHIP
The Contractor shall employ only competent building carpenters. All work shall be true and exact. Nails and screws shall be driven with just enough force to leave heads, flush with wood surfaces. The Contractor shall discharge any worker who does poor workmanship by leaving deep hammer marks in wood surfaces. Workmanship on metal parts shall comply with requirements for steel structures.

6.04.32 SHOP DETAILS
The Contractor shall provide the Engineer with 5 sets of shop detail drawings for all treated timber. These Shop Drawings shall show dimensions for all cut, framed, or bored timbers. The Engineer will return the Contractor 1 set of approved or corrected Shop Drawings. No material shall be framed or bored until the Engineer approves the Shop Drawings. Shop Drawings may be placed on sheets that conform to the sizes required in Section 14.05.

6.04.34 FIELD TREATMENT OF CUT SURFACES, BODY HOLES, AND CONTACT SURFACES
All cuts and abrasives in treated piles or timbers shall be trimmed carefully, coated with 2 coats of hot creosote and covered with hot pitch or water-based preservative. Application of creosote treatment shall be the only treatment used in the holes. All bolt holes shall be filled with wood plugs treated with the same preservative used in the holes. On untreated timber, all bolt heads shall be plugged with wood plugs treated with the same preservative used in the holes.

On structures of untreated timber, 2 through holes of hot creosote oil shall be filled with all the heads of all piles, the ends, tops, and all contact surfaces of sills, caps, floorbeams, stringers, and wall girders. All end joints, all contact surfaces of bracing and members, the back faces of full and ledger timbers, the ends of floor members, and the ends of the ends of all wall timbers shall be treated with a preservative. In addition, all depressions or openings around bolt holes, joints, or connections may retain moisture shall be sealed with the hot pitch of an approved quality.

6.04.35 HOLES FOR BOLTS, DOWELS, RODS, PIVOTS, AND OTHER FASTENING DEVICES
Holes shall be bored:
1. For all pins and dowels with a 1/4 inch diameter in the center of the pile or post.
2. For all pins and dowels with a 1/4 inch diameter in larger than the pins and dowels.

6.04.36 BRACING
When piles are taller than 10 feet, each shall be braced close to the ground every other pile. For single crossbracing, there shall be at least 20 feet of vertical distance on the piles. If the vertical distance between crossbracing is less than 20 feet, the crossbracing shall be bolted through the pile, post, or cap with a bolt 3/4 inch in diameter or larger. Crossbracing on piles with a diameter in excess of 20 inches shall be bolted or bolted as the Drawings require. Crossbracing shall lap both upper and lower caps and shall be bolted to them at equal spacing.

6.04.37 STRINGERS
All stringers that carry laminated decking or vary more than 1/8 inch in depth shall be spaced at an even depth at bearing points. Outside stringers shall be fast joined and spliced. Interior stringers shall be joined so that each rests over the full width of the cap or floorbeam at each end. Except for sharp horizontal or vertical curves, stringers may vary 2 spans. In this case, joints shall be staggered and the stringers either lapped or bolted as the Drawings require. Permitted air circulation on unboxed timber structures, the ends of lapped stringers shall be separated. Separation shall be done by fastening across the laps the stringer 1 inch x 1 inch, wood strip cut 2 inches shorter than the depth of the stringer. Any cross-bracing or solid bridging shall be neatly and accurately framed, then securely fastened at each end (with 2 nails for cross-bracing and 4 nails for solid bridging). The Drawings show bridging size and spacing.

6.04.38 WHEEL GUARDS AND RAILINGS
Wheel guards and railings shall be built as Section 6.04.33 requires.

6.04.39 SINGLE-PLANK FLOORS
Single-plank floors shall be made of a single thickness of planks, unless otherwise specified. The floor joist, unless the Engineer otherwise directs, shall be:
1. Laid flat side down with tight joints.
2. Spliced to each end of each joist with at least 2 spikes, not less than 4 inches longer than the plank thickness.
3. Spliced to at least 2/12 inch the floor joist.
4. Cut off at a straight line parallel to the centerline of the room.
5. Arranged so that no adjacent planks vary in thickness by more than 1/8 inch.
6. Surprised on one side and 1 inch thick unless otherwise specified.

6.04.40 LAMINATED FLOORS
The strips shall be placed on edge and shall be driven down tightly against the bottom flange of the joist or girder. End strips and, where held in place, shall be spiked. Each strip shall extend the tread into the riser and shall be fastened to the adjacent stringer. The arrangement is shown in the Drawings or permitted by the Engineer.

Each strip shall be spiked to the adjacent strip at intervals not more than 2 feet and staggered 1 inch in adjacent strips. The spikes shall be of sufficient length to pass through 2 strips and be driven as specified in the Drawings, and the ends of the spikes shall be at least 6 inches in the post.
PLANK Subfloors for Concrete Decks

Any plank slab shall be laid side down with close joints at right angles to the centerline of the roadway. Planks shall be spiked in place as required in Section 6.6-3.14.

PILING

6.05-1. DESCRIPTION

This section covers the construction and driving piles, timber, concrete, cast-in-place concrete, and steel of the pile caps, and splices and the Engineer requires. This work shall also include cutting off and building up piles when required, in providing the means to comply with the requirements of this Section, the Drawings, and the Engineer.

This work shall also include furnishing and driving test piles and preparation of data derived from these procedures in conformance with these Specifications to assist the Engineer in determining pile lengths and driving criteria.

6.05-2. MATERIALS

Materials shall meet the requirements of the following Sections:
- Timber Piling
- Concrete Piling
- Cast-in-Place Concrete Piling
- Prefabricated Hollow Concrete Piling
- Steel Piling

6.05-3. CONSTRUCTION REQUIREMENTS

6.05.3.1 PILES

6.05.3.1.1 GENERAL

Concrete piling may be precast, prestressed, or cast-in-place driven to the minimum load-bearing capacity called for in the Drawings.

6.05.3.1.2 ORDERING PILING

The length of piling given to the Bid Form is for estimating purposes only and is not to be used as an order list.

6.05.3.1.3駒PILING

All piles shall be ordered by the Contractor and shall be determined by the length required from the results obtained by testing the driving of the test piles called for in the Drawings and subsequent exploration data. The Contractor shall increase the length, at his own expense, the necessary amount to provide for fresh bed and to reach from the frost level upward to the position of his driving equipment.

6.05.3.1.4 DRIVER

The contractor shall provide all the equipment necessary to drive all required foundation piles (and build any required caissons or other structures) to their heighth unless the Engineer directs otherwise. If piles do not develop the required load-bearing capacity at the specified tip elevation, the Contractor shall continue driving them until they reach bearing capacity. If no tip elevation is specified, piles shall be driven at least 10 feet below the bottom of the concrete footing and 15 feet below the bottom of the concrete footing.

In embankments, if piling is driven through previously placed material, its bearing capacity shall be based on resistance found only in the underlying foundation material unless otherwise specified. Embankment material includes all that placed above line or the new ground line for excavation or removal of unstable soils.

The Contractor shall coordinate with the engineer to determine how many bearing piles shall be driven, which shall be covered with concrete, and which may be left exposed. The Engineer may, at his discretion, direct that this work be done by special contract.

The Contractor shall also provide all the equipment necessary to drive piles which are not included in the regular plan, but which may be required by the Engineer during the construction. The Contractor shall also provide all necessary equipment for driving piles which are not shown in the Drawings.

Piles shall be driven in true alignment at the locations shown on the Drawings and shall be plumbed or battered as indicated thereon; the final placement location of the piles shall be within ±2 inches from the true alignment position. Piles shall be driven such that the flat side of concrete piles is parallel to the side of the footing.

Any hole developing around a driven pile during driving shall be filled with dry sand or pea gravel as approved by the Engineer. The pile is driven, the Contractor shall fill the open space left by the overturned hole with dry sand or pea gravel approved by the Engineer.

So long as the pile is not injured and the embankment not permanently damaged, the Contractor shall use any means necessary to:
- Secure the minimum depth specified.
- Install the necessary casings or liners under a test upper layer.
- Obtain the specified minimum tip elevation, or
- Execute a test to parallel a previously placed embankment.

If the Engineer requires, the Contractor shall overdrive the pile beyond the minimum load-bearing capacity and penetration shown in the Drawings. In this case, the Contractor will not be required to:
- Use any special means, such as jetting or preheating, to achieve the additional penetration; or
- Bore the expense of removing or replacing any pile damaged by overstressing.

When driving piles for foundations with steel, the Contractor shall use no method (such as jetting or preheating) that might reduce bearing capacity. The Engineer may require the Contractor to increase steel thickness if it proves impossible to drive piles adequately. Unit bid shall cover all costs related to increasing steel thickness for this reason.

Piles shall be driven accurately in true line and position. Unless the Drawings show otherwise, all piles shall be driven vertically. The Contractor shall trim the tops of all piles to the true plane shown in the Drawings and the elevation the Engineer requires. Any piles under timber caps or grilles shall be trimmed to the plumb line of the structure, above them and fit it exactly. The Contractor shall remove and replace any broken, split, or moved piles.

When driving piles, the Contractor shall protect all adjacent structures and piping from damage by whatever means necessary. In complying with the requirements of Section 6.45, it shall be the responsibility of the Contractor to see that his equipment does not damage any adjacent property.

The Contractor shall provide and use vibration recording devices to monitor the vibrations caused by pile driving. The Contractor shall also provide and use vibration monitoring equipment to prevent damage to the nearest structures or piping and shall comply with the specifications and criteria. The Contractor shall provide and use vibration recording devices to monitor the vibrations caused by pile driving. The Contractor shall also provide and use vibration monitoring equipment to prevent damage to the nearest structures or piping and shall comply with the specifications and criteria.

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PILING

(a) Thirty thousand pounds per blow (and the ram of the hammer weighing at least 3,200 pounds) for piles of 5 tons bearing capacities or less, and
(b) Twenty-four thousand pounds per blow (and the ram of any diesel hammer weighing at least 4,000 pounds) for piles with bearing capacities greater than 50 tons.

When using a diesel hammer, the Contractor shall increase ram weight to a point that produces satisfactory results if the weights shown above do not do so. Precast concrete piles (13, 16, and 18 inches in diameter) shall be driven with a single-action steam, air, or diesel hammer. The ram shall weigh at least half as much as the pile. The ratio of footpounds to ram weight shall not exceed 6. The hammer shall develop at least

(a) Thirty thousand pounds per blow for 13-inch piles
(b) Twenty-four thousand pounds per blow for 16- and 18-inch piles.

All piles shall be driven with fixed-lead drivers. The Contractor shall use the hammering or swinging loads unless they can be fixed in position during driving. Loads shall be large enough to be considered for all followers except for timber piles as specified in Section 6-05.3(3). To avoid breaking the tops of the surface of treated timber piles, the Contractor shall use spoons and checkers as little as possible. In forming the spoil, the use of spoons with inclosed leads, tools shall be adapted for driving the piling driver.

The cushion block shall consist of a combination aluminum-magnesium-iron or similar material between the ram and helmet and at least 8 inches of Douglas Fir plywood between the buffer of the cushion block and the header. The buffer shall be eliminated if it has been damaged, split, compressed 6% in any one direction, has become corroded, or has become spogy or deteriorated in any manner. Under such circumstances, it shall be replaced with 3 inches of hot creosote oil of a quality the Engineer approves. The Engineer may reject any pile because of a cut or break.

6-05.3(1)E TEST PILES

The Contractor shall furnish and drive test piles at the locations shown on the drawings or at the locations designated by the Engineer. They shall be driven to determine the pile driving resistance and to evaluate the soil carrying capacity of the pile from the driving record for the Engineer. The driving criteria for production piles shall then be established by the Engineer.

(a) Made of the same material and have the same tip diameter as the permanent piles. All test piles for treated timber piles may be either treated or untreated.
(b) Driven with pile tips if the permanent piles will have tips.
(c) Provided when prefabricated is specified for the permanent piles.
(d) Located in the area designated by the Engineer.
(e) Driven only to determine the driving resistance and to evaluate the soil carrying capacity of the pile.

The Contractor shall base test pile lengths on test-hole data in the Contract. All test piles that prove to be too shallow shall be replaced at the Contractor’s cost.

The Contractor shall complete the "Pile and Driving Equipment" form included in the Appendix and submit this form to the Engineer for approval prior to pile driving. All pile driving equipment shall be designed, constructed, and maintained in a manner suitable for the work to be performed in this section. If, in the opinion of the Engineer, the driving equipment is inadequate or defective, the Engineer may direct that it be removed from the job site and replaced. If a driving method is being used, the Contractor shall be responsible for all equipment and for any repair costs resulting from this equipment or its removal, replacing, or removing such equipment shall be the Contractor’s responsibility.

A driving helmet or cap including a cushion block or cap block shall be used between the top of the pile and the ram to prevent impact damage to the pile.

The driving helmet or cap shall be cushioned to provide a smooth surface and shall be capable of being replaced by the driving head, minimizing entry of dirt, sand, and other foreign material or debris and transmitting hammer energy uniformly and consistently during the entire driving period. If a driving helmet or cap block is not used, the top of the pile shall be made to rotate slightly without binding within the driving head.

6-05.3(2) TIMBER PILING

6-05.3(2A) STORAGE AND HANDLING

The Contractor shall store and handle piles in ways that protect them from injury. Treated piles shall be stacked closely and piled to prevent warping. The ground beneath and around stored piles shall be cleared of weeds, brush, and

rubbish. Piles shall be covered against the weather if the Engineer directs.

The Contractor shall take special care to avoid breaking the surface of the pile. The pile shall be handled with care and moved with rope or chain slings (without the use of cant, derricks, hoists, or cranes). When piles are handled by water, all attachments shall be within 6 feet of the bitts or tips. Any surfaces of the pile shall be handled with 3 inches of hot creosote oil of a quality the Engineer approves. The Engineer may require any pile because of a cut or break.

6-05.3(2B) DRIVING

Treated and untreated timber piles shall be freely cut on the bitt ends just before they are driven. If piles will be driven into hard material, caps, collars, or bands shall be placed on the bitt ends to prevent crushing or bashing. If the bitt area of the pile is larger than that of the hammer face, the head shall be shielded or chambered to fit the hammer. On treated piles, the heads shall be shielded or chambered to at least the depth of the sawed up to avoid splitting the supposed from the pile body. On timber piles, the Contractor may use steel (not wooden)followers if the driving head and cap will not reach over the pile head. The Owner prefers, however, that the hammer strike the pile head directly without any cushion, block, or follower. If a follower is used, the Contractor shall, in each group of 10 piles, drive 1 long pile without a follower. This long pile shall be used to test the bearing power of the group.

The Owner prefers that timber piles be driven with squared ends. If conditions require, they shall be shaved with metal above an approved design.

The Contractor shall use full length timber piles. Treated timber piles shall have pressure treated wood.

In timber pile heads, boxes shall be true to line and position and shall locate all piles. The piles shall be driven accurately to the correct location and to the vertical or better than the Drafter requires. If a pile is driven out of line, it shall be straightened without injury before it is cut off or bashed. The Contractor shall remove any deviation from the line of the driving or straightening or any pile driven below grade. No shimming on top of piles will be permitted.

The Contractor shall never allow piles in any single batch to prevent sway breaks from undue bending or distorting.

6-05.3(2C) SPACING COMPOSITE PILES

If the Drafter requires more than one batch (i.e., batch of treated and untreated timber), the untreated pile shall be driven first. It shall be driven to a point not less than 10 feet above ground or water line before the treated pile is commenced and replaced. The Drafter may direct the Contractor to drive the next pile in more than 15 tons over the minimum bearing value for permanent piles. In this case, the overriding shall be at the Drafter’s expense. The overriding shall be determined from the driving records and and at the Contractor’s expense.

6-05.3(2D) TREATMENT OF PILE HEADS

The Contractor shall thoroughly coat the heads of all untreated piles with 2 coats of hot creosote oil (except concrete-encased piles). After cutting treated piles to correct elevation, the Contractor shall brush 3 coats of hot creosote oil on all pile heads (except those to be covered with concrete footings or concrete caps). That portion of the piles shall be lashed with alternate layers of hot pitch (or approved roasting asphalt) and a waterproofing fabric as shown on the drawing in Section 9-11.2. The cap shall be made of 4 layers of pitch and 3 layers of fabric. The fabric shall be cut large enough to cover the pile top and folded down at least 6 inches along all sides of the pile. After the fabric cover is bent down over the pile, its edges shall be fastened with large bolt galvanized nails or with three turns of galvanized wire. The edges of the cover shall be neatly trimmed.

On any treated pile encased in concrete, the cut end shall receive 2 coats of hot creosote oil and then a heavy coat of coal tar pitch, or some other sealer.

6-05.3(2E) STRAPPING

Section 9-11.1 governs strapping for timber piles. The following formulas shall determine safe-bearing values:

P = 20HL for all gravity hammers
P = 20HL for all single-acting hammers and closed-out hammers (double-acting diesel hammers)
P = 20HL for double-acting steam or air hammers

Where:
H = Safe bearing capacity in pounds
W = weight, in pounds, of hammer striking parts
B = drop of hammer or stroke of ram, in feet
A = area of piston in square inches
P = steam pressure in psi at the hammer

The average penetration is in inches per blow for the last 10 to 20 blows for gravity hammers for the last 10 to 20 blows for steam, air, or diesel hammers

For closed-end diesel hammers (double-acting), the energy (PR) is to be determined from the boundary chart.

The boundary chart is to be caleculated for each project.

The formula above apply only when:
(a) The hammer shall be in gear in the desired position.
(b) The pile head is free from embedded, buried, or obstructed soil.
(c) The penetration occurs at a reasonably uniform rate.
(d) There is no perceivable bounce after the blow. Twice the height of the bounce is deducted from "P" to determine its true value in the formula.

The Engineer may require the Contractor to install a pressure gauge on the inboard end of the line to check pressure at the hammer.

For timber piles, bearing power calculated by the formulas above shall be considered effective only when it is less than the crushing strength of the piles. Unless the Drafter states otherwise, timber piles shall have minimum bearing values (determined by the formulas above):
(a) In foundation: 40 tons
(b) In water depths: 20 tons

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6-05.3/C3/B CASTING

In casting concrete piles, the Contractor shall:
(a) Cast them either vertically or horizontally,
(b) Use metal forms (unless the Engineer approves otherwise) with smooth joint surfaces and inside surfaces that can be reached for cleaning after use,
(c) Brake and fill the forms to prevent distortion,
(d) Use a concrete mix that will distribute aggregates evenly, with fine and coarse aggregate having approximately the same specific gravity,
(e) Place concrete continuously in each pile, providing special horizontal or diagonal clearance planes,
(f) Ensure that the reinforcement is properly embedded,
(g) Use internal vibration around the reinforcement during concrete placement to prevent rock pockets from forming,
(h) Cast test cylinders with each set of piles as concrete is placed.

Centrifugally cast piles shall be fabricated in a machine that can spin the forms fast enough to distribute and consolidate the concrete without leaving voids, thereby improving the reinforcement. The forms shall be rigid enough to take the centrifugal force without distortion or reduction in effective speed. Centring and spooling shall be continuous. Spooling shall begin with each piece of the machine, and the machine shall drain excess water forced to the center of the form as it spins.

6-05.3/C3/F FINISHING

As soon as the forms for precast concrete piles are removed, the Contractor shall fill all holes and irregularities with a matchless mortar. Part of any tendon pile that will be underformed or below the low-water line and all parts of any pile to be used in still water or alkali soil shall receive only the mortar treatment. That part of any tendon pile that will show above the ground or water level shall be given a Class F finishing (see Section 642.21/0D).

6-05.3/C3/D CURING

(a) Precast Concrete Piles. The Contractor:
(i) Maintain the concrete continuously wet with water after placement for at least 10 days with Type II portland cement or at least 3 days with Type III.
(ii) May remove side forms 3 hours after concrete placement, and remove all cover until concrete remains at a minimum of 50 degrees for 5 days with Type II portland cement,
(iii) May cure precast piles with saturated steam or hot or cold water for at least 2 days, provided the piles are kept continuously wet until the concrete hardens.
(iv) These piling shall be cast with each set of piles as they are poured.
(b) Precast-Posttensioned Concrete Piles. These piles shall be cured in water in accordance with Section 642.21/0D.

6-05.3/C3/E STORAGE AND HANDLING

The Contractor shall not handle or store any pile until test cylinders placed with it reach at least the specified design strength. On all other precast piles, the cylinders must reach a strength of at least 4,000 psi before the piles are driven.

6-05.3/C3/J PRESTRESSING STEEL

Prestressing steel shall meet the requirements of Section 507.2 and shall be tensioned as required in Section 642.21/0F.

6-05.3/C3/K TOLERANCES AND CUTOFF

(a) Fill shall be driven with a variation of not more than 0.25 inch per foot of pile length from the vertical or from the axis of the better shown on the Drawings. Manipulation of fill to force them into position will not be permitted. The Contractor is advised that piles driven outside of the specified tolerances may require pile cap modification, related to both size and reinforcement, or may require additional piles to be driven. Such modifications shall be performed as directed by the Engineer at an additional cost to the Owner. The tops of all piles shall be cut to the elevation shown on the Drawings. Cut-off tolerance shall be plus 1.0 inch and minus 0.5 inches for 14-inch piles and 16/12-inch piles. Cutting off concrete piles shall be done with pneumatic tools sawing, or other approved means. The use of explosives for cutting will not be permitted.

6-05.3/C3/L CASE-IN-PLACE CONCRETE PILES

The Contractor shall add expansions, splices, or building up (if necessary) on precast concrete piles after they are driven.

6-05.3/C3/M STEEL CASTINGS OR SHEELS

(a) Seed casings shall be strong and rigid enough not to distort from pressures from the soil or the driving of adjacent piles. The casings shall keep water out before and during concrete placement.

(b) The diameter of steel casings shall be as follows:

(i) Fifty-five Ton Bearing Capacity Piles. Casings of constant diameter shall be at least 1 inch in diameter. Tapered or step-casings shall be at least 1 inches in outside diameter at the top, at least 8 inches in outside diameter at the tip. The taper shall be a gradual one and shall not exceed 1 inch in outside diameter at the top of the pile. Casings of constant diameter shall be at least 14 inches in outside diameter at the top, and at least 16 inches in outside diameter at the base and at least 10 inches in outside diameter 5 feet above the tip. All sections in a stepped-casing shall be the same length. The Contractor shall not weld a constant-diameter section to the tip section to increase pile length unless the Engineer approves in advance. The diameter of the pile sections shall be measured from crest to crest of the flutes. The casings of 55-ton bearing capacity piles shall be welded as required in Section 642.38/3E. The lower end of each casing shall have a steel driving plate that is thick enough to keep the casing watertight and free from distortion as it is driven. The Contractor is advised that piles driven outside of the specified tolerances may require pile cap modification, related to both size and reinforcement, or may require additional piles to be driven. Such modifications shall be performed as directed by the Engineer at an additional cost to the Owner. The tops of all piles shall be cut to the elevation shown on the Drawings. Cut-off tolerance shall be plus 1.0 inch and minus 0.5 inches for 14-inch piles and 16/12-inch piles. Cutting off concrete piles shall be done with pneumatic tools sawing, or other approved means. The use of explosives for cutting will not be permitted.

6-05.3/C3/N DRIVING AND INSPECTING STEEL CASTINGS

(a) A driving head and pile of the right size for the hammer shall distribute the blow and protect the tip of the steel casing from driving damage. Right blows shall support hammer and pile.

(b) The Contractor shall drive piling true alignment and location as shown in the Drawings. If a casing will be driven within 15 feet of a pile containing reinforcement, the
concrete in that pile must not set for at least 7 days before the casing is driven. If the pile does not contain cement, the concrete to be used must have set at least 24 hours before the casing is driven.

After driving a pile casing, the Contractor shall leave it empty until the Engineer has inspected and approved it. The Contractor shall make available to the Engineer a light suitable for inspecting the entire length of its interior. The Engineer will reject any casing that is improperly driven, that shows partial collapse that would reduce its bearing value, or that has been reduced in diameter. The Contractor may replace any rejected casing.

Also approved by the Engineer, driven casings shall be cut off horizontally at the required elevation. They shall be clean and free of water when concrete and reinforcing steel are placed.

If part of the pile will show above the ground or water line, the steel casing shall be cut off at least 6 inches below the finished ground line or at the low water line as determined by the Engineer. Any pile building above the steel casing for 50 feet and 50 feet piles shall conform respectively to WSDOT Standard Plan No. T-6-4 and T-6-4a for 15-inch and 16-inch diameter prestressed piles except that these buildings may be round or oval. Building piles shall conform with Section 6-6.3.7(2). The reinforcing steel for the building pile above the steel casing shall extend at least 1 foot to the center of the building section.

6-6.3.5(2) PENETRATION

No. 5 reinforcing steel bars shall be used in all cast-in-place concrete piles. The number of bars per pile shall be as follows:

(a) 12-inch diameter, 50 feet pile: 6 bars.
(b) 14-inch diameter, 70 feet pile: 7 bars.
(c) All other pile sizes: 1.5 percent of the cross-sectional area.

Reinforcement shall extend to the bottom of the pile or the ground line below the helix anchor if less. It shall extend at least 1 foot above the footing or pile cap or to within 3 feet from the top of the footing or pile cap.

All bars shall be bent to either 90 degrees or 180 degrees of the main reinforcement and at 6-inch centers around the remainder of the main reinforcement. The bars shall be bent at an angle of at least 90 degrees of the main reinforcement and at 6-inch centers around the remainder of the main reinforcement. The bars shall be bent at an angle of at least 90 degrees.

6-6.3.5(3) PLACING CONCRETE

The formulas in Section 6-6.3.7(2) shall determine bearing capacities of prestressed, hollow concrete piling, or as shown otherwise in the Project Manual.

6-6.3.5(4) STIRRING PILING

Steel piles shall be made of rolled steel H-piles sections or of other structural steel sections described in the Drawings.

6-6.3.5(5) STORAGE AND HANDLING

The Contractor shall store and handle steel piles in ways that protect them from injury. The Engineer will reject bent or damaged piles.

Compensation for the cost necessary to complete the work described in Section 6-6.5 will be made at the unit contract prices bid only for the bill items listed or referenced above:

(1) "Furnishing and Driving (Kind) Test Pile", per each.
(2) "Driving Timmer Pile, Electromagnetic Magnetic Treatment", per each.
(3) "Driving Timmer Composite Pile", per each.
(4) "Driving Conc. Pile Size", per each.
(5) "Driving Steel Size", per each.
(6) "Furnishing Timmer Piling (Untreated or Name Treatment)", per linear foot.
(7) "Furnishing Conc. Piling (Size)", per linear foot.
(8) "Furnishing Steel Piling", per linear foot.
(9) "Pile Splice-Timber", per each.
(10) "Furnishing Prestressed Hollow Conc. Piling Sizes", per linear foot.
(11) "Furnishing Prestressed Hollow Conc. Pile Sizes", per each.
(12) "Driving Prestressed Hollow Conc. Pile Sizes", per each.

The unit contract price for "Furnishing and Driving (Kind) Test Pile" shall be full pay for furnishing and driving test piles to the bearing capacity or penetration required by the Engineer; furnishing and installing a pile tip when pile tips are specified for the permanent piles, testing when producing is specified for the permanent piles, for pulling the piles or cutting them off as required, and for removing them from the site or for delivery to the Owner or designated location for storage when ordered by the Engineer. The price shall also include all costs in connection with moving all pile driving equipment or other necessary equipment to the site of the work and for removing all such equipment from the site after the piles have been driven. If, after the test piles have been driven, it is found necessary to eliminate the pile from all or any part of the structure, no additional pay will be allowed for moving the pile driving equipment and to return the site of the work.

The unit contract price for "Driving (Kind) Test Pile" shall be full pay for driving the pile to the bearing and/or penetration specified. No additional pay over the contract price for "Driving (Kind) Test Pile" will be made for driving piles to the additional penetration as directed by the Engineer and as provided in Section 6-6.3.7(2), except that if driving to an additional penetration of more than 3 feet, additional penetration will be paid for on the basis of force account work as covered in Section 6-3.7.

The unit contract price for "Furnishing (Kind) Pile" shall be full pay for furnishing the pile as specified. Such price shall also be full pay when measurement includes, for pile length ordered but not driven.

The unit contract price for "Pile Splice-Timber" shall be full pay for furnishing the pile splice as specified. No payment will be made for steel or cast-in-place concrete pile splices.

Payment for build-ups of precast or prestressed concrete piles will be made on the basis of hours as covered in Section 1-6.6. No payment will be made for build-ups or additional piling or cast-in-place concrete piles because of damage to the pile during driving. The length of splice for prestressed concrete piles shall be such that the piling shall not impose reinforcing steel for the splice. The length of splice for non-prestressed concrete piles shall be such that the holes are drilled and reinforcing bars are ground.

The unit contract price for "Furnishing Prestressed Hollow Concrete Piling Sizes", "Installing Prestressed Hollow Concrete Pile Sizes", for "Driving Prestressed Hollow Conc. Pile Sizes", and for "Driving Conc. Pile Sizes" shall be full pay for pile in place. Required extensions will be paid for on the basis of force account work as covered in Section 1-6.6 of these Specifications.

Any pile which is damaged or removed before or at the time it is being driven shall be replaced by the Contractor at his own cost.
Unless the Drawings show otherwise, wheel guards shall be:
(a) Beveled and surfaced on the roadway side and surfaced on the top edges. They may be beveled on four sides of this work.
(b) Horizontally supported position at a 12 foot length.
(c) Horizontally supported position at a 12 foot length at 6 feet spacing (railing pieces) with 3/4 inch bolts spaced no more than 4 feet apart.

All rails and rail post material shall be S4S and painted as required in Sections 606 and 607. Railang members shall be fastened together securely, with the bolts tightened once at inspection and again just before the Owner's final acceptance of the Contract.

Metal railings include posts, railings, and horizontal members of the sidwalk and roadway railing. Unless the Drawings or Project Manual shows otherwise, these shall be made of aluminum alloy or similar material. After fabrication the railing, the Contractor shall submit 6 copies of the Shop Drawings for the Engineer's approval. The Contractor may substitute other rail connection details for those shown in the Drawings if details of those changes are shown in the Shop Drawings and if the Engineer approves. In approving Shop Drawings, the Engineer indicates only that they are adequate and complete enough. Approval does not indicate a check on dimensions. Anchor bolts or wedge anchor shall be positioned with a tolerance to assure that bolts match the hole spacings of the bottom channels or anchorage plates. The specified, cover plates shall fit the bottom channel tightly after being snapped into position. Metal railing shall be installed true to line and grade (or layout) After final application of the surface material, and the Shop Drawings shall be considered accepted to construction. Payment for "Tool Remover Bar" shall be in accordance with Section 504.5.

All expense for jetting, sand and pea gravel and vibration monitoring shall be considered incidental to completing and no separate payment or further compensation shall be made.

SECTION 6-06 BRIDGE RAILINGS

6-06.1 DESCRIPTION

6-06.2 MATERIALS

6-06.3 CONSTRUCTION REQUIREMENTS

6-06.3(1) TIMBER RAILINGS

6-06.6 PAYMENT

6-07 PAINTING

Payment for timber railing shall be per "Timber and Lumber, (untrimmed or rough dimensions) per Section 604.5 and all costs necessary to construct and paint the railings and posts as shown in the Drawings.

SECTION 6-07 PAINTING

6-07.1 DESCRIPTION

6-07.2 MATERIALS

6-07.3 CONSTRUCTION REQUIREMENTS

6-07.3(1) PAINTING NEW STEEL STRUCTURES

6-07.3(1A) GENERAL

6-07.4 NUMBER OF COATS AND COLOR

PAINTING 6-07

6-07.3(1B) WEATHER CONDITIONS

6-07.4(1D) APPLICATION

Welding, painting, or dry forming shall be true to line and grade and framed accurately. The Contractor shall follow Section 6-06 however this Section does not specify a construction method.

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6.07.3.1(F) FIELD CLEANING

After completing erection work (including bolting, driving, welding, etc.), the Contractor shall thoroughly clean all metal surfaces to the satisfaction of the Engineer. The metal surfaces shall be so cleaned that: metal, breakers, switches, chutes, hoppers, sanitizing, or other means the Engineer requires to remove rust, dirt, and grime which should be used to remove oil and grease, and brake or wood fiber brushes to remove loose dust. If the structure is covered with dirt or concrete residue, pressure washing may be required (as specified in Section 6.07.3.2(F)).

- When shipping, handling, or welding injures the shop coat, damaged areas shall be thoroughly cleaned by wire brushing before field painting. Between coats of paint, if the Engineer requires, the Contractor shall reduce the structure by the methods described above.

6.07.3.1(G) FIELD PAINTING

Immediately after the Engineer approves the field cleaning, the Contractor shall apply one touch-up coat of the same paint used for the shop coat in these area bell heads, areas where the shop coat has been broken, and all marks made during shipping or erection.

The first field coat shall be applied only after the touch-up coat is completely dry. If the first field coat leaves small cracks and nicks that are not superficial, they shall be filled with red lead or red oxide primer painted (by brush or airbrush) before the second field coat is applied. No later coat shall be applied until the full thickness of the previous coat has been applied.

6.07.3.2 REPAINTING EXISTING STEEL STRUCTURES

Unless otherwise provided, corrosion/painting includes cleaning and painting the metal parts of an existing bridge.

Cleaning means removing rust, scale, paint, dirt, grease, and other contaminants from the metal surfaces to be painted. The Contractor shall clean and paint all exposed metal surfaces that are rust. These include all supports, other than other metal, wooden floor or girder members, or structural steel, etc.

The first coat of paint shall consist of a base primer conforming to Form 9-A-49 (Phosphated Red Lead Primer) and shall be applied immediately after the cleaning process and prior to the application of additional priming.

After the second coat of paint has dried, all cracks and nicks which are not sealed with the sealant, and all cracks and damage that is not covered with rust or dirt shall be sealed with Acrylic Surface Seal (A.S.S.) or a similar product. After which, the resulting raw eased has been added to render it workable. The painting shall be applied according to the requirements of Sections 6.07.3.2(C) and 6.07.3.3(C) of the Project Manual.

Painting shall be completed after exhaust painting is applied. The color of the succeeding coat shall be sufficiently different from that previously applied. This prevents the operation of an incomplete application of the paint coat. The color of the third coat shall be so directed by the Engineer.

Prior to pressure washing and abrasive blasting, the Contractor shall be notified. Paint may be omitted in some areas, as directed by the Engineer.

Pressure washing shall precede all other methods of cleaning the metal surfaces. Pressure washing may be used in some areas, as directed by the Engineer.

 Priming shall be done with clean, fresh water. The solution shall be sufficient pressure to remove all oil debris, dirt, etc. and leave a clean, dry surface. The pressure washing equipment shall protrude (at the nozzle) not more than 2 feet, and a maximum of 8 gpm. The nozzle shall have a 90° tip and shall not be more than 5 inches from the surface being washed.

A period of three days shall elapse before applying paint to a surface which has been cleaned by flushing, with care being taken to remove any dust, or dirt, before painting, which may have settled on the steel members in the interim time. In these areas where flushing cannot be satisfactorily accomplished, the surface shall be washed down with a solution of water and rust inhibitor to the satisfaction of the Engineer.

Pretreatment shall be by mechanical abrasive blasting in accordance with SPC-SPG Specifications. All rust spots that are abraded shall be painted with the specified paint. Metal appearance shall be in accordance with SPC-SPG Specifications. The Engineer shall have no evidence of rust or scale rust or scale at the edges of the blasted area, but the blasted area shall be extended to sound paint and the sound paint edges shall be flashed to give a smooth surface. Minimum sandblasting nozzle pressure shall be 60 psi.

While metal shall be defined as the Structural Steel Painting Council No. 33 and is a situation, gray, white metallic color, slightly rough to form a suitable base for paint. If the metal at the edge of a abrasive blasted area 1 foot or the spot coats are applied, the field paint shall be a scuff coat and allowed to dry.

All rust spots which are not removed by abrasive blasting shall be removed by wire brushing, scraping or other effective means as directed by the Engineer.

Painting shall not begin until after approval of surface separation of each section of the structure by the Engineer. All steel surfaces shall be uniformly swabbed blotted prior to spot blasting corroded areas. Non-galvanized railing shall be 100% sandblasted to Commercial Blast (SPSC-SPG) specifications.

Abrasive blasting operations shall be done in such a manner that no damage occurs to any portions of the work partially or entirely completed.

6.07.3.3 REPAINTING EXISTING STEEL STRUCTURES

The degree of cleanliness shall be determined by the Engineer. After abrasive blasting, all loose rust, dust, and dust shall be thoroughly removed before paint is applied. The contractor shall recover 98% of the waste abrasive blasting material. Abrasive blasting clean up and painting shall be in accordance with local air pollution control regulations.

After the second coat of paint has dried, all cracks and nicks which are not sealed with the sealant, and all cracks and damage that is not covered with rust or dirt shall be sealed with Acrylic Surface Seal (A.S.S.) or a similar product. After which, the resulting raw eased has been added to render it workable. The painting shall be applied according to the requirements of Sections 6.07.3.2(C) and 6.07.3.3(C) of the Project Manual.

6.07.3.4 PAINTING GALVANIZED SURFACES

All galvanized surfaces to be painted shall be prepared and painted as follows:

- Clean all surfaces thoroughly with tallow base solvent.
- Wipe off all the solvent with clean rags until surface is dry.
- Apply as many coats of primer as specified by the following schedule:
  - 6-A-46 First Coat, Zinc Dust Zinc Oxide Primers, C-900 or C-1100 (Non-Phosphated Finish Coat for Steel).
  - 6-C-35 Third Coat, Phenolic Finish Coat for Steel.
- The color of the finish coat shall be as specified in the Project Manual.
- Any other finish, no matter how being applied, shall have a wet thickness of at least 3.0 mg per m² and a dry film thickness of at least 1.5 mg per m².

6.07.3.5 PAINT FILM THICKNESS

A full wet film of Formul 6-A-55-vinyl ester free from dusts and saga from the proper film thickness (the rapid solvent release in this vinyl pretreatment makes it difficult to measure the wet film thickness). Dry film thickness shall be between 0.4 and 0.7 mg.

Any other finish, no matter how being applied, shall have a wet thickness of at least 3.0 mg per m² and a dry film thickness of at least 1.5 mg per m².
609-08 WATERPROOFING

609-08.02 MATERIALS

Concrete or asphalt shall meet the requirements of the following Sections:
- Asphalt for Waterproofing 911.11
- Waterproofing Fabric 911.12
- Portland Cement Mortar 911.13

609-08.03 CONSTRUCTION REQUIREMENTS

609-08.03.01 STORAGE OF FABRIC

On the fabric shall be stored in a dry, protected place. Rolls shall not be stored standing on end.

609-08.03.02 PREPARATION OF SURFACE

Concrete surfaces shall be reasonably smooth and without projections or holes that might puncture the waterproofing membrane. The surfaces shall be dry, with all dust and loose material removed. The Contractor shall not apply waterproofing in wet weather or when the air temperature is below 15 degrees F unless the Engineer approves in writing.

609-08.03.03 APPLICATION OF WATERPROOFING

Waterproofing asphalt shall be applied so frequently as it is heated to between 300°F and 500°F. Each heating bin shall have a thermometer.

Each coat of primer or asphalt shall be laid at the low point of the surface so that water will run off (not against or along) the laps.

In applying the waterproofing, the Contractor shall:
- Apply a coat of primer and let it dry before applying the hot asphalt.
- Heat asphalt on a band about 10 inches wide across the full length of the surface.
- Immediately roll a starter strip of half-width fabric into the asphalt, pressing it into place to rid it of all air bubbles and to bond it closely to the surface.
- Heat asphalt on the first strip and an adjacent portion of the surface so that the fresh asphalt forms a bond with the old asphalt that is still hot.
- Immediately roll a full-width strip of fabric into the fresh asphalt and bond it into place as before.
- Heat asphalt on the last strip and on an adjacent portion of the surface slightly wider than the full width of the fabric.
- Roll a starter strip of fabric into the asphalt, lapsing the primer strip by at least 1 inch and pressing it into place as before.
- Repeat steps (2) and (3) until the entire surface is covered.
- Heat the entire surface with a final coating of hot asphalt.

The three complete mappings of asphalt shall ensure that no fabric layer ever touches another fabric layer or the concrete surface. The Contractor shall examine all laps and ensure that they are thoroughly sealed down.

Each mapping shall cover completely, with a coat heavy enough to hide the fabric weave and all gray spots from the concrete. On horizontal surfaces, at least 15 gallons of asphalt shall be used for every 100 square feet of finished work. On vertical surfaces, at least 15 gallons per 100 square feet shall be used.

At the end of each day's work, all fabric that was laid shall have received its final mapping of asphalt. Wherever the membrane ends or is punctured by drains, it shall be necessary to seal the ves towards the area to prevent water entering from the waterproofing and the concrete surface.

609-09 CREEPING

609-09.03 VACANT

609-09.04 VACANT

609-09.05 METAL CREEPING

The Contractor shall follow the WSDOT Standard Plan Notes, P-5 and S-5 in fixing metal creeping. Metal creeping is classified under six designs based on its width:

- Design A: Base Width (in feet)
  A: 5.5
  B: 12.5
  C: 9.9
  D: 12.1
  E: 14.3
  F: 16.5

Cribbing members shall be handled carefully. Damaged members shall be removed and replaced. The fabricator's instructions and recommendations for field assembly shall accompany each shipment of cribbing materials. If the Engineer requests, a qualified agent of the materials supplier shall visit the field for inspection and advice during assembly.

The Contractor shall:
- Expedite in accordance with Section 2.49.
- Construct and insulate in accordance with Section 14.32(10).
- Place cribbing inside roads and behind walls in horizontal layers no more than 6 inches thick.
- Maintain an equal elevation of fill behind walls and inside dikes during the backfilling operation.
- Trim and compact each layer to 95 percent of maximum density (determined by the Compaction Control Test described in Section 33.13(14)).

609-09.06 GABION CREEPING

This work is bidding wire gabion creeping as required by the Engineer for the specifications, and the Engineer.

609-09.07 BASKETS

Baskets shall be fabricated from woven steel wire. Baskets may be formed of 12-inch rolls and constructed cribbing as required by the Engineer, for the specifications, and the Engineer.

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Baskets shall be fabricated from woven steel wire. Baskets may be formed of 12-inch rolls and constructed cribbing as required by the Engineer, for the specifications, and the Engineer.
6-10.4 MEASUREMENT
The items of work completed pursuant to Contract Documents will be measured as provided in Section 1401. Measurement of Quantities shall be performed for by individual measurement paragraphs herein. This Section shall be measured by the square foot using the sum of the face areas. To determine the face area, the Owner will consider each bin 10 feet long even when shorter bin lengths are used on the face. Bin heights will be calculated by multiplying the number of strings on the bin by 1.25 feet. Each bin face area will be calculated as follows: Bin Face Area = (No. of strings in face) x 1.313 x 10.

6-10.5 PAYMENT
Compensation for the cost necessary to complete the work described in Section 6-10 will be made at the unit contract price bid only for the pay items listed or referenced below:

(a) "Metal Cribbing, (Type) per cubic yard.
(b) "Galen Cribbing, per cubic yard.

The unit contract price for "Metal Cribbing, (Type) per cubic yard" shall be full pay for construction and handling of the metal cribbing. All costs involved in the use of special crews shall be included by the Contractor in the unit contract price for the adjusted basis as specified in Section 6-10.4.5.

The unit contract prices for "Galen Cribbing" shall be full pay to complete the work as specified including testing, cleanup, and any final adjustments deemed necessary by the Engineer.

Payment for "Structure Excavation" shall be per Section 2-6.5.

SECTION 6-10 CONCRETE BARRIER

6-10.1 DESCRIPTION
This work shall consist of building precast or cast-in-place concrete barrier as required by the Drawings, these Specifications, or the Engineer.

6-10.2 MATERIALS
Materials shall meet the requirements of the following Sections:

Portland Cement
Galaire
Precast Joint Fillers

Wire rope shall be Class 6 x 19, made of improved low heat steel that has been galvanized and preformed. Galvanized wire rope shall have regular lay and a fiber core. It shall be 5/8 inch in diameter and have a minimum breaking strength of 15,000 lb.

All hardware (connecting pins, drift pins, nuts, washers, etc.) shall be galvanized to comply with AASHTO M 272.

The wire rope shall be untwisted and used in the same manner as required for concrete traffic and pedestrian barriers in Section 6-10.8.

At final acceptance of the project, the barrier shall be free from stains, marks or scratches.

6-10.3 CONSTRUCTION REQUIREMENTS

6-10.3.1 GENERAL
All barriers, the Contractor shall use pre-stressed concrete that complies with Section 6-10.3.4.

6-10.3.2 PRECAST CONCRETE BARRIER
Precast concrete barrier shall reach a compressive strength of at least 2,000 psi at 28 days. No concrete barrier shall be shipped until test cylinders made of the same concrete and cured under the same conditions along the same concrete has reached a minimum of 2,000 psi.

Class A3 concrete that complies with Section 6-10.2 will meet this strength requirement. The Contractor, however, after the mix and aggregate grading it.

(a) "The Engineer approves.
(b) "The altered mix meets the strength requirement,
(c) "No aggregate is used that is larger than the maximum for Class A3 concrete.

The Contractor may use Type III perlament concrete, but shall bear any added cost.

Precast barrier shall be cast in steel forms. After release, the barrier shall be mounted on a smooth, dense surface, free from any rock pockets or holes larger than 1/4-inch in diameter or lifting holes. The work "temporary" shall be either staple or drop in each barrier segment.

All barrier shall be in good condition, without cracks, chips, spalls, dirt, or traffic marks. Any barrier segment is damaged during or after placement, the Contractor shall immediately repair it to the Engineer's satisfaction or replace it with an unbroken part thereof.

As soon as the temporary barrier is no longer needed, the Contractor shall remove it from the project. Owner furnished barrier shall remain Owner property, and the Contractor shall deliver it wherever the Engineer directs. Contractor furnished barrier shall remain the property of the Contractor.

6-10.3.3 PLACING CONCRETE BARRIER
Precast concrete barriers shall be cast on a paved foundation shaped to a uniform grade and section. The foundation surface shall meet the following requirements:

(a) The barrier shall be made of Class A3 concrete that meets the requirements of Section 6-10.
(b) The Contractor shall prepare the foundation and shall interlock it with adjacent precast segments.
(c) The barrier shall be placed so that the surface is perfectly true, a terminal section shall be made temporarily to the end of the barrier being laid each day.

6-10.3.4 CAST-IN-PLACE CONCRETE BARRIER
Forms for cast-in-place barrier shall be made of steel or exterior plywood coated with paint. The forms shall be made of Class A3 concrete that meets the requirements of Section 6-10. The Contractor may use Type III perlament concrete, but shall bear any added cost.

6-10.4 MEASUREMENT

6-10.5 PAYMENT
Compensation for the cost necessary to complete the work described in Section 6-10.4 shall be made at the unit contract prices bid only for the pay items listed or referenced below:

(a) "Precast Concrete Barrier, (Type), per linear foot.
(b) "Cast-In-Place Concrete Barrier, (Type), per linear foot.
(c) "Concrete Barrier Light Standard Section," per each.
(d) "Temporary Concrete Barrier," per linear foot.
(e) "Resetting Concrete Barrier," per linear foot.

The unit contract price for "Precast Concrete Barrier, (Type)" and "Cast-In-Place Concrete Barrier" shall include all costs for the work required to furnish material and construct barrier as specified.

The unit contract price for "Concrete Barrier Light Standard Section" shall include all costs for the work required to furnish, place, maintain, and remove the temporary concrete barrier as specified.

The unit contract price for "Resetting Concrete Barrier" shall include all costs for the work required to reset and temporarily store the barriers.

Payment for concrete class AX and steel reinforcing bar shall be made in accordance with Section 5-275.

Payment for Transition sections between different types of barriers shall be made at the unit contract price for the type of barrier indicated in the Drawings for each transition section.
DIVISION 7
STORM DRAINS, CULVERTS, SANITARY AND
WATER MAINS AND RELATED STRUCTURES

SECTION 7-01 DRAINS

7-01.1 DESCRIPTION

This work shall consist of constructing subsurface drain pipe in accordance with the Drawings, these Specifications and WSDOT Standard Plan No. B-10, at the locations as specified by the Engineer.

This work also includes constructing sidewalk drains as specified herein and in accordance with Standard Plan No. 281. The work shall include installing a 4-inch drain pipe under the sidewalk, installing a 12-inch x 12-inch gravel drain behind the sidewalk, installing filter fabric, saw cutting and removing the curb, and constructing a reinforced concrete curb block as specified in other Sections of these Specifications.

7-01.2 MATERIALS

Materials shall meet the requirements of the following Sections:

- Gravel Backfill for Drains
- Zinc-Coated (Galvanized) Iron Pipe
- Subsurface Drain Pipe
- Filter Fabric
- Filter Material
- Joins

Gravel drain and filter material shall be Mineral Aggregate Type B, meeting the requirements of Section 9-03.

7-01.3 CONSTRUCTION REQUIREMENTS

- A trench of the dimensions shown in the Drawings or as specified by the Engineer shall be excavated to the grade and line as given by the Engineer. Subsurface drain pipe shall be laid in reasonably close conformity with the line and grades as shown in Drawings. The subsurface drain pipe shall be laid with watertight rubber gasketed joints unless otherwise specified.
- PVC drain pipe shall be joined with a bell and spigot joint using a flexible cement seal as described in Section 904.1. The bell shall be laid upslope. PE drain pipe shall be joined with snap-on, screw-on, or wrapped coupling bands as recommended by the manufacturer of the pipe.
- The subsurface drain trench shall be dug to the required alignment and grade and as far in advance of pipe laying as the Engineer will approve. The lower width of undisturbed or sheeted trench measured at the horizontal diameter of the pipe in place shall be 24 inches, or 1 foot greater than the outside diameter of the pipe, whichever is the greater.
- Materials shall be excavated by the Contractor at all times during the performance of the work to maintain the trench. There shall be no mixing of the excavated material with the filter material to be used backfilling. All excess excavated material not required elsewhere on the project shall be disposed of by the Contractor, unless otherwise provided for in the Project Manual.
- The filter material and the gravel drain material for drain shall be deep enough to be placed in the trench and be deposited uniformly on both sides of the pipe for the full width of the trench and to the springline of the pipe. The material shall be tamped in 4-inch layers to provide thorough compaction under and on each side of the pipe. Subsequent layers of gravel shall be deposited in 4-inch layers and be thoroughly compacted to the depth shown on the Drawings, or as specified.

(2) Pipe, Subsurface Drain, (Material), (Slab)," per linear foot.
(3) "Filter Material," per cubic yard.
(4) "Filter Fabric," per square yard.

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7.02 CONSTRUCTION REQUIREMENTS

7.02.03 PLACING CULVERT PIPE

7.02.03.1 GENERAL

A. Culvert pipe shall be placed with respect to the width, depth, and grade as shown in the Drawings or as designated by the Engineer.

B. Proper preparation of foundation, placement of foundation material, and compaction of bedding material shall provide insulation of all culvert pipe. This shall include necessary leveling of the native trench bottom or the top of the foundation material as well as placement and compaction of required bedding material to a uniform grade so that the entire length of pipe will be supported on an adequately dense and uniform base. The bedding material shall be thoroughly compacted around the piping to a manner to meet the requirements specified.

C. Material meeting the requirements of gravel backfill for pipe bedding shall be placed under the pipe and against the sides of the pipe in accordance with Standard Plan No. 289. Bedding shall be placed to two or more lifts. The first lift shall consist of 6 in thick compacted material under the pipe, and shall be placed, spread, and compacted before the pipe is installed so that the pipe is uniformly supported on all sides. Subsequent lifts of pipe bedding, of not more than 6 inches in thickness, shall be placed and compacted along the sides of the pipe shown in Standard Plan No. 289. Lifts shall be brought up together on both sides of the pipe and shall be worked carefully under the pipe backfill and then compacted. The Engineer shall determine the existing material in the trench in which the trench is satisfactory for bedding the pipe, gravel backfill for pipe bedding is not required. The compacting material shall be loosened, raked, and compacted to form a dense and uniformly graded base.

D. In the opinion of the Engineer, the material in the bottom of the excavations is of such character as to cause unequal settlement along the length of the pipe, less culvert, or pipe trench, it may be necessary to install a backfill under each pipe, backfill shall not be placed to a depth of 6 inches in thickness, shall be placed and compacted along the sides of the pipe shown in Standard Plan No. 289. Lifts shall be brought up together on both sides of the pipe and shall be worked carefully under the pipe backfill and then compacted. The Engineer shall determine the existing material in the trench in which the trench is satisfactory for bedding the pipe, gravel backfill for pipe bedding is not required. The compacting material shall be loosened, raked, and compacted to form a dense and uniformly graded base.

7.02.03.2 PLACING CONCRETE PIPE

7.02.03.2.1 GENERAL

In the trench, prepared as specified in Section 202.02.10A, concrete pipe shall be laid beginning at the lower end, with the bell or gasket end up grade. For pipe with elliptical reinforcement, the major axis of reinforcement shall be in a vertical direction.

7.02.03.2.2 INSTALLATION OF METAL END SECTIONS

7.02.03.2.3 MITERED ENDS

The ends of steel culvert or pipe or pipe arch shall not be bevelled unless called for in the Drawings. If beveled ends are specified, the ends of culvert pipe over 20 inches in diameter shall be mitered to conform to the slope of the embankment in which the culvert is to be installed. The ends of pipe arch shall be mitered to conform to the outline of the roadbed. Beveled steel pipe ends shall be constructed in conformance with WSDOT Standard Plan No. 289.

7.02.03.3 PROTECTIVE TREATMENT

Steel pipe and steel culvert arches shall be coated with one of the following protective treatments, when such treatment is specified:

- Treatment 1: Coated uniformly inside and out with asphalt. Treatment 2: Coated uniformly inside and out with asphalt and with an asphalt paved invert.
7-02.3(3) HEADWALLS

If headwalls are specified in the Drawings, they shall be constructed in accordance with the applicable portions of Section 6.02.

7-02.3(3) BACKFILLING

Placement of earth materials around and over culverts shall be performed in accordance with requirements specified within the pipe concrete zone as shown in WSDOT Standard Plan No. B-11 or indicated in the Drawings.

Material placed within the pipe concrete zone shall be at least ten inches thick and not contain stones larger than three inches in the greatest dimension, frozen lenses, rocks, rot, or moisture in any condition. Material placed within the pipe concrete zone shall be placed with the aid of all other materials to the top of the culvert.

In other trench or embankment installations, the material within the pipe concrete zone and up to the top of the pipe shall be placed in 18" layers and compacted to 95 percent maximum density. Placement of materials within the pipe concrete zone above the top of the pipe shall be in accordance with WSDOT Standard Plan No. B-11. The top of the culvert shall be a point where legal highway load limitations are not in effect.

7-02.3(4) REMOVING AND RELATING CULVERTS

Where shown in the Drawings or where designated by the Engineer, existing culverts shall be removed and related in accordance with these Specifications. In the case of concrete pipe, all joints of the pipe before being related shall be cleaned so as to be free from all adhering materials, including old mortar placed as a collar or seal in the original construction.

All joints in the existing or related culvert shall be removed and related shall become the property of the Contractor.

7-02.3(5) PLUGGING EXISTING CULVERTS

Where shown in the Drawings or where designated by the Engineer, existing culverts shall be plugged in accordance with Section 5.02.4(1)(a) and 5.02.4(1)(b).

Concrete shall be used in placing the concrete in the culvert to ensure that the opening of the pipe is completely filled and thoroughly plugged.

When drain pipes, pipe, or block culverts are installed, all joints shall be filled with low strength concrete. Measurement and payment for drain pipes, pipe, or block culverts shall be paid as provided for in the Drawings. When drain pipe underpasses shall be a multi-centered arc shape, a variable number circular arc tangent to each other at their junctions and symmetrical about the vertical axis and of the design, type, gauge or thickness, and size specified.

7-02.4 MEASUREMENT

Bid items of work completed pursuant to Contract Documents shall be measured as provided in Section 1.08.01 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein Section 1.08.

The length of culvert pipe, box culvert or pipe arch culvert shall be the number of linear feet of completed installation measured along the invert. Broveled end sections shall be considered as part of the culvert pipe box, culvert pipe or pipe arch culvert and shall be measured as culverts.

Embankment construction before culvert placement under the applicable provisions of Section 14.03.10 will be measured in accordance with Section 3.03.

7-02.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 7.04 will be made at the unit contract prices bid only for the bid items listed or referenced below:

(1) "Pipe, Culvert, (Material), (Class), (Size)," per linear foot.
(2) "Pipe Arch, (Material), (Class), (Size)," per linear foot.
(3) The unit contract price for "Pipe, Culvert, (Material), (Class), (Size)" and "Pipe Arch, (Material), (Class), (Size)" shall include all cost for the work required to furnish and install culvert pipe and pipe arch, as specified in Section 7.06; including broveled and sections when required, and final cleaning of the culvert.
(4) "Concrete, (Material)" will be paid for plugging existing pipes. See Section 2.05.0.3, "Concrete for existing pipes, will be paid for in accordance with the Drawings approved by the Engineer shall have no increase in cost to the Contractor of the price specified in Section 2.05.0.3(a)."

The Contractor shall pay for all necessary overhead equipment over the culvert when it has been backfilled as provided above; or until the embankment has reached a height of 2 feet above the top of the culvert, or as provided in Section 1.08.01 Measurement of Quantities.

All costs incurred in storing, protecting, re-handling, and placing the materials as directed by the Engineer shall be included in other items of work on the project.

7-03.03 STRUCTURAL PLATE PIPE, PIPE ARCH, AND UNDERRUN

The base for structural plate pipe, pipe arches, and underruns shall be a 100 percent of the portion of the backfill, the backfill material shall be placed in accordance with Section 2.03.2(14).

The Contractor shall furnish all necessary overhead equipment over the culvert when it has been backfilled as provided above; or until the embankment has reached a height of 2 feet above the top of the culvert, or as provided in Section 1.08.01 Measurement of Quantities.

All costs incurred in storing, protecting, re-handling, and placing the materials as directed by the Engineer shall be included in other items of work on the project.

7-03.1 STRUCTURAL PLATE PIPE, PIPE ARCH, AND UNDERRUN

7-03.1.1 DESCRIPTION

This work shall consist of constructing structural plate pipe, pipe arches, and structural plate arches of the various types and designs in accordance with the Drawings, those Specifications, WSDOT Standard Plan Nos. 89a and 89b, at the locations and in conformity with the lines and grades as stated by the Engineer, at locations shown in the Drawings.

Structural plate pipe shall be full circle of the type, gauge or thickness, and size specified.

7-03.1.2 DESIGN AND MATERIALS

Structural plate pipe shall be a one-centered arc shape, placed on a reinforced concrete foundation, and shall be set in the fill of fill of the embankment from the pipe centerline and spandrel as provided for in the Drawings. Structural plate pipe underpasses shall be a multi-centered arc shape, a variable number of circular arcs tangent to each other at their junctions and symmetrical about the vertical axis and of the design, type, gauge or thickness, and size specified.

7-03.2 MATERIALS

Materials shall meet the requirements of the following Sections:

Concrete Class B
Corroded Steel
Corroded Aluminum
Reinforcing Steel

7-03.3 CONSTRUCTION REQUIREMENTS

7-03.3.1 FOUNDATIONS

Structural plate pipes, pipe arches, underruns, and bases for arches shall be placed on stable foundations prepared to the widths, depth, and grade as shown in the Drawings or as designated by the Engineer. Soil cuts encountered in the base shall be excavated to a depth directed by the Engineer and be backfilled with gravel or other suitable material and thoroughly compacted per Section 5.17.03.2B.

Rock, in either boulder or header formation, hard pan, or cemented gravel occurring in the base material shall be excavated to a depth and compacted with suitable material so there will be a minimum 500 mm cushion under the pipes, pipe arches, or underruns.

Concrete required for constructing structural plate arch foundations shall be produced in accordance with the requirements of Section 6.02.03.

Steel connection bars shall conform to the requirements of Section 9.07.

7-03.3.1.1 STRUCTURAL PLATE PIPE, PIPE ARCH, AND UNDERRUN

The base for structural plate pipes, pipe arches, and underruns shall be placed in accordance with Section 9.07.01. The base for structural plate arches shall be placed in accordance with the requirements of Section 9.07.01.

7-03.5 PAYMENT

Compensation for the cost necessary to complete the work described in Sections 7.05 shall be paid as provided for in Section 1.08.01 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein Section 1.08.01.

The unit contract price for "Structural Plate Pipe (Material)," per linear foot, shall be paid for in accordance with the Drawings, Project Manual or WSDOT Standard Plan Nos. 89a and 89b, at the locations specified in the Drawings. The unit contract price for "Pipe Arch, (Material)" shall be paid for in accordance with the Drawings. The unit contract prices bid only for the bid items listed or referenced below:

(1) "Structural Plate Pipe (Material) (Thickness) (Dia.)," per linear foot.
(2) "Structural Plate Pipe Arch (Material) (Thickness) (Span)," per linear foot.
(3) "Structural Plate Arch (Material) (Thickness) (Span)," per linear foot.
(4) "Underruns (Design) (Thickness) (Span)," per linear foot.

7-03.6 HEADWALLS

If headwalls are specified in the Drawings, they shall be constructed as shown in the embankment has been completed to a sufficient height over the structure to allow the required work. Headwalls shall be constructed in accordance with the applicable portions of Section 6.02.

7-03.6.1 ALTERNATE INSTALLATION

If the Contractor elects to use an alternate installation, Shop Drawings for the alternate shall be submitted to the Engineer for approval prior to procuring or constructing the alternate.

7-03.4 MEASUREMENT

Bid items of work completed pursuant to Contract Documents shall be measured as provided in Section 1.08.01 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein Section 1.08.01.

7-03.03.1.1 STRUCTURAL PLATE PIPE, PIPE ARCH, AND UNDERRUN

The base for structural plate pipes, pipe arches, and underruns shall be placed in accordance with Section 9.07.01. The base for structural plate arches shall be placed in accordance with the requirements of Section 9.07.01.

Steel reinforcing bars shall be measured by the pound as specified in Section 2.06.03.01. The unit contract prices bid only for the bid items listed or referenced below:

(1) "Structural Plate Pipe (Material) (Thickness) (Dia.)," per linear foot.
(2) "Structural Plate Pipe Arch (Material) (Thickness) (Span)," per linear foot.
(3) "Structural Plate Arch (Material) (Thickness) (Span)," per linear foot.
(4) "Underruns (Design) (Thickness) (Span)," per linear foot.

7-03.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 7.05 shall be paid as provided for in Section 1.08.01 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein Section 1.08.01.

The unit contract price for "Structural Plate Pipe (Material) (Thickness) (Dia.)," per linear foot, shall be paid for in accordance with the Drawings, Project Manual or WSDOT Standard Plan Nos. 89a and 89b, at the locations specified in the Drawings. The unit contract price for "Pipe Arch, (Material)" shall be paid for in accordance with the Drawings. The unit contract prices bid only for the bid items listed or referenced below:

(1) "Structural Plate Pipe (Material) (Thickness) (Dia.)," per linear foot.
(2) "Structural Plate Pipe Arch (Material) (Thickness) (Span)," per linear foot.
(3) "Structural Plate Arch (Material) (Thickness) (Span)," per linear foot.
(4) "Underruns (Design) (Thickness) (Span)," per linear foot.

Payment for the class of concrete shall be as specified in Section 6.02.

Payment for steel reinforcing bar shall be as specified in Section 6.02.
7-05.3.1(1) BASE

7-05.3.1(4) GENERAL

7-05.3.1(3) PRECAST WALL SECTIONS

Reinforcement for standard sections shall consist of a single cage of steel, placed at the approximate center of the wall of the section. The cage shall be welded at every 4-in. (102-mm) dimension along the length of the wall shall develop a tensile strength of 60,000 psi of wire diameter.

Joists between sections shall be tongued and grooved, and shall provide 1/2 inch nominal mirror space and a minimum of 1/16 inches lap.

No more than two lift slabs shall be cast into each section. Holes shall be so located as to not damage reinforcing or expose it to corrosion. At the manufacturer's option, steel loops may be provided for handling, in lieu of lift slabs.

Steps shall be installed in each section so that sections placed together in any combination shall provide a continuous vertical ledger with runs equally spaced at 12 inches. The lowest rung shall be at least 16 inches above the floor, and the uppermost rung shall be not more than 14 inches below the street surface.

Steps shall project uniformly from the inside wall of the masonry slab on Standard Plan No. 202 and shall be cast or firmly grouted in place so as to ensure complete watertightness.
MANHOLES, CATCH BASINS, AND INLETS

7.05.3.11R JOINTS
Joints between precast manhole elements shall be rubber gasketed to prevent passage of water through the pipe joints conforming to ASTM C 442. Shop Drawings of the joint design shall be submitted to the Engineer for approval, prior to manufacture. Completed joints shall show no visible leakage and shall conform to the dimensional requirements of ASTM C 478.

7.05.3.13L SHOP FABRICATED CORRUGATED METAL MANHOLEs
Shop fabricated corrugated metal manholes, shall be constructed in strict accordance with the Drawings and Shop Drawings as approved by the Engineer, and shall conform to all applicable provisions of these Specifications.

7.05.3.11M MANHOLE CHANNELS
All manholes shall be channeled unless otherwise stated in the Drawings. Manhole Channels shall be made to conform accurately to the sewer grate and shall be brought together smoothly with rounded junctions, satisfactory to the Engineer. Channel sides shall be carried up vertically to the crown elevation of the various pipes, and the concrete shell between channels shall be smooth finished and warped evenly with slopes to drain.

7.05.3.11N MANHOLE PIPE CONNECTIONS
All pipes except CMP and PVC pipe entering or leaving the manhole shall be provided with flexible joints within 1/2 of a pipe diameter or 12 inches, whichever is greater, from the outside face of the manhole structure and shall be placed on freshly compacted bedding, particularly within the area of the manhole excavation which normally is deeper than that of the sewer trench. Special care shall be taken to see that the openings through which pipes enter the manhole are completely and firmly rammed full of non-shrink grout to ensure an accurate and tight fit.

7.05.3.11S PIPE CONNECTING TO MANHOLE shall be provided with a manhole adapter complete with gasket and approved by the Engineer. No pipe shall be placed within 10 feet of the outside face of the manhole.

7.05.3.11O BACKFILL
Each inch of soil above the pipe zone shall consist of selected native material and shall conform to the applicable provisions of Section 7.11.18D. Typical 'Backfilling Trenches'. Compaction of backfill shall be by means of mechanical tamper use 10% of maximum density in accordance with Section 7.11.20B. "Compaction of Trench Backfill"

7.05.3.11P Backfill around a catch basin shall provide adequate foundation support for shallow laden and shall conform to the applicable provisions of Section 7.11.20B. "Compaction of Trench Backfill"

7.05.3.11L MANHOLE GRADE ADJUSTMENT
The Contractor shall initially construct manholes of the type specified in the Drawings so as to provide adjustment space of not less than 8 inches or more than 16 inches between the top of the structure and the underside of the structure and to street grade or ground surface. The grade sheet furnished by the Engineer shows the approximate top grade for the structure plus or minus 0.2 foot, and the final grade will be set by the Engineer. Final elevation and slope of the frame and cover shall conform to the requirements of the approved street standards.

7.05.3.11Q RECHAMBER EXISTING MANHOLE
This work shall be in accordance with Section 7.05.3.1O, 7.05.3.11 and shall be made so as to bring the existing manhole up to the designated location and on the existing manhole wall by charring a full hole in the concrete operation to accommodate the inlet and outlet pipe as per the existing grade. The loading shall be in accordance with the regulations of the Engineer.

7.05.3.12L INLET GRADE ADJUSTMENT
This work shall be in accordance with the requirements of concrete or set or form the bottom line on a minimum of one row of concrete adjustment blocks and mortared. It shall not, in any case, be grooved, cut, or formed to be recessed at the front of the inlet or outlet pipe. The pipes shall be leveled and the cover shall be placed in position and mortared in accordance with the regulations of the Engineer. A minimum of 10 feet deep.
7-06 PIPE ANCHORS

The unit contract price for "Catch Basin (Type)," shall include all costs for the work required to furnish and install the catch basin including trap, excavation and backfill with native material, installation of drainpipes, inspection, and castings.

When directed by the Engineer, the unit contract price for "Branch Catch Basin," shall include all costs for the work required to furnish and install the branch drain including sand and access to the work.

The unit contract price for "Inlet (Type)," shall include all costs for the work required to furnish and install the inlet including excavation, brick, block, mortar, and castings.

Payment for "Extra Excavation," will be as per Section 7-17.5. Payment for foundation materials, when required by the Engineer, will be "Material Aggregate (Type)," according to Section 7-17.5.

7-07 CLEANING EXISTING DRAINAGE STRUCTURES

7-07.1 DESCRIPTION

This work shall consist of clearing and removing all debris and obstructions from existing catch basins, sanitary sewer pipes, drain inlets, manholes, lint balls, grates, cleanouts, branches, or other drainage features within the limits of the project.

7-07.2 VACANT

7-07.3 CONSTRUCTION REQUIREMENTS

- All piping and drainage structures shown in the Drawings shall be cleaned by flushing, rodding, or whatever means are necessary to provide unobstructed drainage. All catch basin septic tanks, manholes, inlet and outlet structures, and debris racks shall be cleaned of all dirt, rocks, and debris.
- Existing drainage facilities shall be cleaned as a first order of work to enhance proper drainage and through the project. It shall be kept clean throughout the lifetime of the project and be clean upon final acceptance of the work.

7-07.4 MEASUREMENT

Work described in Section 7-07 will not be measured for payment.

7-07.5 PAYMENT

All work described in Section 7-07 shall be considered incidental to the various bid items comprising this improvement.

SECTION 7-08 PIPE AND FITTINGS FOR WATER MAINS

7-08.1 DESCRIPTION

This work shall consist of constructing concrete pipe and installing concrete pipe, backfilling of trenches, and installing concrete pipe and other materials as designated and in accordance with the Specifications as defined in Plan No. 7-20. All fittings shall be specified, and all other materials shall be shown in the Drawings as directed by the Engineer.

7-08.2 MATERIALS

Material shall meet the requirements of the applicable portion of Sections 602 and 603.

7-08.3 CONSTRUCTION REQUIREMENTS

The work shall be in accordance with the Drawings and the applicable portions of Sections 602.3 and 603.3.

7-08.4 MEASUREMENT

Bill items of work completed pursuant to Contract Documents will be measured as provided in Paragraph 10-01.1.1. All quantities shall be as specified in the Drawings and the applicable portions of Sections 602.3 and 603.3.

7-08.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 7-08 will be at the unit contract prices bid only for the bid item listed or referenced below:

(1) "Pipe, Concrete Foundation (Material) (Class), (Size)," as per linear foot.
(2) "Pipe, Inlet Connection (Material) (Class), (Size)," as per linear foot.
(3) "Drop Connection (Material) (Class)," as per vertical foot.

The unit contract price for "Pipe, Catch Basin Connection, (Material) (Class), (Size)," shall include all costs for the work required to furnish and install the pipe including connections to catch basins or inlets, excavation, backfill, and compaction.

The unit contract price for "Drop Connection, (Material)," shall include all costs for the work required to furnish and install the complete drop connection including the concrete footing, ductile iron spigot and fittings at the drop connection and the ductile iron pipe that spans between the flexible coupling and the tee of the drop connection.

The cost for furnishing and installing new taps when installing catch basin connection pipe to existing catch basin shall be included in the unit contract price for "Pipe, Catch Basin Connection, (Material) (Class), (Size)," as per linear foot.

SECTION 7-09 PIPE AND FITTINGS FOR WATER MAINS

7-09.1 DESCRIPTION

The work included under Sections 7-09 through 7-15 and the materials included in Section 9-30 shall apply to the construction of water main and service connections for water mains and appurtenances for both temporary and permanent installations.

7-09.2 MATERIALS

Materials shall meet the requirements of Section 7-09. Specification references made herein for manufactured materials such as concrete, pipe, valves, and fittings refer to designations for American Water Works Association (AWWA), United States of Canada (CSA) Standards (CSA), American National Standards (ANSI) or to American Water Works Association (AWWA), or American Society of Testing and Materials (ASTM) which are in effect on the date of advertisement for bids.

The Contractor shall furnish all new and unusual materials suitable and approved for potable water service.

It is not intended that materials listed herein are to be necessarily considered equal or generally interchangeable for all applications. Those suitable for the project will be specified in the Project Manual or shown in the Drawings.

The pipe manufacturer shall test all pipe and fittings as required by those specifications and the standards referenced. The pipe manufacturer shall submit to the Engineer two copies of each test report of each lot of pipe delivered that meets the specified requirements. No pipe lot shall be accepted until test results and certification are in the hands of the Engineer.

The Engineer shall have free access to all testing and records pertaining to material to be delivered to the job site. The Engineer may elect to be present at any or all material testing operations.
7-10. CONSTRUCTION REQUIREMENTS
Installation of pipe and fittings is described in Section 7-11.
7-10.1 DESCRIPTION
This work shall consist of excavating, bedding, and backfilling for water mains and appurtenances, the construction of water distribution mains and appurtenances for both temporary and permanent installation under ordinary conditions.

Water mains shall be constructed at the locations shown on the Drawings.

Where grading is required, such grading as excavation and embankment shall conform to the requirements of Section 5-3.

Removal of existing street improvements and pavement from driveways and sidewalks shall be performed as specified in Section 5-26. Backfilling of waste materials along the trench will not be allowed.

7-10.2 MATERIALS
Materials specified as "Mineral Aggregate, (Type)" shall be in accordance with Section 6-4.

7-10.3 CONSTRUCTION REQUIREMENTS
7-10.3.1 GENERAL
Material excavated from trenches and placed adjacent to the trench, or in a roadway or public thoroughfare, shall be placed in such manner as to minimize the creation of garbage or obstructions.

Grading shall be performed to provide for fire hydrants, water valves, and meters, and illustration shall be left for the easy flow of storm water or sewers, other conduits, and natural watercourses.

7-10.3.2 UNGRADED STREETS
On ungraded streets, where grading is not called for in the contract, the depth of trench excavation shall be as shown on the Drawings and approved as required by the Engineer.

Where the Drawings show the pipe to be laid below the existing grade, the backfill shown shall be made compact and compacted in accordance with Section 5-15.2.

7-10.3.3 CLEANING AND GRUBBING IN UNGRADED STREETS
On ungraded streets, where cleaning and grubbing is not called for in the contract, the area to be grubbed or filled shall be grubbed or filled as required by the Contractor. This work shall consist of the removal and disposal of all debris, stumps, roots, brush, and other refuse within 5 feet of the centerline of the new work, and such material shall be disposed of in accordance with the Project Plans.
7-10.3.4 REMOVAL OF EXISTING STREET
Removal of existing street improvements and pavement from driveways and sidewalks shall be performed as specified in Section 5-26. Backfilling of waste materials along the trench will not be allowed.
7-10.3.5 GRADE AND ALIGNMENT
Prior to any pavement cutting or removal, or excavation for pipe laying, the Contractor shall verify, in the presence of the Engineer, the location and establish the depth of the existing water mains at the points where connections are to be made.

The Contractor shall verify the dimensions, type, and condition of the existing water main. The profile shall be adjusted so neither a high spot nor a low spot is created adjacent to the connection to the existing water main.

Unless otherwise specified in the Drawings or Project Manual, the depth of trenching for water mains shall give a minimum depth of cover of 26 inches over the top of the pipe for small and smaller water mains. Depth of cover of larger water mains shall be in accordance with the Standard Plans for "Locations for Underground Utilities." Deeper excavation may be required due to local bedrock in grades, or to install the new mains under existing curvatures or other utilities where necessary. Where profile of pipeline and grade surface is shown on the Drawings, pipeline shall be laid to the elevation shown regardless of depth. Excavation shall be to such depth that the minimum cover over the water main shall be 6 feet.

Grade alignment on ungraded streets will be given from hubs set parallel to the side of the pipe. On graded streets, the grade alignment and slope shall be taken from established points on the existing curbs or sidewalks, as directed by the Engineer.

7-10.3.6 EXISTING UTILITIES
Existing utilities of record, except sewers, are shown on the Drawings and are the responsibility of the owner or utility company, and the Engineer assumes no responsibility for connections to existing utilities. The Contractor shall pay for all cost of these connections on the Drawings. The Contractor shall be responsible for all costs of extending or extending and replacing existing utilities as required by the Engineer. The Contractor shall be responsible for all costs of extending or extending and replacing existing utilities as required by the Engineer. The Contractor shall be responsible for all costs of extending or extending and replacing existing utilities as required by the Engineer.

7-10.3.7 TRENCH EXCAVATION
7-10.3.7.1 GENERAL
The Contractor shall perform all excavation of every description and of whatever materials encountered to the depth indicated on the Drawings or specified in the Project Manual. All excavations shall be made by open cut unless otherwise provided for. The bottoms of trenches shall be accurately graded and backfilled according to the Standard Plans or as directed by the Engineer.

7-10.3.7.2 EXCavATION
The maximum trench excavation width for pipes 4 inches to 12 inches in diameter shall be no more than 20 inches, and for larger sizes of pipe the trench widths shall not exceed that indicated on the Standard Plans for the particular pipe size. Standard excavating equipment shall be adjusted so as to excavate the trench.

The length of trench excavation in advance of the pipe laying shall be kept to a minimum, and in no case shall it exceed 500 feet unless otherwise specifically authorized by the Engineer.

7-10.3.7.3 CLEANING AND GRADING
The Contractor shall exercise care in excavating the trench and shall keep the area clean and free of all debris and dirtage. All the surface material shall be removed to the final grade as shown on the Drawings. This contractor shall drain, fill, level, and compact all the trench to shall be inspected as shown on the Drawings. Minimum surface and storm drains shall not be damaged, removed, or otherwise disturbed. Water main pipes shall be inspected to test these utilities.

7-10.3.8 TRENCH EXCAVATION, BEDDING, AND BACKFILL FOR WATER MAINS
Ends of abandoned water main shall be plugged by filling with Class CVC Concrete, or minimum longitudinal wall thickness of 12 inches.

When utility owned water mains occupy the same space as the project trench, the Contractor, in order to avoid damage and the cost of replacement of repairs, may request, with three days notice, that the Seattle Water Department cut the services ahead of the excavating machine and reconnect them after the machine passes.

It is anticipated that the Contractor will encounter private water service utilities (water service lines running between the Seattle Water Department and private residences) during work operations. Records of these utilities are not maintained by the City and therefore do not appear on the Drawings and will not be field located by the Seattle Water Department. It shall be the Contractor's responsibility to ascertain the location of and protect these private utilities from damage.

If it is necessary to provide temporary water supply connections due to conflicts between existing private water service pipes and the new water main, it shall be the responsibility of the Contractor to provide temporary services.

If the Contractor damages the private water service lines, he shall notify the Engineer of any such damage and shall begin repairs immediately and continue work until water service is restored.

7-10.3.9 ROCK EXCAVATION
7-10.3.9.1 GENERAL
Rock excavation shall cover the removal of rock, i.e., boulders which require systematic drilling and blasting for its removal, and boulders exceeding 1/2 cubic yard in volume. Large rock, boulders, or stones shall be removed to provide a minimum clearance of 6 inches under the pipe.

7-10.3.9.2 EXTRA EXCAVATION
Changes in grades of the water main from those shown on the Drawings, or as proposed in the Project Manual, may be necessary because of the unforeseen, or of rock, or for other reasons.

If, in the opinion of the Engineer, it is necessary to adjust, correct, relocate, or in any way change the line and grade, such changes shall be made by the Contractor under the terms of these Specifications.

When pipe line grade is lowered in excess of 1 foot below the grade indicated on the Drawings, the Contractor shall be allowed to make such extra excavation as necessary.

When the piping line is changed by more than 1 foot from the line indicated on the Drawings, after the trench has been excavated, the Contractor shall excavate the trench at the changed location and backfill and compact the previous trench.

Additional excavation so required will be calculated as extra excavation.

7-10.3.10 CRIBBING AND SHEETING - SHORING
The Contractor shall adequately shore trenches to protect the work, equipment, material, etc., and to provide safe working conditions in the trench. The method of shoreing shall be acceptable to the Contractor's design. The Contractor may elect to use either a combination of shores and shoreing, shore, or other means of accomplishing the work, provided the method complies with the drawings and specifications. The Contractor shall be responsible for the design of the shores and shoreing. Damages resulting from improper cribbing or failure to shore shall be the responsibility of the Contractor.

All cribbing and sheathing shall be removed from the trench. Removal shall be in such manner as to fulfill the above requirements. Bedding or side support deemed by the Contractor to be necessary shall be removed by the Contractor.
TRENCH EXCAVATION, BEDDING, AND BACKFILL FOR WATER MAINS

Bedding of specially protected pipe shall be conducted at all times in such a manner as to prevent damage and abrasion to the protective coating or wrap. Pipe shall be covered with 6 inches of backfill as soon as practicable before the barrel of pipe is placed in the trench.

PIPE INSTALLATION FOR WATER MAINS

(6) Unimproved areas or landscape areas shall be considered incidental to the unit price of each size and type of pipe installed.

Comparison contract tests shall be performed in accordance with Section 7.13.07.03.

The procedure and equipment to be used for backfill compaction, shall be determined on a test section of pipe to be designated by the Engineer.

The Engineer will sample excavated material to determine suitability of the native material for backfill use. If native material is found to be unsuitable and within the tolerance range of moisture content, the Contractor will be required to provide the necessary native material for backfilling. The Contractor shall take any necessary steps to protect the excavated material from becoming saturated beyond the critical moisture limits.

The Contractor shall excavate test pits in the backfill as directed by the Engineer, for the purpose of testing the backfill compaction. At the option of the Engineer, density tests may be taken on a test section of compacted backfill immediately prior to placing the next lift.

If the required compaction density has not been obtained, the Contractor shall remove the backfill from the trench and recompaction using an improved technique, heavier compaction equipment or more passes. This process shall be repeated until the Contractor has established a procedure that will provide the required field density. The Contractor will then be permitted to proceed with backfilling. In testing the remainder of the pipeline under the approved compaction procedure, the event routine field densities taken during the course of construction show the specified compaction is not being obtained because of changes in soil type or for any other reason, the Contractor will be required to establish his compaction procedure. In no case will excavation and pipelaying operations be allowed to proceed until the specified compaction has been obtained.

7.14. MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured and paid for in accordance with Section 7.13.06. Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein this Section.

Measurement for "Solid Rock Excavation," shall be in accordance with Section 7.13.07. Measurement for "Bedding, (Class)" shall be in accordance with Section 7.13.07.

7.15. PAYMENT

The unit price for "Bedding, (Class)" shall be as indicated in accordance with Section 7.13.07.

Payment for "Extra Excavation," shall be in accordance with Section 7.13.07.

Payment for "Solid Rock Excavation," shall be in accordance with Section 7.13.07.

If no bid item is in the Bid Form for "Solid Rock Excavation," or "Extra Excavation," the Contractor shall perform the work as directed by the Engineer and payment will be made in accordance with Section 7.13.07.

7.16. DESCRIPTION

Pipe shall be installed in accordance with the manufacturer's plotted specifications and instructions, and to the standards of the Federal standards for the type of pipe to be installed. Pipe sections shall be joined in such a manner as not to damage the linings or coatings. Any damage to the lining or coating shall be repaired by the Contractor at the expense of the owner. All trench cutting for outside wall main pipe accuracies shall be made with epoxy core bit. Inside pipes with the pipe accuracies shall be replaced or reinstalled as being included in the unit bid prices for each class, size, and type of pipe.

Payment for trench excavation work shall be in accordance with Section 7.13.07.
PIECE INSTALLATION FOR WATER MAINS

PIECE INSTALLATION FOR WATER MAINS

Except where restrained joint systems are required, mechanical or push joints may be used.

7.11-3.2(6) LAYING AND JOINING POLYETHYLENE ENCased PIPE

Pipe with polyethylene encasement shall be installed in accordance with Section 7.11-3.2(6) of the method used for encasing the pipe shall be approved by the Engineer. All damage to the polyethylene encasement shall be repaired at the Contractor's expense. Bedding and backfill shall be in accordance with Sections 7.11-3(15), and 7.11-3(10), and 7.11-3(11).

7.11-3.29c LAYING AND JOINING MULTI-LAYERED POLYETHYLENE TAPE COATED PIPE

Pipe shall be hoisted from the trench side into the trench by means of a wide canvas or leather sling. Use of chains, cables, toges or other equipment likely to cause damage to the lining or to the coating of the pipe will not be permitted. Dragging or sliding the pipe will not be permitted. The Contractor shall check the coating of the piping on the side of the pipe while suspended from the sling. Any damage shall be repaired to the satisfaction of the Engineer before the pipe is lowered into the trench. Bedding and backfill shall be in accordance with Sections 7.11-3(28), 7.11-3(29), and 7.11-3(11).

At all times during construction of the pipeline, the Contractor shall use every precautions to prevent damage to the protective coating on the pipe. No metal tools or heavy objects shall be unnecessarily permitted to come in contact with the finished coating. Workers will be permitted to walk upon the coating only when necessary. In case of such necessity, the workers shall wear shoes with rubber or composition soles and heels. This shall apply to surfaces whether bare, painted or coated. Any damage to the protective coating from any cause, prior to final acceptance of pipe, shall be repaired as required by the Engineer, and at the expense of the Contractor.

Cathodes on the upgirt end shall be 6 inches or less and shall be made with a coating that is gelled from the end of the pipe to ensure a straight uniform cutback. No cutback shall be permitted on the pipe.

Following the application of the outer wrap, the coating shall be electrically tested for continuity with a pulse or signal detector. The detector voltage range for this coating is 7000 - 5000 volts. The testing shall confirm the coating of the pipe.

All holidays detected in the field shall be repaired by removing the outer wrap and primary coating from the damaged area, cleaning the exposed surfaces thoroughly, and then repairing the coating in accordance with the manufacturer's specification. The quality of welding shall be confirmed after patching.

If the outerswrap is damaged and a holiday is not found in the outerswrap, an inspection of the outerswrap will be required at the discretion of the Engineer. The damge is deemed to be somewhat more intense upon the integrity of the outerswrap. The outerswrap is to be replaced the damaged outerswrap shall be removed. The outerswrap shall not be replaced. A holiday detector shall be applied to the outerswrap, if it is to be replaced, and then repaired with an approved or equivalent at the discretion of the Engineer.

7.11-3.6D LAYING AND JOINING COAL-TAR EPOXY COATED PIPE

Specifications for installation of coal-tar epoxy coated pipe shall be as noted in Section 7.11-3.6D, paragraph 1 if and paragraph 2.

Holidays detected in the field shall be repaired by grouting to ensure that settlement of the area of the pipe and ensuring the area in accordance with AWWA C505, Sections 2.2 and 2.3.

7.11-3.6E(5) LAYING AND JOINING POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

Laying and joining of PVC pipe shall be in accordance with "Recommanded Standard for Installation of PVC Pressure Pipes" (Uni-Bell UNR-3-7-99) Sections 5.3 through 5.3.4.4. Bedding and backfill shall comply with Sections 7.11-3(15), and 7.11-3(10), and 7.11-3(11).

For valves and fittings shall be supported by concrete caddies; their weight shall not be carried by the PVC pipe. The caddies shall be trench wide and 6 inches thick and shall be poured against undisturbed earth. The valves and fittings shall be set to design grade and finally braced while the concrete caddies are poured and cured.
PIPE INSTALLATION FOR WATER MAINS

7.11.3.7(10) STEEL CASING SEALS AND SPACERS

Casing seals shall be made of a multi-purpose seal that is resistant to heat, cold, vibration, impact, abrasions, fluids, and other common hazards of the water main. Casing seals shall be installed according to the manufacturer's instructions.

The穿越ing Insulators (Spacers) shall be composed of fiberglass or polyethylene sheets. The穿越ing Insulator shall be resistant to abrasion and sliding wear. There shall be two穿越ing Insulators (Spacers) per length of pipe, spaced no more than 15 feet apart. Crossing Insulators (Spacers) shall be installed per manufacturer's instructions.

Casing seals and穿越ing Insulators (Spacers) shall be located as shown on the Drawings.

7.11.3.8(1) LAYING CONCRETE CYLINDER PIPE

Concrete cylinder pipe with steel joint rings, or concrete non-cylindrical pipe when called for in the Drawings, shall be laid to conform with the requirements of the following Sections.

7.11.3.8(6) CLEANING AND ASSEMBLING JOINT

All parts of the joint, both bell and spigot ends, shall be brushed and cleaned to remove all dirt, grime, and foreign matter. The circular rubber gasket provided with the pipe shall be stretched and snapped into the groove provided on the spigot end. It shall be filled and sealed at several points on the circumference to equalise tension and remove twist in the gasket.

The end of the pipe shall be lubricated with a solution of vegetable soap and water or other prepared solution supplied by the pipe manufacturer and approved by the Engineer. The pipe shall then be jacked home until it seats.

The outside apron space at the joint shall be filled with cement mortar.

The inside apron of the outside joints shall be made by wrapping the joint with two bands of strong, waterproof sheeting. Ordinary grade of paper shall then be tightly strapped to the pipe with 3/8-inch band strapping, using tools recommended by the manufacturer of the strapping. Hand-tamped backfill shall be built up around the band to the internal diameter of the pipe. The joint shall then be filled with mortar from one side only until the mortar appears on the outer side of the pipe. Mortar shall be mixed with the least amount of water that will permit placing by the method described. Possible voids shall be worked around the joint to assist grouting and ensure proper filling of the joint. The top of the apron shall be compacted and the paper band laid over the entire joint to protect it while curing.

Concrete apron shall also be filled with cement mortar and trowel flush. Mortar shall consist of one part portland cement and two parts sand. An inspector shall be present when outside joints are being poured.

7.1.13.8(9) VACANT

7.1.13.8(9) CONNECTIONS

7.1.13.8(9) CONNECTIONS TO EXISTING MAINS

Connections to existing mains shall be made according to the instructions approved by the Contractor.

The Seattle Water Department will make all connections to charged mains and water pipes, and will operate all valves to accomplish shutdowns and subsequent reactivations. Connections shall be verified by written agreement with the Contractor before the work shall be started.

Connection points shall be verified to the satisfaction of the Contractor, prior to connections being made or approved, prior to connections being scheduled or made.

The Seattle Water Department requires 48 working days prior notice to schedule inspections for approval of water main installations. Within 48 working days after the inspection, the Contractor will be provided with written approval or a list of items to be corrected. Items to be corrected must be re-inspected. The response and notification times for re-inspection are the same as for the initial inspection.

Approval is contingent on the water main and appurtenances being installed directly and satisfactorily inspected per contract documents excluding street, sidewalk, and planting strip restorations. Tests and appurtenances include all pipe, fittings, all blocking except temporary blocking, all hydraulic control units, backflow assemblies, valves, flowmeters, chambers, corrosion protection, and coating systems.

Tests are for pressure and water quality, and the requirements are specified elsewhere in this Section. Scheduling of connections with the Engineer is the Contractor's responsibility. Approval after the water main has been received, the Contractor shall request that the Engineer examine the condition of the existing water mains required to complete the connection. The Contractor's request shall be submitted to the Engineer a minimum of 3 working days in advance of the desired date of the connection, and in accordance to Seattle Water Department approval. The excavation for the connection shall be complete, cleared, and staked, and all required materials and equipment shall be available at the scheduled shut-downs.

The scheduled shut-downs will be made by Seattle Water Department personnel.

The Seattle Water Department will furnish connection fittings, valves, and all other materials and equipment in accordance to the new connection of the new main, the Seattle Water Department will furnish:

(a) Derate water main.
(b) Designate pie of pipe sections as necessary to install the new materials.
(c) Operate Seattle Water Department connections.
(d) Perform Seattle Water Department connection with chlorine solution (50% c) to install required fittings.
(e) Remove existing water main.
(f) All fittings not specifically called out as being furnished by SWD, and other materials and equipment required to complete the installation shall be furnished by the Contractor.

The Contractor shall erect, wrap and hand the connection to conform with the requirements. If the connecting pipe is longer than one standard pipe length (including a branch added as a temporary service only) a satisfactory bacteriological sample must be obtained.

The Contractor shall make all necessary excavations, shotfiling, and backfills and provide any equipment and operating requirements for main service shutdown. The Contractor must notify the Seattle Water Department in advance to the service installation. The Contractor shall provide the Seattle Water Department with the files of all permits and inspections required to connect to the new water main.

Where existing services are to be transferred from old to new mains, all water services shall be transferred to the new service before the transfer of the old service to the new service. The Contractor shall turn off and remove the old service prior to the new service being connected to the new. The Contractor shall provide all necessary excavation, shotfiling, and backfills and provide any equipment and operating requirements for main service shutdown. The Contractor must notify the Seattle Water Department in advance to the service installation. The Contractor shall provide the Seattle Water Department with the files of all permits and inspections required to connect to the new water main.

The Contractor's schedule shall allow adequate time for the Seattle Water Department to arrange for necessary inspections and close all 2-weeks written notice shall be provided to the Engineer for scheduling one of the Seattle Water Department's normal service work.

The Seattle Water Department will make all required excavation, backfill, and compaction as well as furnishing the necessary equipment and pipe for temporary water mains. All temporary water mains will be chlorinated, flushed, and a satisfactory bacteriological sample obtained by the Seattle Water Department prior to placing in service.

7.1.13.8(10) LOCATING PIPE

Locating pipe shall be installed directly over all PVC pipe with minimum 3/12 feet of cover. The locating pipe shall be bonded by concentric welds in all dull edge iron fittings, valves and valve boxes to form an electrical continuous system.

7.1.13.8(11) HYDROSTATIC PRESSURE TEST

7.1.13.8(11) GENERAL

All water mains and appurtenances shall be tested as soon as possible after they are laid, backfilled and prior to backfilling of the soil.

All labor, equipment, pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, necessary for performing the test shall be furnished and operated by the Contractor. Pressure recorders and charts, which will be furnished by the Seattle Water Department, shall be used to record the tests.

At points where pressure reaction and movement may occur, such as at bends, tees, and plugs, the pipe shall be properly blocked or braced. Where permanent blocking is not required, the Contractor shall furnish initial temporary blocking and remove it after testing.

Where water for testing is not available the Contractor shall provide the water from a Seattle Water Department approved source.

To protect existing water mains from contamination by backflow of the test water current, check valves or a double check valve assembly shall be temporarily installed between the test and supply main. Prior to being hydrostatic tested the temporary backflow protection shall be removed and the main under test isolated from the supply main.

Dust iron water mains and appurtenances shall be tested hydrostatically to 300 psi for 1 inch in diameter and smaller, and 250 psi for 1 inch in diameter and larger unless otherwise specified.

Polyvinyl Chloride (PVC) water mains (C1200) and appurtenances 12 inches in diameter and smaller shall be tested hydrostatically to 300 psi.

Test pressure for other pipe will be as noted in the Project Manual.

The test pressure shall be applied at the low end of the section of water main being tested. All air in the pipe shall be vented prior to test.

The test pressure shall be applied at the low end of the section of water main being tested. All air in the pipe shall be vented prior to test. When testing short (less than 100 feet) lengths of main pipe or when old mains shall be tested hydrostatically to 300 psi.

When called for in the Drawings, the Seattle Water Department will arrange for necessary inspection and test service main connections to be made by the Contractor and charged segments of the new water main to be completed by SWD personnel.
PIPE INSTALLATION FOR WATER MAINS

Sections to be tested shall normally be limited to 1,500 feet. The contractor 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 the material. Pipe laying shall not be continued more than 72 inches in diameter. Each test section has been tested successfully.

Hydrostatic tests shall be performed on every complete section of water main between valves, or as directed by the Engineer. Each side of each valve shall withstand the same test pressure as the pipe, with no pressure active in the section of pipe being tested.

All tests shall be made with the hydrant auxiliary 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 releasing the pressure beyond. This test of the gate valve shall be acceptable if there is no immediate loss of pressure on the gauge when the pressure comes against the valve being checked. The Contractor shall verify that the pressure differential across the valve does not exceed the rated test pressure of the valve.

A reliable leakage detector shall be corrected by the Contractor regardless of the allowable leakage specified above. Should the tested section fail to meet the pressure test successfully as specified, the Contractor shall, at his expense, locate and repair the defect and then retest the pipeline.

Prior to rolling 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 ensure that the pipe is in a satisfactory condition.

Defective materials or workmanship discovered as a result of hydrostatic field test shall be replaced by the Contractor. Whenever it is necessary to replace defective material or correct the workmanship, the hydrostatic test shall be renewed until a satisfactory test is obtained.

7.11.3.11.1B TESTING EXTENSIONS FROM EXISTING MAINS

When an existing water main is extended with new pipe to a new valve and the distance from the existing pipe to the new valve is 10 feet or less, the section of new pipe installed between the new valve and the end of the existing main will be made by the Seattle Water Department with pre-chlorinated, and no hydrostatic test will be required. When the required hydrostatic tests are conducted at the new main section beyond the installed new valve in the closed position, the normal pressure of available chlorine may be present against the other side of the valve.

When the distance between the ends of water main pipe extensions to the new valve is more than 15 feet, the section of new pipe installed between the new valve and the existing main shall be hydrostatically tested and, after hydrostatic tests have been made to the required pressure of both directions against the new valve. This shall be accomplished by a temporary cap or plug installed on the end of the pipe at the point of connection, as close as possible to the existing pipe for testing purposes.

7.11.3.11.2B PRE-DISINFECTION FLUSHING

Sections of pipe smaller than 24-inch diameter to be disinfected by methods other than that found in Section 7.11.3.11.1B-METHOD 1 shall be flushed to remove any solid or contaminated material. If Method 1 is used, the 24-inch flushing shall be carried out at the end of the pipe on a test section.

When the flushing is completed, the Contractor shall be responsible for removing any solid or contaminated material. The Contractor shall provide the necessary equipment and labor for the flushing operation. The Contractor shall be responsible for removing any solid or contaminated material.

The Seattle Water Department will perform the hydrological tests and report the results to the Engineer. Results will be available no earlier than 48 hours after sample tests are taken by the Seattle Water Department Laboratory. The Seattle Water Department may require bacteriological tests on any water before it is released to the public. The Seattle Water Department will be responsible for any costs incurred in connection with the bacteriological tests.

7.11.3.11.2B DISINFECTION FLUSHING

Sections of pipe larger than 24-inch diameter to be disinfected by methods other than that found in Section 7.11.3.11.1B-METHOD 1 shall be flushed to remove any solid or contaminated material. If Method 1 is used, the 24-inch flushing shall be carried out at the end of the pipe on a test section. The Contractor shall be responsible for removing any solid or contaminated material.

The Seattle Water Department will perform the hydrological tests and report the results to the Engineer. Results will be available no earlier than 48 hours after sample tests are taken by the Seattle Water Department Laboratory. The Seattle Water Department will be responsible for any costs incurred in connection with the bacteriological tests.

7.11.3.11.2C DISINFECTION FLUSHING

Sections of pipe larger than 24-inch diameter to be disinfected by methods other than that found in Section 7.11.3.11.1B-METHOD 1 shall be flushed to remove any solid or contaminated material. If Method 1 is used, the 24-inch flushing shall be carried out at the end of the pipe on a test section. The Contractor shall be responsible for removing any solid or contaminated material.

The Seattle Water Department will perform the hydrological tests and report the results to the Engineer. Results will be available no earlier than 48 hours after sample tests are taken by the Seattle Water Department Laboratory. The Seattle Water Department will be responsible for any costs incurred in connection with the bacteriological tests.
PIPE INSTALLATION FOR WATER MAINS

7.11.3(14) BLOWFALL ASSEMBLIES

Water main blowfall assemblies shall be constructed as shown on the Drawings. The Contractor shall not be allowed to use any blowfall assemblies subject to vehicular traffic. Care shall be taken in locating the storm sewer such that it is not in any water course or in any other location subject to drainage or sewage contamination. Ties shall be set to conform to finished grade. Backfilling and compaction shall conform with Sections 7.10(3)(B) and 7.10(3)(C).

Drilling and tapping into the water main will be performed by the Contractor except in the event of installation on a changed (above) water main, in which case the Seattle Water Department will make the connection.

7.11.3(15) CORROSION PROTECTION OF DUCTILE IRON PIPE

7.11.3(15)(A) GENERAL

Where called out on the Drawings, the pipeline contractor furnishing the pipe shall comply with the following:

(a) Bond Electrical Contingent Bonds: The Contractor shall furnish and install electrical bonds, as specified herein, at all mechanical couplings and all rubber joint gaskets. The Contractor shall take special precautions to avoid disturbing heasts, electric cables, and wires for test stations and other cathodic protection equipment connected to, or installed near the pipeline.

(b) Electrical Test Stations: The Contractor shall furnish and install the Electrical Test Stations where shown, and as detailed on the Drawings.

7.11.3(15)(B) ELECTRICAL JOINT BONDS FOR ALL Ductile Iron Pipe and Fittings

7.11.3(15)(B)(1) GENERAL

Each length of ductile iron pipe in the pipeline, and each heather joint shall be bonded together, and each mechanical joint shall be bonded to the pipe as shown on the Drawings. The Engineer will make adhesion tests of all bonds and bonded joints. Any bonded joint which fail to meet the adhesion test requirements of a satisfactory test is in the Drawings shall be replaced and the cost of such replacement shall be as specified in Section 9.20.14 herein.

Details of mechanical joint bonding shall be as shown in Standard Plan No. 100.

7.11.3(15)(B)(2) BOND CONNECTIONS FOR DUCTILE IRON PIPE

Prior to making any bond connection to metal, an area approximately 1 inch wide from the bond shall be free of all rust, dirt, grease, and other detrimental material. Each bonded area shall be cleansed with an emery cloth, emery paper, or other material similar to emery cloth, as may be adequate to remove all rust, dirt, dust, moisture, oil, and grease. All bonded areas shall be cleaned in the same manner immediately prior to insulating. All bond connections shall be made in the same manner as shown on the Drawings, and shall be tested for adhesion by the Engineer in accordance with the testing procedure shown in Section 7.11(3)(B11).

7.11.3(15)(B)(3) INSULATED BOND CONNECTIONS

Each bond connection shall be insulated thoroughly with a Boeing blanket, insulating Cap or approved equal. The cap shall completely cover the cleaned area and provide insulation of the bond connection from the soil environment. The cap must be attached by use of a bonding cement or primer and must contain an element of at least 10 mils. A class 1 corrosion material must completely surround the bond on all sides except for a minimum of 6 inches x 1 inches x 0.15 mill thick. Bond caps are not required when the connection is covered by heat shrink joint wrapping.

7.11.3(15)(B)(4) APPLICATION OF HEAT SHRINK PIPE JOINT SLEEVE

After electrical bonds are installed and tested, the entire pipe joint and electrical bond strap shall be protected with a heat shrink joint sleeve. The sleeve shall be wrapped around the joint with a joint closure and shall contain a Thermal Indicate. The sleeve shall be Raychem Thermod Wraparound Pipe Sleeve WPCF and the closure shall be Raychem WPCF III or approved equal.

7.11.3(15)(C) ELECTROLYSIS TEST STATION

7.11.3(15)(C)(1) GENERAL

Electrolysis Test Stations shall be installed as shown on Standard Plan No. 160 and on the Drawings. Items used shall be as specified in the following Sections.

7.11.3(15)(C)(2) ZINC REFERENCE ELECTRODES

The electrode shall be packaged in a leakless material of 50% gypsum and 50% bentonite clay. The package shall be water permeable and of sufficient size to ensure complete containment of the reference electrode.

7.11.3(15)(C)(3) TEST STATION

The test station shall consist of a molded Ethylene junction box installed inside a concentric cast iron water meter box for non-traffic areas or inside a Type 3015 Ring and Cover for traffic areas.

7.11.3(15)(C)(4) TEST WIRES

Wire location, connections to pipe, size, and insulation color shall be as shown and as detailed on the Drawings.

7.1.14 MEASURE

Bid items of work performed pursuant to Contract Document shall be measured as provided in Section 14.4. Measurement of Quantities unless otherwise provided for is on the drawings or the specification.

Measurement for "Pipe, Water Main, (Material), (Class), and fittings, including Fittings" shall be paid for under this contract.

All costs in connection with furnishing and installing polyethylene cross-linkage, multi-layered polyethylene tape coating or special coating to the pipe where required as indicated on the Drawings shall be included in the unit contract price for "Pipe, Water Main, (Material), (Class), and fittings, including Fittings" as listed in the Bid Form.

Payment for holding or storage shall be paid for under this contract for unprocessed, multi-layered polyethylene tape coated or specially coated pipe shall be in accordance with the previous paragraph.

No separate payments will be made for the hydrostatic test, temporary caps, pipe fittings, test stands, temporary blocking/anchorage and the cost of all labor, material, tools, supplies and equipment used in the test shall be considered as incidental to the pipeline construction.

Defective materials or workmanship discovered as a result of hydrostatic field tests shall be repaired and the cost of such repair shall be credited against the overrun and profit. Special fittings called for on the Drawings but not used by the Contractor shall be deducted from the Contractor's final estimate based on the current cost of the supplier of fittings used on the improvement.

The unit contract price for "Blockwall, Cement Concrete" shall include all costs to place concrete block for the proportions required, including excavation, turnbacks, scaffolds, roads, site preparation, backfilling and removal of disposal of excavation not required for backfill, and any other work that may be necessary to make the block wall blocking in place as specified.

The unit contract price for "Blockwall Assembly, Slab" shall also include all costs for furnishing and installing the complete assembly including concrete, fittings, pipes, valves, meters, fittings per linear foot.

The unit contract price for "Blowfall, Cement Concrete" shall also include all costs for furnishing and installing the complete assembly including concrete, fittings, pipes, valves, meters, fittings per linear foot.

The unit contract price for "Blowfall, Cement Concrete" shall also include all costs for furnishing and installing the complete assembly including concrete, fittings, pipes, valves, meters, fittings per linear foot.

The unit contract price for "Blowfall, Cement Concrete" shall also include all costs for furnishing and installing the complete assembly including concrete, fittings, pipes, valves, meters, fittings per linear foot.
7.12.2 MATERIALS

Materials shall meet the requirements of Section 7.30.2. Valves for water mains shall be suitable for ordinary waterworks service, intended to be installed in a normal position on buried pipelines for water distribution systems.

Valves shall open counter clock-wise and shall be equipped with a 2 1/2 inch 
#1800B standard operating nut. Unless otherwise specified, all valves shall be the nailing stem type.

7.12.3 CONSTRUCTION REQUIREMENTS

7.12.3.1 GENERAL

All valves shall be inspected upon delivery to the field to ensure proper working order before installation and shall be free of all rust and dirt. They shall be set and jointed to the pipe in the manner as set forth in the 'AWWA Standards for the type of connecting ends furnished. The valves shall also be carefully inspected for injury to the outer protective coatings. At all places where the casting has been repaired or scraped off, the damaged area shall be thoroughly cleaned to expose the iron base installation. The cleaned area shall then be recoated with zinc chromate primer. After recoating with the primer, the entire valve shall be field painted with two or more coats of Bostian Rustoleum No. 913234 or approved equal.

An Operating Nut Extension shall be installed where the ground surface is more than 30 inches above the valve operating nut. The Operating Nut Extension shall extend into the top section of the Standard Valve Box and shall clear the bottom of the lid by a minimum of 6 inches. If required, it shall be furnished and installed by the Contractor.

Upon delivery at the works, all valves shall be opened to prevent the collection of water in the valve. Valves shall have the interior cleared of all foreign matter and shall be inspected both open and closed position prior to installation. Valves and valve boxes shall be set plum and valve boxes shall be placed over the valve or valve operator in a manner that the valve shall be level. A glass shutoff cock or street on the valve. The lower casing of the unit is installed first, in a manner as to be supported by a minimum of 2 inches thick. The upper casing shall not rest directly upon the body of the valve. A backfill shall be carefully tamped around the valve box to a distance of 12 inches from the unit to a depth of 2 feet. The entire valve box shall be set off the conduit of the building to a height of 1/2 inch.

The combination air relief/air vacuum valve shall be installed and connected as outlined in the Contractor's own cost. Additional payment will be made for the replacement and reassembling of the casing pipe.

After installation, all valves shall be subject to field testing and will be test run with water. Should any defects in design, materials, or workmanship appear during these tests, the Contractor shall correct such defects with the least possible delay and to the satisfaction of the Engineer.

7.12.3.2 VALVES CHAMBERS AND VALVES

7.12.3.2A GENERAL

Valves installed on water mains that are polyethylene encased, tape coated, or special coated, shall be encased, tape, or special coated the same as the water main.

7.12.3.2B PRECAST VALVE CHAMBER

The concrete base shall be poured-in-place or precast. Poured-in-place base shall be able to attain sufficient strength to support the chamber (usually 2 or 3 days), as directed by the Engineer. Precast chambers shall be set on the base in cement mortar with the slooted holes straddling the water main. The water main shall be wrapped with 2 1/2 inch thick plastic foam sheeting at the areas where the main intersects the chamber wall. Any remaining space between the chamber wall and the plastic foam material shall be filled with cement mortar or mortarized bricks. In no case shall the water main rest on the chamber wall.

Precast chamber shall be constructed with 12 inch hot rolled steel channel at the top of the dimensions shown in the Standard Plans. Chambers shall have a cast-in-place or precast concrete top slab suitable for H-20 loading capacity.

7.12.3.2C CONCRETE CHAMBERS MADE WITH PRECAST CONCRETE BLOCKS

Circular or rectangular chambers may be made with solid precast concrete blocks. The base shall first be poured in place. After the base has attained sufficient strength (usually 2 or 3 days), the walls may be constructed of concrete blocks with 12 inch hot rolled steel channel at the top of the dimensions shown in the Standard Plans. Chambers shall have a cast-in-place or precast concrete top slab suitable for H-20 loading capacity.

7.12.3.3 CAST-IN-PLACE CHAMBERS

Cast-in-place chambers may be constructed by using forms and poured concrete. Filling of voids is not required other than the patching of porous spots (rock pockets) and bolt holes. Forms shall be used for inspection of concrete.

7.12.3.3A SETTING RING AND COVER

The cast iron frame and cover shall be set to grade furnishing the base for the Engineer. Provisions for future adjustment of frame to changes in grade shall be made by placing a minimum of 2 courses of brick with mortar joints between the top of the chamber and the bottom of the casing. Brick for this purpose shall be standard clay or concrete brick 2 1/4 inches thick.

7.12.3.3B SETTING VALVE BOX

Cast-in-place boxes shall be set to position during backfilling operations so that they will be in a vertical alignment with the gate valve operating stem. The lower casing of the unit shall be supported by a plastic form collar and shall be 2 inches thick, and shall be held in place by carefully compacted backfill. The casing shall not rest directly upon the body of the valve. A backfill shall be carefully tamped around the valve box to a distance of 12 inches from the unit to a depth of 2 feet. The entire valve box shall be set off the conduit of the building to a height of 1/2 inch.

Compaction shall be as specified in Section 7.30.311.

7.12.3.3C VALVES INSTALLED ON SPECIALLY FORGED VALVE BOXES

Valves installed on water mains that are polyethylene encased, tape coated, or special coated, shall be encased, tape, or special coated the same as the water main.

7.12.3.3D MATERIALS

Ref to Section 7.30.319.

7.12.3.7 PAINTING OF VALVES

Prior to the field test and inspection, all forarms parts of the valves except finish or bearing surfaces shall be thoroughly cleaned and not coated with two coats of asphalt varnish, Federal Specification TT-V-0131, or equivalent.

7.12.3.8 PAINTING IN THE FIELD

The valve shall be carefully inspected for injury to the outer protective coatings. At all places where the coating has been repaired or scraped off, the damaged area shall be thoroughly cleaned to expose the iron base installation, and the cleaned area shall then be recoated with zinc chromate primer and the entire valve shall be field painted with two or more coats of Bostian Rustoleum No. 913234, or equal.

7.12.4 MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured as prescribed in Section 7.30.1 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein. This Section.

7.12.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 7.12 will be made at the unit contract price bid only for the bid items listed or referenced below:

(1) "Valve, Gate, Slab," per each.
(2) "Valve, Butterfly, Slab," per each.
(3) "Valve, Gate or Butterfly Slab," per each.
(4) "Tapping Sleeve, Slab or Sleeve and Tapping Gate Valve, Slab," per each.
(5) "Valve, Cast Iron, Sleeve," per each.
(6) "Valve Box, Cast Iron," per each.

The unit contract price for "Valve, (Type, Slab)," shall include all costs for the work required to furnish and install the valve, including precision grinding, testing, operating nut and extensions. The value shall include polyethylene encased, multi-layered polyethylene tape coated, or special tape coated as indicated in the drawings or in the Project Manual. The cost for furnishing and installing the casing as specified in Section 7.12 shall be included in the unit contract price, and shall be cast-in-place, including foundation, adjustment brick, castings and lid, rubber cushion, mortar placing, valves, sleeves, spacers, window framing materials and stems or bolts.

The unit contract price for "Valve Box, Cast Iron" shall include all costs to furnish and install the valve box, including plastic foam coating.

SECTION 7.13 VACANT

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HYDRANTS

SECTION 7.14 HYDRANTS

7.14.1 DESCRIPTION

These specifications are to be used in conjunction with the AWWA Standard C502 for dry barrel fire hydrants for ordinary water service.

This work shall consist of furnishing, installing, and setting hydrants, valves, and other accessories such as strainers, safety valves, pressure regulators, backflow preventers, reducing valves, and all necessary tools and equipment.

7.14.2 MATERIAL

Materials shall meet the requirements of Section 9.30.

7.14.3 CONSTRUCTION REQUIREMENTS

7.14.3(1) SETTING HYDRANTS

Where shown in the Drawings, hydrants shall be installed in accordance with the details shown on Standard Plan No. 315 through 318. Hydrants shall not be installed within 3 feet of a traveled roadway. In addition, a minimum 3 foot radius unobstructed working area shall be provided around all hydrants. The sidewalk flank shall be set 4 inches above finished grade.

All hydrants shall be set on concrete blocks as shown in Standard Plan No. 315 through 318. The hydrant shall be set in a 1.5 cubic foot hole of crushed stone or gravel situated at the base of the hydrant as shown in Standard Plan Nos. 316 and 317a.

All hydrants shall be inspected in the field upon arrival to ensure proper working order. After installation, they shall be backfilled to a hydrostatic test as specified in Section 7.34.

The Contractor shall check the threads on the popper and other parts for proper gaskets and service capability.

A concrete shear block, as shown on the hydrant details, shall be constructed if the hydrant is not in a concrete sidewalk. Construction, materials, and finishing shall conform to specifications for new work. The base of the hydrant shall be at the grade of the sidewalk. After construction and finishing is complete, the exposed portion of the hydrant shall be painted with one field coat. The color and type of paint shall be designated by the Engineer.

Any hydrant seat shall be identified by colored bands.

7.14.3(2) HYDRANT CONNECTIONS

7.14.3(2)A GENERAL

Hydrant laterals shall consist of a section of 6inch ductile iron pipe in the main in the hydrant and shall include an auxiliary gate valve set vertically and placed in the line as indicated on Standard Plan Nos. 315 and 316.

7.14.3(2)B HYDRANT RESTRAINT

Hydrants shall be restrained with 2 1/2 inch diameter steel shackles as shown on the drawings. The shackles will be cut at the ends, or where rod couplings are used, to be factory fittings. The shackles shall be completely coated pursuant to Section 9.30.

7.14.3(2)C AUXILIARY GATE VALVE AND VALVE BOX

All auxiliary gate valves and boxes shall conform to Section 7.12 except that the end connections shall be provided with lugs for shackling or the boxes shall have additional clearance between the body of the valve and the hub to permit the installation of shackles.

7.14.3(3) REINSTALLING EXISTING HYDRANTS

Where, on the Drawings, an existing hydrant is shown for adjustment to conform to new street alignment or grade, the hydrant shall be moved without disturbing the location of the hydrant lateral set in the main.

The hydrant shall be shacked as specified in Section 7.14.3(2)B.

This work shall be in accordance with the specifications for setting new hydrants.

7.14.3(4) MOVING EXISTING HYDRANTS

When an existing hydrant is shown on the Drawings to be moved, a new tee shall be inserted in the main, and the open part of the abandoned tee shall be securely plugged and shackled or blocked. The hydrant shall be shacked as specified in Section 7.14.3(2)B. The work shall be done in accordance with the specifications for setting new hydrants.

On charged mains, the furnishing and insertion of the new tee, and the plugging and blocking of the existing tee, will be the responsibility of the Seattle Water Department as specified in Section 7.11.3(36a).

7.14.3(5) RECONNECTING EXISTING HYDRANTS

On reconnecting existing hydrants as specified, the hydrant remains unchanged in their original position, but the existing hydrant connections is changed to connect with a new hydrant as provided in a new main.

Hydrant reconnections shall meet all the requirements for new work.

Where existing hydrants were not shacked to the old main, the new connection shall be shackled with steel rods as shown in Standard Plan No. 315 through 318, or by such other means as the Engineer shall direct.

7.14.3(6) HYDRANT BARREL EXTENSIONS

The minimum requirements for hydrant barrel extensions, specified with the hydrant, Rynoate, Rynoate 05B, and Rynoate 05D. The barrel shall be of the specified material and finished in such a manner as to match the color of the hydrant.

7.14.3(7) NEW HYDRANT ON EXISTING MAIN (EXISTING TEE)

When a new hydrant is shown on the Drawings to be installed in an existing main, the new hydrant shall be installed as indicated. The hydrant shall be shacked as specified in Section 7.14.3(2)B.

All work shall be in accordance with specifications for new work.

7.14.3(8) NEW HYDRANT ON EXISTING MAIN (EXISTING TEE)

When a new hydrant is shown on the Drawings to be connected to an existing main at an existing hydrant tee, all hydrant shall be installed as indicated and shall be shackled as specified in Section 7.14.3(2)B. All work shall be in accordance with specifications for new work.

The connection shall be by the Seattle Water Department as specified in Section 7.11.3(36a).

7.14.3(10) HYDRANTS ON WATER MAINS THAT ARE POLYETHYLENE ENCAPSULATED, TAPED, OR SPECIALLY COATED

For hydrants installed on water mains that are polyethylene encapsulated, taped, or specially coated, the following shall be required.

(a) Hydrant Connections (See Section 7.14.3(2)) shall have the same special coating as the water mains to which they are connected, and shall have Class B bedding in accordance with Section 7.14.3(5).

(b) Hydrant barrels below ground shall have the same special coating as the water main to which they are connected.

(c) Hydrant connection shall be installed as specified in Section 7.11.3(1A).

7.14.3(11) HYDRANT SHOP PAINTING

All iron parts of the hydrant, shall be thoroughly cleaned and painted in the factory. All inside surfaces and the outside surfaces below the ground line shall be coated with asphalt varnish, and all fittings shall be properly finished with a smooth, even finish. The hydrant shall be painted in accordance with the specifications for new work.

Following installation, the hydrant shall be painted as follows:

(a) Prior to backfill, the extension below ground portion shall be painted with a coat of Benjamin White Enamel No. 1000, or an approved equivalent.

(b) After backfill, the outside area of the hydrant, which is shown the finished ground line when backfilling is complete, shall be painted with a coat of Benjamin White Enamel No. 1000, or an approved equivalent.

(c) All hydrant of concrete shall be painted with one coat of Benjamin White Enamel No. 1000, or an approved equivalent.

7.14.4 MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured as provided in Section 14.4.1. Measurement shall be made in accordance with the specifications for new work.

7.14.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 7.14.4 will be made at the unit contract prices bid only for the pay items listed or referenced below:

(a) "Hydrant, Ductile Connection, (Type)" per each.

(b) "Hydrant, Ductile Connection with Vertical Extension," per each.

(c) "New Hydrant on Existing Main (New Tee)," per each.

(d) "New Hydrant on Existing Main (Existing Tee)," per each.

(e) "Reset Hydrant," per each.

(f) "Move Hydrant," per each.

(g) "Reinstall Hydrant," per each.

(h) "Hydrant Extension, Vertical, 24-inch and Under," per each.

(i) "Hydrant Extension, Vertical, Over 24-inch," per each.

(j) "Retaining Wall for Hydrant," per square foot.

The unit contract price for "Hydrant, 6 inch Connection, (Type)" shall include all costs for the work required to furnish and install the hydrant, including the hydrant tee, auxiliary valve, valve box, restraint system and shackles, gravel drain, concrete blocks, bladder, coating, painting and shear block, the 6-inch Ductile Iron pipe connecting the hydrant auxiliary gate valve to the water main and all the costs of the work to furnish and install the connecting pipe are included in the unit contract price for "Hydrant, 6 inch Connection, (Type)" plus all costs for the work necessary to furnish and install the required vertical extensions.

If the location of the hydrant differs from that shown in the Drawings and requires an increase of more than 5 feet of connection pipe, the rough of pipe exceeding 5 feet will be paid for by either "Pipe, Water Main, Ductile Iron, Class 52, 6inch," if such a bid item is in the Bid Form or in accordance with Section 14.4.4 if not in the Bid Form.

The unit contract price for "New Hydrant on Existing Main (New Tee)" and "New Hydrant on Existing Main (Existing Tee)" shall include all costs for work and materials required to furnish and install the hydrant as specified, the excavation, backfill, and new connection pipe.

The unit contract price for "Reset Hydrant" shall include all costs for the work required to reset the existing hydrant as specified, including shackling, painting and new connection pipe.

The unit contract price for "Move Hydrant" shall include all costs for the work required to move the existing hydrant as specified, including shackling, painting and new connection pipe.

The unit contract price for "Reconnect Hydrant" shall include all costs for the work required to reconnect the existing hydrant, including new tee, shackles, painting, shanking and the required backfill pipe.

The unit contract price for "Hydrant Extension, Vertical, 24-inch and Under," and "Hydrant Extension, Vertical, Over 24-inch" shall include all costs necessary for the work to extend the hydrant to the required finish elevation.

All handicapped and finished condition and shall also include the cost of steel, bolts, nuts, washers and gaskets.

The unit contract price for "Retaining Wall for Hydrant" shall include all costs for the work required to furnish and install the concrete slabs. Rock facing may be used in place of block concrete.

All costs in connection with furnishing and installing coating as specified in Section 7.14.4(10) shall be included in the unit contract price of various bid items comprising this improvement.

Payment for bedding for polyethylene encapsulated, multi-layered tape coated, or specialty tape coated hydrant connection pipe and hydrant barrel shall be in accordance with Section 7.13.
SECTION 7.15 SERVICE CONNECTIONS

7.15.1 GENERAL
The Water Department will, at no cost to the Contractor, make all taps for service connections, and for supplying, disconnecting, and installing the service pipe.

SECTION 7.16 FLOW CONTROL SYSTEMS

7.16.1 DESCRIPTION
This work shall consist of excavation, shoring, foundation preparation, bedding, jointing, backfilling and compacting for the construction of a flow control structure and detention pipe for storm water storage. The flow control structure shall consist of manhole structure with a flow control device.

7.16.2 MATERIALS
Materials shall meet the requirements of the following Sections:
- Manhole Components
- Corrugated Pipe
- Corrugated Steel Pipe
- Corrugated Aluminum Pipe
- Frame and Grate
- Flow Control Structure

Joint coupling bands for detention pipe shall be of the type specified in Section 8.09.03.D and 8.09.04.B.

7.16.3 CONSTRUCTION REQUIREMENTS

7.16.3.1 GENERAL
All work including excavation, foundation preparation, bedding, pipe laying and jointing, backfilling, compacting for the construction of detention pipe and flow control structure shall be performed in accordance with Sections 7.16.4 through 7.17.

7.16.3.2 FLOW CONTROL STRUCTURE
The PVC office plate shall be fastened welded in the PVC conduit with an office of the diameter indicated on the Drawings dealt in its center.

7.16.3.3 DETENTION PIPE
Sewer pipes and bands shall be galvanized in accordance with A.S.T.M. Designation A530. Each end plate shall be welded to the end of the detention pipe with a watertight continuous weld.

The end of the detention pipe inside the flow control structure shall be ground smooth of all sharp edges. Aluminum in contact with concrete shall be cleaned with a soapy solution to remove all dust and foreign materials. All references to "servicemen" shall be construed to mean "storm drain, sanitary sewer, and combined sewer, respectively.

7.17 MATERIALS

STORM DRAINS AND SANITARY SEWERS

7.17.1 GENERAL
Materals shall meet the requirements of the following Sections:

Concrete Sewer Pipe
Corrugated Steel Pipe
PVC Sewer Pipe
Cast Iron Sewer Pipe
Steel Sewer Pipe
Aluminum Sewer Pipe
Joists

All sanitary sewer pipe shall have flexible gasket joint unless otherwise specified.

It is not intended that materials listed are to be considered equal or generally interchangeable for all applications. The Engineer shall determine from the materials lists those suitable for the project, and shall specify to the Specifications or the Drawings.

7.17.2 PAYMENT
Compensation for the cost necessary to complete the work described in Section 7.17 will be made at the unit contract prices bid only for the work items listed or referenced below:

(1) "Flow Control Structure, (Diameter)," etc., each.
(2) "Pipe, Detention, (Material), (Size)," linear foot.

The unit contract price for "Flow Control Structure, (Diameter)," shall include all costs for the work required to furnish and construct the flow control structure including excavation, backfilling, grading backfill or foundation material, the PVC connection pipe and flexible adapter coupling.

The unit contract price for "Pipe, Detention, (Material), (Size)," shall include all costs for the work required to furnish and install the detention pipe, including excavation, backfilling, the end plate, grouting smooth the detention pipe, and utilizing the flow control structure, consisting of locating and placing the aluminum, or steel surfaces as specified.

7.17.3 MATERIAL CERTIFICATION
The manufacturer or fabricator shall furnish appropriate certification based on manufacturer's routine quality control tests that the pipe meets the requirements of the pertinent A.S.T.M. or A.N.S.I. Specifications.

7.17.4 CONSTRUCTION REQUIREMENTS

7.17.4.1 EXCAVATION AND PREPARATION OF SITE

7.17.4.1.1 TRENCH EXCAVATION

7.17.1.1 GENERAL
The length of trench excavation in advance of pipe laying shall be 100 feet minimum and in no case shall exceed 150 feet unless specifically authorized by the Engineer.

All trenching shall be done with a trencher or similar equipment. The trench shall be kept clean and free of earth, and such provision shall be made for the temporary protection of the public or property as may be necessary.

All excavation shall be made in accordance with the specifications and drawings as shown.

The Contractor shall furnish, install, and operate the necessary equipment to keep excavation above the foundation level free from water during construction, and shall remove, and replace the same so as to prevent injury to public or private property or nuisance to the public. All equipment shall be sufficient to do the work, and the Contractor shall be responsible for the operation of the same.

Standard Plan No. 284 or to the requirements specified in Sections 240.220, whichever is greatest.

Vertical trench width in a paved roadway, sidewalks or other improved area shall not exceed a maximum of 60 inches. If the Contractor exceeds this width, he will be required to replace all backfill material required outside the trench next line limit.

Excavated trench material shall be removed and disposed of in accordance with Section 8.09.12 and 8.09.13, or as determined by the Engineer.

The material of proposed backfill shall be such that settlement of the bottom of excavations, or formations of "quicks" or "boils" during excavation shall be prevented. Dewatering systems shall be designed and operated so as to prevent removal of the backfill material.

During excavation and installation of pipelines, and placement of trench backfill, there shall be kept free of water. The Contractor shall control surface runoff so as to prevent entry into the drainage system. The static water level shall be drawn down a minimum of 1 foot below the bottom of the excavation with the disturbed state of the foundation soils and allow the placement of any fill or backfill to the required density. The static water level shall be maintained and operated so that the ground water level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

The release of groundwater to its static level shall be performed in such a manner that the disturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent any erosion or movement of existing structures, pipelines, and sewers.

Excavation for manholes and other structures connected to the pipelines shall be sufficient to provide a minimum of 12 inches between the surface and the bottom of the excavation.

All material excavated from trenches and placed adjacent to the trench shall be placed in such manner as to minimize the flow of storm water in ground water, or natural water courses.

The Contractor shall furnish, install, and operate all necessary equipment to keep excavation above the foundation level free from water during construction, and shall remove, and replace the same so as to prevent injury to public or private property or nuisance to the public. All equipment shall be sufficient to do the work, and the Contractor shall be responsible for the operation of the same.

All trenching shall be done with a trencher or similar equipment. The trench shall be kept clean and free of earth, and such provision shall be made for the temporary protection of the public or property as may be necessary. All excavation shall be made in accordance with the specifications and drawings as shown.
7.17 STORM DRAINS AND SANITARY SEWERS

The Contractor shall have trenches to protect the work, existing property, utilities, property, etc., and to provide safe and serviceable trench. The Contractor may elect to use any combination of trenching, standard excavation or trenching, or any other method, so long as it is in accordance with the contract drawings, specifications, and project conditions.

Shoring to be removed, or moveable trench shields or boxes, shall be located at least 3.75/2 pipe diameters away from flexible pipe if the bottom of the shoring, shield, or box extends below the top of the pipe. If soil is required, unless satisfactory means of reconsolidating the bedding or side support material disturbed by shoring removal can be assured. Damages resulting from improper shoring or failure to shore shall be the sole responsibility of the Contractor.

Trench excavation shall not be allowed to be performed outside the project, except by the Contractor. Unsuitable foundation materials shall be removed as specified in the approved plans. The location of bedding and pipe, the trench bottom shall be brought to grade as necessary by means of excavation or cutting. If the trench excavation is to be carried out at least six inches below the bottom of the pipe, the trench bottom shall be brought to a minimum depth of 36 inches below the bottom of the pipe.

A minimum distance of (x) inches is required to place the pipe over基础. The Contractor shall be responsible for providing a foundation capable of supporting the pipe in the project area. The trench bottom shall be considered to meet this requirement when the bottom of the trench is level or is horizontal, when it has adequate support over the length of the pipe. No movement or deflection of the pipe shall be permitted in the excavation area.

7.17.313A3 TRENCH EXCAVATION IN SOLID ROCK

Solid Rock Excavation shall cover the removal and disposal of solid rock as defined in Section 3.31.1.3. Material removed shall be replaced with suitable excess excavated natural materials adjacent to trenches, non-rocky excavation, or from imported natural material of the type specified by the Engineer.

7.17.313A4 UNSUPERSED MATERIALS

Surplus material obtained from trench excavation as determined to be unsuitable for use elsewhere on the project shall be disposed of at the Engineer's discretion.

7.17.313A5 PIPE BEDDING

Bedding of the pipe shall be constructed as shown on the Drawings and as described in the Project Manual. The bedding materials shall be installed in accordance with Standard Plan No. 259, and shall include all materials and work within the limits of the pipe area as shown in Standard Plan No. 259. All bedding shall be provided for the pipe and Class B bedding shall be provided. Class B bedding shall provide uniform support to the pipe.

7.17.313A6 PIPE BEDDING FOR RIGID PIPE

Bedding shall be classified as Class A, Class B, Class C, and Class D. The requirements for bedding are as specified in the Project Manual.

Unauthorized excavation has been made below the established line. The Contractor is not to be held liable for the removal of the pipe. The requirements for the project are to be followed.

7.17.313A7 UNEXPECTED OBJECTS

Unexpected objects, such as stumps, railroad ties, buried pipes, etc., shall be removed and disposed of by the Contractor. Removal of unexpected objects will be considered incidental to pipe installation unless one or more of the following conditions are met:

(a) The object(s) cannot be removed by the same equipment used in the excavation, or the trench with depth must be increased by 2 feet or more.

(b) In the event that any of the above conditions are met, removal of the object will be paid for in accordance with Section 3.05.4.

7.17.313BbedoING FOR FLEXIBLE PIPE

Material for bedding of flexible pipe such as PVC, ABS, and corrugated metal pipe shall be Class B with the bedding material consisting of Mineral Aggregate Type #2. Class B bedding shall be placed in more than one lift. The first lift, in place at least 4 inches thick, shall be placed above the pipe and shall be placed before the pipe is installed, and shall be backfilled as necessary so that the pipe is uniformly backfilled as necessary. The second lift of less than 4 inches thickness shall be installed on the pipe and uniformly compacted to 90% density, as determined by ASTM D3037, Method D. A further 6 inches lift of relatively compacted material shall be placed over the crown of the pipe. The lift shall be placed according to specified curves of sufficiently short radius to deflect the pipe joints in an amount greater than specified by the manufacturer. The materials shall be compacted with a series of tongs, and shaf-fabricated booms, subject to the approval of the Engineer.

7.17.313C LAYING SEWER PIPE

7.17.313C1 SURVEY LINE AND GRADE

The Contractor may use any method, such as "sewline of betterment" and "laser beam" methods, etc., which will allow him to accurately transfer the control points provided by the Engineer in the laying out of the pipe project. The lines and grades shall be established as specified in Section 3.05.2.

7.17.313C2 PIPE BEDDING

Bedding of the pipe shall be constructed as shown on the Drawings and described in the Project Manual. The bedding materials shall be installed in accordance with Standard Plan No. 259, and shall include all materials and work within the limits of the pipe area as shown in Standard Plan No. 259. All bedding shall be provided for the pipe and Class B bedding shall be provided. Class B bedding shall provide uniform support to the pipe.

7.17.313C3 BEDDING FOR RIGID PIPE

Bedding shall be classified as Class A, Class B, Class C, and Class D. The requirements for bedding are as specified in the Project Manual.

Unauthorized excavation has been made below the established line. The Contractor is not to be held liable for the removal of the pipe. The requirements for the project are to be followed.

7.17.313C4 PIPE LAYING

After an accurate grade line has been established, the pipe shall be placed in conformance to the established line and grade in the properly dewatered area. The bed shall be placed and compacted to the specified line and grade as shown in the Drawings and as described in the Project Manual. All pipe shall be laid out of the pipe and off the jointing surface.

7.17.313C5 CONCRETE PIPE TO EXISTING PIPE

Concrete tee may be installed on concrete pipe 18 inches or larger by placing a length of concrete pipe over tee that is cast into the core drill hole with its outer edge positioned just outside of the existing pipe. The barrel end inserted just to the inside face of the existing pipe. The concrete tee will extend from the bounding areas between the tee and the existing pipe so that the sewer line at the area above all or other contaminants that may reduce the bond of the concrete tee. Both must be covered with grout.

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7-17.3-2/D PIPE MARKINGS

On elliptically reinforced concrete pipe, the markings shall be located at least 24 in. above the pipe’s finished grade on a vertical plane (top or bottom) when the pipe is laid.

7-17.3-2/E GASKETED JOINTS

Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing the gasket and knocking it out of position, or contaminating it with dirt or other foreign material. Any gaskets so disturbed shall be removed, cleaned, replaced, and relubricated before rejoining the sections.

Carts shall be taken to properly align the pipe before joints are entirely forced home. During insertion of the tongue or nape, the pipe shall be partially supported by hand, slings, or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since 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.

Sufficient pressure shall be applied in making the joint to ensure that it is home, as described in the standard installation instructions provided by the pipe manufacturer. Sufficient restraint should be applied to the pipe to ensure that joints once home are held so, until all material under and alongside the pipe has been sufficiently compacted. At the end of the work day, the last pipe shall be blocked in an effective way to prevent creep.

Where pipe must be deformed to accommodate irregularities or horizontal or vertical curvature, it shall first be joined in straight alignment and then deformed as required.

7-17.3-2/F JOINTING

Where it is necessary to break out or connect to an existing sewer or during the installation of new sewers having the same inside diameter will be used to reconstruct the sewer. Joints must be made between pipes with care to prevent wall thickness, the Contractor shall use a flexible gasket, or use a make a watertight joint. Gaskets shall be those manufactured by “Forest Companies.”

7-17.3-2/G SEWER LINE CONNECTIONS

Catch basins, service drain, or sewer connections to trunks, mains, or laterals constructed by the Engineer shall be connected and approved by the Engineer. Approval of the connection point at the sewer.-same height as the top of the pipe and the trench backfill.

7-17.3-2/H STRAIGHT CONNECTIONS

Where a side sewer is larger or larger than the trunk, main, or lateral to which it is to be connected, the connection shall be made with a standard manhole unless otherwise provided in the Drawings or as in the Project Manual, or unless otherwise authorized by the Engineer.

Side sewers shall be laid below all water mains and shall meet the requirements for sanitary sewers and water mains in accordance with Section 14-07.

7-17.3-2/I PROTECTION OF EXISTING SEWER FACILITIES

All existing sewer lines including septic tanks and drain fields shall be kept in service at all times unless it is determined by the Contractor’s operations. If Drainage and Water Utility is laid in a pipe with a tee already in it, no fitting will be required.

7-17.3-3 JACKETING, AUGERING, OR TUNNELING

Where indicated on the Drawings, the Contractor shall install the pipe by jacketing, augering or tunneling; or installing the pipe in a casing pipe by a combination of these methods.

When use of a casing pipe is required, the Contractor shall be responsible for selecting the gauge and size required, unless otherwise indicated on the Drawings, and consent with his jacketing or augering operations, and shall be set to line and grade. During jacketing or augering operations, particular care shall be exercised to prevent caving ahead of the pipe which will cause waste outside of the pipe. When the carrier pipe is installed within a casing pipe, the carrier pipe shall be skidded into position in an acceptable manner to the base and grade as designated. The annular space between the casing and the pipe shall be filled with material as specified in the Project Manual.

The faces of the jacketing pipe shall be constructed or driven steel sheets, or installing timber lagging as the excavation proceeds. The sheets, or lagging, shall extend a minimum of 5 feet below the bottom of the pipe except at the pipe sewer. Prior to placing the jacket, 5 sets of Shute Drawings describing three activities, including dimensioning of pitch length and size of underground features and complete description of sheeting, shall be submitted to the Engineer for approval.

The approved procedure and equipment shall not relieve the Contractor of responsibility nor waive or modify any provisions of this Section.

7-17.3-3/B BACKFILLING TRENCHES

7-17.3-3/A GENERAL

In backfilling the trench, the Contractor shall take all necessary precautions to maintain the grade of the trench and prevent washouts or shalings. The Contractor shall backfill from the side of the trench to a uniform depth of 2 feet above the crown of the pipe before starting excavation. See Section 7-17.3-3/B for Contractor’s operations.

During all phases of the backfilling operations and testing as outlined herein, proper site preparation steps must be taken to ensure the proper installation, planning, and for the maintenance of traffic as may be necessary, and provide for the safety of property and persons.

The Contractor shall use suitable native excavated material for trench and fill backfill. The Engineer that the native material is unstable. The Engineer will examine excavated native material at the site of excavation to determine its suitability for use as backfill. Native material will be considered suitable for trench backfill if it is:

(a) Capable of maintaining the degree of compaction specified in Section 13-07.14/D.
(b) Within reasonable tolerance of optimum moisture content.
(c) Reasonably free of organic material, clay, fine sands, steep, or other deleterious material.

7-17.3-4 CLEANING AND TESTING

7-17.3-4/A GENERAL

Sewers and appurtenances shall be cleaned and tested after backfilling by either of the methods described and done by the Contractor at the option of the Contractor, except where the ground water table is such that the Engineer may require the solution text. Unsuitable backfill material shall be removed from the site, disposed of Section 14-06.12, and replaced with Material Aggregate Type 17 or other material mutually acceptable to the Engineer.

The Contractor shall follow any necessary steps to protect the excavated material from becoming contaminated with excessive moisture.

The jointing and the installation of existing manholes or sewer lines shall not be deemed complete until an authorized by the Engineer. Such authorization may not be given until all appurtenances have been completely cleaned, all debris removed, and where applicable, a pipe temporarily placed in the existing channel and sealed.

Water accumulating during construction shall be removed the site, disposed of Section 14-06.12, and replaced with Material Aggregate Type 17 or other material mutually acceptable to the Engineer.
All work involved in cleaning and testing sewer lines between manholes or roadways as required herein shall be completed within 15 working days after backfilling of sewer lines and structures. Any further delay will require the written consent of the Engineer. The Contractor shall furnish all labor, materials, tools, and equipment necessary to make the test, clear the line, and perform all work incidental thereto. The Contractor shall perform the tests under the direction and in the presence of the Engineer. Improper tests shall be taken to prevent joints from drawing during testing, and any damage resulting from these tests shall be repaired by the Contractor. The manner and time of testing shall be subject to approval by the Engineer.

All wires, tees, and stubs shall be plugged with flexible jointing caps, or acceptable alternative, securely fastened to withstand the internal test pressure. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

If the Contractor elects to test large diameter pipe one joint at a time, leakage allowances shall be converted from GPM per 100 feet in GPM per joint by dividing by the number of joints occurring in 100 feet. If leakage exceeds the allowable amount, corrective measures shall be taken and the line then resubmitted to the satisfaction of the Engineer.

Testing site auxiliary sewers shall be for their entire length from the public sewer in the street to the connection with the building's plumbing. Their testing shall be as required by the local sanitary agency but in no case shall it be less than that of filling the pipe with water before backfilling and visually inspecting the exterior for leakage. The decision of the Engineer as to acceptance of the site auxiliary sewer shall be final.

If any sewer installation fails to meet the requirements of the test method used, the Contractor shall determine the source or sources of leakage and shall replace all defective pipes. The complete pipe installation shall meet the requirements of the test method used before being considered acceptable. Replacement of defective pipes shall not commence until the Contractor has received approval of his plan from the Engineer.

7-17.3.6.4C EXPLOSION TEST
Prior to making calibration leakage tests, the Contractor shall cut the pipe with clear water to permit normal suction into the pipe valve boxes, provided, however, that after so filling the pipe it shall be complete the leakage test within twenty-four hours after filling. When under test, the allowable leakage shall be limited according to the provisions that follow. Specified allowances are pre-tested pipes. Leakage shall be no more than 0.03 gph per inch diameter per 100 feet of sewer, with a hydraulic head of 6 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. The length of pipe tested shall be limited so that the pressure at the lower end of the section tested does not exceed 10 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. Where the test is to be made one joint at a time, the leakage per joint shall not exceed the computed allowable leakage per length of pipe.

7-17.3.6C INFILTRATION TEST
Infiltration test leakage shall not exceed 0.35 gph per inch diameter per 100 feet, when the natural groundwater level at the test section is 0.5 feet or less above the crown of the pipe at the upper end of the test section. The length of pipe tested shall not exceed 700 feet or the distance between manholes when greater than 700 feet. Where the natural groundwater level is more than 0.5 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 level to the square root of 2.

Leakage consists = 0.35 x (V x 0.1414 ver sq ft./gph/ft.).

When a suitable head of groundwater exists above the crown of the pipe and the pipe is large enough to work inside, leakage may be based on the repair of visible leakage by means satisfactory to the Engineer.

7-17.3.6D AIR PRESSURE TEST FOR SANITARY SEWERS CONSTRUCTED OF NON-ASB PERMEABLE MATERIALS
(a) Pipelines may be tested with low pressure air by the pressure drop method, in lieu of water infiltration or calibration. The pressure drop shall be from 3.5 to 2.5 psi greater than the average back pressure of groundwater above the centerline of the pipe. At the Contractor's option, pipe may be tested without pre-pressuring; however, the test allowances herein assume pre-pressured pipe.
(b) The allowable rate of air loss shall be 0.002 cfm, per square foot of internal pipe surface, but the total air loss shall be not less than 2 cfm or more than 3.0 cfm.
(c) The test equipment to be used shall be furnished by the Contractor and shall be inspected and approved by the Engineer prior to use. The Engineer may at any time require a calibration test of gauges or other instrumentation that is incorporated in the test equipment.
(d) Safety Precautions. Plugs used to close the sewer pipe for the air test must be securely brazed 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. (For air pressure, air pressure develops a force against the plug in a 12 inch diameter pipe of approximately 400 pounds.) Air testing apparatus shall be equipped with a pressure relief device such as a rupture disk or a pressure relief valve designed to relieve pressure in the pipe under test at 1 psi.
(e) Pipeline under 36 inches in diameter may be tested from manhole to manhole with a length of pipe determined by the Contractor. Pipe 36 inches in diameter and over shall be tested one joint at a time. Each joint must show no appreciable loss of pressure when held for 30 seconds.

7-17.3.6E GENERAL
When non-asbestos pipelines are subjected to the low pressure air test, all of the provisions of Section 7-17.3.6D shall apply except that the pressure drop shall be from 3.5 to 3.0 psi greater than the average back pressure above the center of the pipe, and the minimum time shall be that computed as specified under Section 7-17.3.6D.

7-17.3.6F RECOMMENDED PROCEDURE FOR CONDUCTING ACCEPTANCE TEST BY PRESSURE DROP METHOD
(a) Plug all pipe outlets with suitable test plugs. Brace each pipe securely.
(b) All gage pressures in the test should be increased by the amount of ground water pressure at the center of the pipe.
(c) Air is added slowly to the portion of the pipe installation under test until the internal air pressure is raised to 4.0 psi.
(d) After an internal pressure of 4.0 psi is obtained allow at least 2 minutes for temperature to stabilize, adding only the amount of air required to maintain pressure.
(e) After the 2 minute period, disconnect air supply.
(f) Determine the time in seconds that is required for the internal air pressure to reach 2.5 psi. This time interval should then be compared with the time required by specifications as computed below.
(g) Length of test and length of all portions of pipe under test in table similar to the one that follows. The maximum reach to be tested in one operation shall be the reach between two consecutive manholes.

Add all values of K and all values of C for pipe under test.
If the total of all C values is less than one, enter the total of all K values into the space for "Time Required by Specification".
If the total of all C values is greater than one, divide the total of all K values by the total of all C values to get l. To make this division with the monograph, use scales C and D, and read l."
### NOMOGRAPH FOR THE SOLUTION OF \( K = \frac{0.1105}{C} \cdot \frac{1000}{K} \cdot \frac{1500}{q_0} \cdot \frac{d}{20} \)

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### STORM DRAINS AND SANITARY SEWERS

#### 7.17.3.4/4 OTHER TEST ALLOWANCES

All lateral or side sewer branches included in the test section shall be taken into account in computing allowable leakage. An allowance of 0.2 gallons per hour per foot of head above invert shall be made for each manhole included in a test section.

Upon final acceptance of the work all sewers, side sewers and fittings shall be open, clean, and free draining.

#### 7.17.3.4/5 PLUGGING EXISTING SEWER PIPE

Where shown in the Drawings or where designated by the Engineer, existing sewer pipes shall be plugged at the inlet end with Class 5 (II/6) concrete a minimum of 4 inches in length. Care shall be used in placing the concrete in the sewer to see that the opening in the pipe is completely filled and thoroughly plugged.

#### 7.17.3.4/6 DEFLATION TEST FOR FLEXIBLE PIPE

All auxiliary sewers constructed of flexible pipe shall be tested for deflection not less than 30 days after the trench backfill and compaction has been completed. Any diameter of the installed pipe shall not be decreased by more than 5 percent. The test shall be conducted by pulling a mandrel through the completed pipeline. Testing shall be conducted as a manhole-to-manhole limit and shall be done after the line has been completely flushed out with water. The Contractor shall be required to locate and repair any sections failing to pass the test and to submit the section. Pipe large enough to work inside of may be accepted on the basis of direct measurement.

#### 7.17.3.4/7 TELEVISION INSPECTION

The Engineer will inspect and videotape, using closed circuit television, all auxiliary sewers six inches through 48 inches in diameter. Pipe larger than 48 inches in diameter will be inspected visually after testing. Inspection and videotaping will be performed at least twice; once as part of the final acceptance process, and a second time approximately 6 to 11 months after the final acceptance.

Approximately 1200 linear feet of mainline pipe can be videotaped and inspected per day. Except for projects having less than 1300 linear feet of mainline pipe, 1200 linear feet of pipe will be the minimum length of pipe per day the Engineer will schedule for TV inspection. On projects having more than 1200 linear feet of mainline pipe, television inspection shall be scheduled on the basis of one full day per 250 linear feet of pipe to be inspected. Television inspection and videotaping will not be made until manholes have been channeled and the pipe cleaned and air tested. On projects with less than 1200 linear feet of pipe, the entire work shall be substantially complete prior to the final acceptance videotaping and inspection.

On projects having more than 1200 linear feet of pipe, TV inspections may be performed prior to the work being substantially complete. The Contractor shall notify the Engineer when pipe sections are ready for TV inspection. The Engineer will require a minimum of 5 working days notice in order to schedule the inspection. The Contractor is requested to be present during all TV inspections and videotaping. The Contractor shall also provide whatever assistance may be necessary to ensure vehicular access and egress for the Owner's equipment when making TV inspections.

Should video inspection during the final acceptance process discover any pipe or appurtenance which has been laid or jointed in nonconformance with the Specifications, the Contractor shall, upon order of the Engineer, correct by repairing or by removing and replacing, at the Contractor's expense, that portion of the pipe found defective. After the

### 7.17.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 7.17 will be made at the unit contract prices bid only for the bid items listed or referenced below:

- 206
SIDE SEWERS

Unauthorized excavation below the established trench grade shall be made good by the Contractor at this own cost by providing, placing and compacting suitable bedding material to the proper grade elevation.

Any damage resulting from testing of the sewers and appurtenances as specified in Section 7-13.3(A) shall be made good by the Contractor at his own cost.

All costs to determine the source or sources of leakage, and make good of all defective materials and/or workmanship of the sewer installations that failed to meet the requirements of the test method used as specified in Section 7-13.3(A) shall be borne by the Contractor.

If the pipe fails the test as specified in Section 7-13.3(A), all costs to locate and repair the failed sections and reset the pipe shall be borne by the Contractor.

SECTION 7-11 SIDE SEWERS

7-11.1 DESCRIPTION

This work shall consist of excavation, shoring, foundation preparation, bedding, jointing, backfilling, compacting and testing for the construction of side sewers.

All references to "side sewer" shall be construed to mean "side sewer and service drain".

A side sewer is considered to be that portion of a sewer line that will be constructed between a main sewer line and a residence or other buildings in which the disposal of sanitary waste originates. It does not include any of the internal piping or connecting appurtenances, the installation of which is controlled by a municipal code, ordinance or regulation.

The general requirements for construction of sewers in other sections of these Specifications shall apply for construction of side sewers unless they are inconsistent with any of the provisions of this particular section and the specifications shall apply alike to all side sewers on public rights-of-way and private property.

7-11.2 MATERIALS

Materials shall meet the requirements for the following Sections:

Concrete Sewer Pipe

PVC Sewer Pipe

Joints

All pipe shall be clearly marked with type, class, and/or thickness, as applicable. Lettering shall be legible and prominent in the conditions of handling and storage.

Approved jointing shall be flexible gasketing.

Flexible gasketing shall be constructed to include rubber, synthetic rubberlike and plastic materials specially manufactured for the joint, pipe size, and use intended and shall be furnished by the manufacturer of the pipe to be used.

7-13.3 CONSTRUCTION REQUIREMENTS

7-13.3.1 SIDE SEWER CONSTRUCTION

When a newly-constructed pipe line crosses or is in contact with an existing side sewer or drain, the Contractor shall be responsible for the protection of the existing side sewer from damage during the course of construction.

7-13.3.2 REMOVE AND RE-LAY EXISTING SIDE SEWER

The Contractor shall complete the work in accordance with Sections 7-11 and 7-13.1. All jointing shall be made in accordance with Section 7-13.3.3.D.

7-13.3.3 EXCAVATION, BEDDING AND BACKFILL

Excavation, bedding and backfilling for the new and existing side sewer shall conform to the requirements of Section 7-13, except that no backfill in excess of that required to hold the pipe in true alignment shall be placed prior to inspection.
7.18.3.3) PIPE LAYING AND JOINTING

7.18.3.3A) GENERAL
Pipe laying and jointing, except as hereunder provided, shall conform to the specifications of Section 7.17 and Section 21.36 of the Seattle Municipal Code.

7.18.3.3B) LINE AND GRADE
Pipes shall be laid to a line and grade between the main sewer tee branch or wye branch and the right-of-way margin, so as to be best serve the property relative to the following conditions, as may be directed by the Engineer:
(a) Where a vacant property is level with or lower than the street grade, the lowest elevation of the side sewer end pipe at the right-of-way margin shall be 1 foot higher than the elevation of the crown of the main sewer at the location of its tee or wye branch.
(b) Where an occupied property is higher than the street grade and where the slope will be greater than called for in (a) above, the maximum grade of the side sewer at the right-of-way margin shall be established by the Engineer so as to place the side sewer pipe at an elevation that will be below the invert of any proposed storm drain pipe, unless other conditions prevent it. Where a storm drain pipe exists, the clearance between the crown of one and the bottom of the other shall be not less than 6 inches. In either of the above described conditions, the end pipe of the side sewer, when placed at the right-of-way margin, shall be such as to make a backfill cover over the crown of the pipe of not less than 3'1/2 feet below the established street grade.
(c) Where an occupied property is level with or lower than the street grade, side sewer pipe shall be laid on a grade not less than 1/4 inch per linear foot wherever possible. If this is not possible, the Engineer may authorize the laying of pipe on a grade as little as 1/8 inch per linear foot at his option, and he shall inform the Contractor, prior to laying the side sewer pipe which has a grade less than 2 percent, that this is a "Grade Subsidize" permit for the work.

7.18.3.3C) PIPE LAYING
Pipes shall be laid with the belt end up grade. All pipe laying shall start and proceed up grade from the point of connection of the public sewers or other starting point.
Pipe shall be laid in a straight line as a uniform grade between the highest horizontal or vertical curvature achieved by deflecting pipe joints within the limits recommended by the manufacturer of the pipe used.

7.18.3.3D) JOINTING
Where it is necessary to break out an existing side sewer during construction due to grade conflict with a newly constructed pipeline, only new pipe will be used in reconnecting the side sewer. Where joints cannot be made due to damage or material or minimum wall thickness, the Contractor shall use a flexible gasketed coupling to make a continuous joint. Couplings shall be provided and manufactured by "Ronac," "Fordco," or "Smith-Blair," or approved equal.

7.18.3.3E) FITTINGS
All fittings shall be factory-produced and shall be designed for installation on the pipe to be used. Fittings shall be of the same quality and material as the pipe used, except when installing a PVC insert on existing pipe.

7.19) SEWER CLEANOUT

7.19.1) PROXIMITY TO WATER SUPPLY LINES
Clearance between side sewers and water mains shall be maintained as specified in Section 14.01(7.9).

7.19.2) EXCAVATION
Any unused openings to the side sewer shall be closed with a watertight plug fastened in place.

7.19.3) SEPTIC TANKS AND CESSPOOLS
No side sewer shall be constructed through or adjacent to an existing septic or septic tank. If the conditions prohibit any other location, the Contractor shall site the septic tank or septic tank in such means as the Engineer may direct, and by such permit as may be specified or agreed upon.

7.19.4) RESTORATION, FINISHING AND CLEANUP
The Contractor shall restore and/or replace all pavement, curbing, sidewalks, landscaping, or other disturbed surface improvements to their original condition in such manner as to meet the requirements of applicable sections. All surplus materials and temporary structures, as well as all excavations, shall be removed and the entire site of Contractor operations shall be left in neat and clean condition.

7.19.5) EXTENDING SIDE SEWERS INTO PRIVATE PROPERTY
Unless authorized by Section 21.16 of Seattle Municipal Code, the property owners will not be permitted to extend side sewers under property or connect future Dorris.

7.19.6) END PIPE MARKER
Location of side sewer shall be marked by the Contractor at the property line by a 2x4x4 wooden stake at 4 feet long buried in the ground a depth of 3 feet. The lower end and Section. Extremes care shall be exercised in the selection and marking of the locations of the pipe sections and fittings.

7.19.7) PIPE LAYING
Pipes shall be laid with the belt end up grade. All pipe laying shall start and proceed up grade from the point of connection of the public sewers or other starting point. All pipe shall be laid in a straight line as a uniform grade between the highest horizontal or vertical curvature achieved by deflecting pipe joints within the limits recommended by the manufacturer of the pipe used.

7.19.8) JOINTING
Where it is necessary to break out an existing side sewer during construction due to grade conflict with a newly constructed pipeline, only new pipe will be used in reconnecting the side sewer. Where joints cannot be made due to damage or material or minimum wall thickness, the Contractor shall use a flexible gasketed coupling to make a continuous joint. Couplings shall be provided and manufactured by "Ronac," "Fordco," or "Smith-Blair," or approved equal.

7.19.9) FITTINGS
All fittings shall be factory-produced and shall be designed for installation on the pipe to be used. Fittings shall be of the same quality and material as the pipe used, except when installing a PVC insert on existing pipe.

The unit contract price for "Pipe, (Sewage, (Material) Class), (Size)," and all the above bid items shall include all costs to provide and install the side sewers, include excavation for laying losses for each class, size, and type of pipe.

7.19.10) Trench excavation (excavated, not "Extra Excavation"), backfill, compaction, and inspection of native material, and removal and disposal of excess and/or unstable excavated native material, backfill, and compaction shall be performed in accordance with Section 7.17.

7.19.11) Removal and disposal of existing pipe encountered in required trench excavation and backfill, and temporary bypass of sewers, including pumping.

7.19.12) Payment for safety systems required for trench excavation work shall be in accordance with Section 7.17.

The unit contract price for "Tee, Test, Material, (Size)," shall include all costs for the work to furnish and install the tee as specified in Section 7.18.

The unit contract price for "Remove and Relead Side Sewer" shall include all costs for the work specified in Section 7.18.502.

Payment for Foundation Material will be in accordance with Section 7.17.

Payment for Trees will be in accordance with Section 7.17.
Payment for Bedding will be in accordance with Section 7.17.

Pipe installed and backfilled without visual inspection shall be excavated and exposed for inspection at the Contractor's expense.

SECTION 7.19) SEWER CLEANOUT

7.19.1) DESCRIPTION
The work shall consist of the construction of sanitary sewer cleanouts in accordance with the Drawings, Specifications, and Section 21.36 of the Seattle Municipal Code, Engineer.

7.19.2) MATERIALS
All materials incorporated into the work of sewer cleanouts shall meet the requirements of the various applicable sections and specifications.

7.19.3) CONSTRUCTION REQUIREMENTS
A cleanout shall be provided for each total change of 90 degrees or grade and in any case shall the spacing of cleanouts exceed 100 feet. No cleanout will be required at the connection of the side sewer to a sewer on the public sewers. A suitably located cleanout in the side sewer piping or plumbing may be installed as a cleanout for the side sewer. Cleanouts shall consist of a wye branch in the side sewer.

All cleanouts located in public rights of way be extended in grade.

The extension of cleanouts to grade on private property will be optional with the property owner. Where extended to grade, cleanouts shall be full side sewer diameter and shall be extended to a point not less than 6 inches nor more than 12 inches below the finished ground surface and shall be plugged with a removable stopper which will permit passage of air or water. When specified, the Contractor shall install an approved casing to provide access to the cleanout stopper. A 1/8" bend shall be used to deflect the side sewer upward as a cleanout where the nominal end of the side sewer lies above the last point of connection.
SEWER CLEANOUT

7-20.3 CONSTRUCTION REQUIREMENTS

7-20.3.1 ADJUSTMENT OF MANHOLES, CATCH BASINS AND SIMILAR STRUCTURES

The Engineer will establish approximate grade elevations for the tops of existing utility structures requiring adjustment. The final alignment and grade elevation shall be established from adjacent roadway surfaces, forms, or such other bases as may be provided by the Engineer.

Except where adjustment is to be made for ring extension the Contractor shall, as applicable in any particular case, remove the necessary pavement from around the casting, remove the casting and install or remove adjustment brick, or excavate from around the utility structure, remove such portion as may be necessary, and adjust the structure to meet the new grade elevation. Pavement removal shall be kept to the minimum amount necessary to facilitate the adjustment. Adjustment to finished grade elevation by whatever method is required shall result in a finished structure meeting the requirements for new construction as specified in Section 705.331F, and the overall distance between the top of the casting to the bottom of the adjustment brick shall not be more than 25 inches.

When ring extensions are specified the ring extension shall be opened securely to the existing frame. The surfaces of the frame and the ring extension that are to receive the epoxy shall be thoroughly cleaned prior to the application of the epoxy.

After the utility structure has been adjusted to grade, all voids around the structure shall be backfilled and compacted with selected native material or if ordered by the Engineer an imported material aggregate. Thereafter the casing shall be secured in place with a concrete or asphalt skim, as applicable, and the structure made watertight by painting with a mortar cement.

Adjustment to finish grade of water meter boxes encountered within the planting strip and sidewalk area shall be made and painted in accordance with the applicable portion of Section 7-17.

7-20.3.1(B) UNPAVED STREET GRADEWORK PROJECTS

Materials and costs for manhole castings for ring extensions of existing frames shall be Sylvan 918, Manhole Casting Epoxy, or equal as approved by the Engineer.

ADJUSTMENT OF NEW AND EXISTING UTILITY STRUCTURES TO FINISH GRADE

7-20.3 CEMENT CONCRETE PAVING PROJECTS

Manholes, catch basins, and similar structures shall be constructed or adjusted in the same manner as outlined in Section 7-20.3.3. When a final frame and cast iron frame be set after forms have been placed and checked, the final adjustment, extreme care shall be taken not to alter the position of the casing in any way.

7-20.3.1(D) ASPHALT CONCRETE PAVING PROJECTS

Utility structures requiring adjustment to match finish grade shall be adjusted prior to the start of the final paving operation. Top of existing utility structure shall be raised or lowered to match the finish grade. The Contractor shall temporarily shim each structure under adjustment immediately after adjustment to secure the casing at finish grade and to provide a safe and usable surface for traffic. The Contractor shall maintain the stalls and shall furnish, install, and maintain warning signs and barriers as specified in Section 11-27 Traffic Control. The Contractor shall remove the shims immediately prior to the start of the paving operation.

Inside surfaces of adjusted structures which are disturbed or damaged by the adjustment, as well as the new adjustment area, shall be plastered to give a smooth, watertight surface.

7-20.3.1(E) ASPHALT RESURFACING PROJECTS

Adjustment of manholes, catch basins, and similar structures on asphalt resurfacing projects shall meet the requirement of Section 7-20.3.1D. Unless adjustment rings for castings are provided for in the Project Manual or Flat Form, existing pavements shall be removed to the extent necessary to accommodate the new alignment.

7-20.3.1(F) STORM AND SANITARY SEWER OR WATER PROJECTS

Manholes, catch basins, gate valve structures and other similar type structures being constructed in conjunction with sewer or water projects on graded or paved areas shall be brought to finish grade as outlined previously in these Specifications. When grading elevations differ, the Contractor shall then make final adjustment of the matter box.

7-20.3.1(G) ESTABLISHMENT OF GRADE FOR TOP OF MANHOLE

The Owner will establish approximate grade for top of manhole, catch basins and similar structures for the various stages of construction. However, these grades shall be approximate only. The Owner assumes no responsibility in this regard, except when the final grade is to be determined specifically in the plans.

7-20.3.2 ADJUSTMENT OF INLETS

The final alignment and grade of cast iron frames for new and existing structures shall be established from the tops or form bases as specified in the plans or form bases as established from the finished grade of the roadway surface. Excavation necessary for burial of utility castings or structures to be adjusted shall be backfilled with native material, or if ordered by the Engineer, backfilled with an imported material aggregate and thoroughly compacted.

Where this method is to be used, the manhole castings shall be installed from 1/2 inch to 1 inch higher than the adjacent roadway surface so that the top of the casing will match finished roadway surface.

7-20.3.3 ADJUSTMENT OF MONUMENTS AND CAST IRON FRAME AND COVER

Monuments and monument castings shall be adjusted to grade in the same manner as for manholes.

7-20.3.4 ADJUSTMENT OF VALVE BOX CASTINGS

Adjustment of valve box castings shall be made in the same manner as for manholes.

7-20.3.5 FURNISHING CASTINGS

Where adjustment of existing utility structures is required and the drawings or the Engineer direct the existing castings be replaced, the Contractor shall furnish new castings of the type specified. Subjected castings shall be cleaned and delivered, as directed by the Engineer, to the utility which owns the casing.

7-20.3.6 ADJUST BY SHAPTING

Adjustment of existing utility casing and structure shall be by shapting when the casting remains the same and one of the following conditions exist:

(a) The utility casing will be raised and result in a total depth of the adjustment brick zone greater than the maximum allowable as indicated on the Standard Plans.

(b) The utility casing will be lowered by a depth in excess of the existing depth of the adjustment brick zone or in excess of 16 inches.

Work required shall include excavation, removal of the existing frame and cover, lifting the brick, cones section or flat slab of the utility structure. The Contractor shall aid or remove from the utility structure as appropriate, the vertical clear section having the least dimension, unless otherwise indicated on the Drawings, to allow the structure to be adjusted to the new grade elevation. The cone section or flat slab shall be reinstalled, adjusted, and the new frame and cover reinstalled. The surrounding shall be backfilled and compacted in accordance with the applicable portion of Section 7-17.

7-20.4 MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured as provided in Section 149.1, Measurement of Quantity unless otherwise provided by individual measurement paragraphs herein this Section.

7-20.5 PAYMENT

Compensation for the work necessary to complete the work described in Section 720 will be made at the unit contract prices bid for the bid items listed or referenced below:

7-20.5.1 Sylvan 918, Manhole Casting Epoxy, or equal as approved by the Engineer.

7-20.5.2 MATERIALS

Material used in the adjustment of existing utility structures shall be of the quality and materials specified in the section applicable to the item being adjusted. All materials used and the quantities of materials shall conform to the requirements of Section 9-05 and Standard Plan No. 231.

Shipping instructions and handling practices for manhole castings for ring extensions to existing frames shall be Sylvan 918, Manhole Casting Epoxy, or equal as approved by the Engineer.

Adjustment of new and existing utility structures to finish grade.
Erosion Control

DIVISION B
MISCELLANEOUS CONSTRUCTION

SECTION 8-01
EROSION CONTROL

8-01.1 DESCRIPTION

This work shall consist of preparing slopes, placing and compacting topsoil, seeding, fertilizing, and mulching all graded and disturbed areas in accordance with these specifications and as shown in the Drawings or as otherwise ordered by the Engineer.

8-01.2 MATERIALS

Materials shall meet the requirements of the following Sections:

- Topsoil, Type A, Type B, and Type C
- Seed
- Fertilizer
- Lime
- Mulch and Amendments
- Mulch
- Matting
- Shear Boards
- Water for Seeding

The terms "Topsoil" and "Topsoil" as used herein shall be synonymous.

8-01.3 CONSTRUCTION REQUIREMENTS

8-01.3(1) PREPARATION OF AREA

Areas to be cultivated shall be included in the Drawings or specified in the Project Manual. Areas shall be cultivated to a minimum depth of 6 inches and shall provide a reasonably firm and friable seed bed. Cultivation shall take place no sooner than 2 weeks prior to seeding. When topsoil, fertilizer, or seed conditions are required, they shall be incorporated into the top 6 inches of subgrade by rototilling.

Cultivation of the soil may be by rototilling, farm disc, harrow, or other suitable equipment approved by the Engineer. Cultivation shall be done at right angles to the natural flow of water on the slope unless otherwise ordered by the Engineer.

Prior to the cultivation, the Contractor shall remove all visible rocks, clogs and debris 3 inches or larger in any dimension. Any exposed tree roots in cut slopes shall be cut at the finished grade of the slope.

8-01.3(2) COMPACTION

In addition to the compaction that may be required elsewhere in the specifications, all areas to be seeded, including excavation slopes, shall be compacted and prepared unless otherwise specified or ordered by the Engineer. Unless seed is covered with soil during seed application, a closed polisher, crawler tractor, or similar equipment, approved by the Engineer, that forms longitudinal depressions at least 2 inches deep, shall be used for compaction and preparation of the surface to be seeded. The entire area shall be uniformly covered with longitudinal depressions parallel to the natural flow of water on the slope unless otherwise ordered by the Engineer. The soil shall be conditioned with sufficient water so that the longitudinal depressions will remain in the soil surface until completion of the seeding. The area shall be compacted within three weeks of the time of seeding. Prior to seeding, the finished grade of the soil shall be 1 inch below the top of all curbs, catch basins, walls, driveways, and other structures.

8-01.3(2) PREPARATION

All areas to be seeded shall meet the specified finish grades and shall be free of undesirable weed or plant growth and all clogs, rocks, and debris 3 inches or larger in any dimension.

8-01.3(2) TOPSOIL

Topsoil shall be evenly spread over the specified area to a depth shown in the Drawings or as otherwise ordered by the Engineer. After the topsoil has been spread, all large rocks, hard boulders, and debris 3 inches in diameter and larger, and litter shall be raked up, removed, and disposed of by the Contractor.

Topsoil shall not be placed where the ground or topsoil is frozen, excessively wet, or, in the opinion of the Engineer, in a condition detrimental to the work.

8-01.3(2) TOPSOIL TYPE B

When topsoil Type B is specified in the project, it shall be the Contractor’s responsibility to perform the excavation operations in such a manner that sufficient material is set aside to satisfy the needs of the project.

Upon completion of the work, topsoil Type B remaining and not required for use on the project shall be disposed of by the Contractor.

Should a shortage of topsoil B occur and the Contractor has wasted or otherwise disposed of topsoil material, the Contractor shall furnish topsoil Type A to complete the work.

8-01.3(2) VACANT

8-01.3(4) SEEDING AND FERTILIZING

8-01.3(4) SEEDING

The Contractor shall notify the Engineer not less than 48 hours in advance of any seeding operation and shall not begin the work until the dates ordered for seeding have been approved. Following the Engineer’s approval, seeding of the approved slopes shall begin immediately.

Seeding shall not be done during windy weather or when the ground is frozen, excessively wet, or otherwise unworkable. Unless otherwise specified in the Project Manual, seed of the seed mix specified shall be placed at the rate specified in Section 9-14.2. Seed may be sown by one of the following methods:

(a) An approved hydroseeder which utilizes water as the carrying agent and maintains continuous agitation through paddle blades. It shall have an operating capacity sufficient to agitate, suspend, and put into suspension the specified amount of seed and water or other material. Distribution and discharge tank shall be large enough to prevent spillage and shall be equipped with a set of hydraulic discharge nozzles which will provide a uniform distribution of the spray.

(b) An approved broadcast equipment with an adjustable disintegrating device capable of maintaining a constant, measured rate of material discharge that will ensure an even distribution of seed at the rate specified.

(c) Other methods.

Areas in which the above methods are impractical may be seeded by approved hand methods.
8-01.3 (d) TAKING PLACED EXCEPTED MATERIAL OR CLEAR PLASTIC COVERING

Immediately following the establishment of the finished grade, excelled matting shall be unraveled parallel to the flow of water. Seed and fertilizer shall be placed prior to the placing of excelled matting. Where more than one strip of matting is required to cover the given area, it shall overlap the adjacent mat a minimum of 4 inches. The excelled matting shall be placed adjacent to the preceding strip. The ends of both matting shall overlap at least 6 inches with the upgrade section on top. The upphase end of each excelled strip of matting shall be staked and buried in a trench deep enough with the soil firmly tamped against the mat. Three stakes per width of matting shall be placed at each overlap. Additional staking and grading of the discharge areas shall be large enough to prevent stoppage and shall be equipped with a set of hydraulic discharge survey routes which will provide a uniform distribution of the slurry.

"Areas not accessible by matting equipment shall be placed adjacent to the preceding strip. The ends of both matting shall overlap at least 6 inches with the upgrade section on top. The upphase end of each excelled strip of matting shall be staked and buried in a trench deep enough with the soil firmly tamped against the mat. Three stakes per width of matting shall be placed at each overlap. Additional staking and grading of the discharge areas shall be large enough to prevent stoppage and shall be equipped with a set of hydraulic discharge survey routes which will provide a uniform distribution of the slurry.

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Areas not accessible by matting equipment shall be placed adjacent to the preceding strip. The ends of both matting shall overlap at least 6 inches with the upgrade section on top. The upphase end of each excelled strip of matting shall be staked and buried in a trench deep enough with the soil firmly tamped against the mat. Three stakes per width of matting shall be placed at each overlap. Additional staking and grading of the discharge areas shall be large enough to prevent stoppage and shall be equipped with a set of hydraulic discharge survey routes which will provide a uniform distribution of the slurry.

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ROADSIDE PLANTING

Plants may be placed at spacings and locations shown on the planting plan. The planting and staking shall be the responsibility of the Contractor, subject to the approval of the Engineer. The Contractor shall place the plants starting from the primary side of planting beds, fenced line structures, and unmoved sidewalks unless otherwise specified in the Drawings. The Contractor shall plant the trees in locations shown on the Drawings as being considered appropriate, unless shown otherwise in this section. The Contractor may move the trees to clear any overhead lines and structures. Where location changes are required, the Contractor may move the trees, the following spacing from street improvement should be maintained:

(a) Minimum distance from street light poles: 30 feet
(b) Minimum distance from hydrant: 10 feet
(c) Minimum distance from curb: 1 1/2 feet

The distance given shall be measured from the centerline of the tree to the nearest face of the improvement.

8-02.300 PLANTING

8-02.300A GENERAL

Plants brought to the planting site shall be bare root, balled burlap, or in containers, depending on how specified in the planting schedule on the Drawings or in the Project Manual for the particular type of planting material. No plant material shall be planted until it has been inspected and approved for planting by the Engineer. Plants shall not be planted during freezing weather or when the ground is frozen. Plants shall not be planted during excessively wet conditions. Plants shall not be planted in areas that are below finished grade.

Unless otherwise approved by the Engineer, planting shall be performed during the period between November 15 and April 1.

8-02.300B TREES AND SHRUBS

Plants brought to the planting site in a bare root condition shall be protected at all times to prevent the roots from drying out during planting operations. Bare root plants shall set in the plant holes with roots spread out in a natural position. Planting soil shall then be worked in and around the roots, filling all voids. Firming or tamping of planting soil around roots shall be done in such a manner as to not damage the roots.

Drainage, conforming to the details shown on the Drawings, shall be provided for all trees and shrubs.

Plant material supplied in containers shall not be removed from the containers until the time of planting at the planting locations. Roots of bare root stock shall not be bushed, curled, trimmed, or unnecessarily pruned when placed in the planting hole. In their final position, the plants shall have the same relationship to the finished grade as when growing in the nursery or container.

The plant material shall be handled in such a manner that the root systems are kept covered and damp at all times. The root systems of container-grown stock shall be protected from the weather during the time of planting.

All bare root material shall have strings or cords cut and the burlap laid back from the top half of the bale after the plant is placed in its final position, and before the completion of backfill. The plants supplied in containers shall be removed from the containers in such a manner to prevent disturbances of the root system or material in which they were planted. The plants shall not be removed from the containers by rolling on the roots or branches.

Plants removed from their containers shall be planted without delay in the holes prepared and backfilled with good quality soil. Trees protected in wire baskets shall be placed in the holes with the wire baskets being removed from the tree set in place. The wire around the bare roots shall be cut on opposite sides at least one-half of the diameter of the root ball. Non-tapered containers shall have 2 vertical cuts in the depth of the container, made with a knife just before the root ball is removed. Plant material supplied in containers shall not be removed from the container until the time of planting at the planting locations.

Unless otherwise specified, planting holes for trees shall be dug 12 inches greater on all sides of the diameter of the root ball and natural spread for each side of the root ball. Holes for shrubs shall be 6 inches greater on all sides and under root and root ball shall be removed by hand methods.

When trees are to be planted in concrete sidewalks, pits shall be dug at locations shown on the Drawings. The pits shall have a minimum of 4 feet diameter and a depth of 3 feet.
8-02 ROADSIDE PLANTING

8-02-206C GROUND COVERS, PLANTS AND SEEDLINGS

Plants brought to the planting site in a bare root condition shall be kept moist at all times by a method approved by the Engineer.

Unless otherwise specified, planting holes for ground cover shall be 2 inches greater in all sides and under the roots or root ball.

Ground cover shall be removed from containers and planted so that the soil level of the plants is flush with the finished soil grade of the planting area. Roots of bare root stock shall not be forked, curled, twisted, or unusually bent when placed in the planting hole. Fertilizer shall be placed as required and the soil shall be compacted around the root system by firmly pressing against the plant. Water shall be added when directed by the Engineer.

Bare root plants which cannot be planted within 24 hours after arrival at the project site shall be removed from shipping containers and placed in temporary protective medium such as moist peat moss or sawdust.

Where settlement occurs, additional soil shall be placed over exposed roots on the same working day as planting as settlement occurs. In their final position, the plants shall have the same relationship to the finished grade as when growing in the nursery or container.

8-02-206F PLANTING TECHNIQUES

Plants shall be planted as early as feasible after planting is completed and before the development of new shoots. When planting, the root system shall be spread out as much as possible, compacted to the soil line, and watered to prevent drying out the planting area. Short-rooted plants shall be watered more frequently than long-rooted plants.

8-02-206H GROUND PLANTS

Plants shall be staked to support the plant mass until the plant has established strong enough to support itself independently. The staking shall be done in such a manner as to support the plant in an upright position and not to cause damage to the plant or its roots.

8-02-206J SEEDLINGS

Seeds shall be planted in such a manner as to provide for the rapid establishment of seedlings. The seeds shall be planted at the rate of 200 seeds per square foot.

8-02-206K SEEDLINGS

Plants shall be planted in the same manner as described for the planting of seedlings. The plants shall be staked to support the plant mass until the plant has established strong enough to support itself independently. The staking shall be done in such a manner as to support the plant in an upright position and not to cause damage to the plant or its roots.

8-02-206M PLANTING EARTH MOBILIZATION

Earthwork shall be removed from the site as early as feasible after planting is completed and before the development of new shoots. The earthwork shall be removed in such a manner as to provide for the rapid establishment of seedlings. The earthwork shall be removed at the rate of 200 cubic yards per acre.

8-02-206R PLANTING SOILS

Soil shall be removed from the site as early as feasible after planting is completed and before the development of new shoots. The soil shall be removed in such a manner as to provide for the rapid establishment of seedlings. The soil shall be removed at the rate of 200 cubic yards per acre.

8-02-206S PLANTING MACHINES

Planting machines shall be used for planting seedlings, suckers, and seedlings. The machines shall be equipped with the necessary attachments to provide for the rapid establishment of seedlings. The machines shall be used at the rate of 200 plants per hour.

8-02-3010 SOIL AMENDMENTS

Soil amendments shall be applied in such a manner as to provide for the rapid establishment of seedlings. The amendments shall be applied at the rate of 200 cubic yards per acre.

8-02-3011 PLANTING TECHNIQUES

Plants shall be planted in the same manner as described for the planting of seedlings. The plants shall be staked to support the plant mass until the plant has established strong enough to support itself independently. The staking shall be done in such a manner as to support the plant in an upright position and not to cause damage to the plant or its roots.

8-02-3013 PLANTING MACHINES

Planting machines shall be used for planting seedlings, suckers, and seedlings. The machines shall be equipped with the necessary attachments to provide for the rapid establishment of seedlings. The machines shall be used at the rate of 200 plants per hour.

8-02-3015 PLANTING SOILS

Soil shall be removed from the site as early as feasible after planting is completed and before the development of new shoots. The soil shall be removed in such a manner as to provide for the rapid establishment of seedlings. The soil shall be removed at the rate of 200 cubic yards per acre.

8-02-3016 PLANTING EARTH MOBILIZATION

Earthwork shall be removed from the site as early as feasible after planting is completed and before the development of new shoots. The earthwork shall be removed in such a manner as to provide for the rapid establishment of seedlings. The earthwork shall be removed at the rate of 200 cubic yards per acre.

8-02-3018 PLANTING SEEDLINGS

Seedlings shall be planted in the same manner as described for the planting of seedlings. The seedlings shall be staked to support the plant mass until the plant has established strong enough to support itself independently. The staking shall be done in such a manner as to support the plant in an upright position and not to cause damage to the plant or its roots.

8-02-3019 PLANTING SUCKERS

Suckers shall be planted in the same manner as described for the planting of seedlings. The suckers shall be staked to support the plant mass until the plant has established strong enough to support itself independently. The staking shall be done in such a manner as to support the plant in an upright position and not to cause damage to the plant or its roots.

8-02-3020 PLANTING EARTH MOBILIZATION

Earthwork shall be removed from the site as early as feasible after planting is completed and before the development of new shoots. The earthwork shall be removed in such a manner as to provide for the rapid establishment of seedlings. The earthwork shall be removed at the rate of 200 cubic yards per acre.

8-02-3021 PLANTING SOILS

Soil shall be removed from the site as early as feasible after planting is completed and before the development of new shoots. The soil shall be removed in such a manner as to provide for the rapid establishment of seedlings. The soil shall be removed at the rate of 200 cubic yards per acre.

8-02-3022 PLANTING MACHINES

Planting machines shall be used for planting seedlings, suckers, and seedlings. The machines shall be equipped with the necessary attachments to provide for the rapid establishment of seedlings. The machines shall be used at the rate of 200 plants per hour.

8-02-3023 PLANTING TECHNIQUES

Plants shall be planted in the same manner as described for the planting of seedlings. The plants shall be staked to support the plant mass until the plant has established strong enough to support itself independently. The staking shall be done in such a manner as to support the plant in an upright position and not to cause damage to the plant or its roots.

8-02-3024 PLANTING SEEDLINGS

Seedlings shall be planted in the same manner as described for the planting of seedlings. The seedlings shall be staked to support the plant mass until the plant has established strong enough to support itself independently. The staking shall be done in such a manner as to support the plant in an upright position and not to cause damage to the plant or its roots.

8-02-3025 PLANTING SUCKERS

Suckers shall be planted in the same manner as described for the planting of seedlings. The suckers shall be staked to support the plant mass until the plant has established strong enough to support itself independently. The staking shall be done in such a manner as to support the plant in an upright position and not to cause damage to the plant or its roots.
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large clovers, rocks, debris, and litter over 1 inch in any dimension. Such clovers, rocks, debris, and litter shall be removed by the methods specified.

(a) The area shall then be compacted by rolling in two directions at right angles to the first rolling. The roller shall be of a standard, lightweight, smooth-roller type. The grade after compaction shall be such that the root zone of the soil will be flush with the final grade.

(b) The area shall be raked to make it smooth and level. Finesand shall be added when necessary, or designated by the Engineer.

(c) Immediately prior to placement of sod, a 10-20-20 fertilizer shall be raked into the soil at a rate of 12 pounds per 1,000 square feet. The fertilizer shall be applied by approved methods and chemicals. Application in one direction will be sufficient.

(d) The sod strips shall be placed within 48 hours after being cut. Soil shall be maintained by maintaining prior to the laying of the sod. Soil shall be placed without weeds, and the base and drainage improved. The root crown shall be set to the grade of the sidewalk or curb. Butt joints shall be staggered and lightly tamped. On sloped areas, sod shall be laid with the long dimension across the slope, parallel to the top of the slope.

(e) Following placement the sod shall be rolled with a smooth, water-filled tyro roller. After rolling, the soil shall be lightly watered by sprinkling. Lawns areas shall be uniformly level.

(f) When directed by the Engineer, the Contractor shall apply surface dressing slow-release form of nitrogen fertilizer derived from urea-formaldehyde at the rate of 55 pounds per 100 square feet.

(g) The Contractor shall commence watering immediately as specified in Section 8-03.21(1). Watering and fertilizing shall be the Contractor’s responsibility during the 120 days from construction. Watering shall be scheduled to prevent drying of joints between the sod strips.

8-03.21(1) LAWN ESTABLISHMENT

Lawn establishment shall consist of providing adequate and proper conditions for public and private lawns areas included within the limits of the project. The lawn establishment period shall begin immediately after the lawns have been planted and accepted by writing in the Engineer and shall extend through a minimum period of 180 days or until the Actual Completion Date whichever comes first.

During the establishment period the Contractor shall provide adequate and proper care to ensure the continued health of the turf. Adequate and proper care shall include the labor, materials, and equipment necessary to keep the planted areas in a primate condition including, but not limited to, mowing; trimming; removal of grass clippings, litter and debris; irrigation; fertilizer; and fungicide applications; weed control; repair and reseeding damaged areas; and maintenance of proper soil moisture and soil drainage systems installed as part of the work.

As a condition of the law, a part of the law, the Contractor shall accomplish the following minimum requirement:

(a) Mowing and trimming shall be done as often as conditions dictate. Maximum height of lawn shall not exceed 2 inches. The final cutting height shall be 1 1/2 inches with all cuttings removed.

(b) Adequate and proper care shall be provided to the turf. Adequate and proper care shall include the labor, materials, and equipment necessary to keep the planted areas in a primate condition including, but not limited to, mowing; trimming; removal of grass clippings, litter and debris; irrigation; fertilizer; and fungicide applications; weed control; repair and reseeding damaged areas; and maintenance of proper soil moisture and soil drainage systems installed as part of the work.

(c) The Contractor shall furnish all necessary equipment and labor necessary to complete the work as specified in the Project Manual.

8-03.21(2) GRID BLOCKS

The Contractor shall install grid blocks of the type specified in areas shown on the Drawings or designated by the Engineer. The grid blocks shall be laid in accordance with the specified average depth of 6 inches. Compaction shall be to a 95% maximum. The grid blocks shall be laid flat and rolled on the top of the crushed rock base. The grid blocks shall then be placed on the sand bed and each block shall be level with each adjacent block. The top of the blocks shall be laid flat with the top of the adjacent sidewalks and curbs. After the blocks have been installed and leveled, Planter Trench D and E shall be spread and worked into all voids. The area receiving grid blocks shall then be seeded with Perennial Ryegrass or similar grass seed and the new grass shall be kept well watered by hand or by approved machine, use of backhoe will not be permitted. The Contractor shall exercise extra care to make sure that the newly seeded area is placed within the drip line of the existing trees. The root zone of the new grass shall be watered and fertilized with the following schedule in such a manner as to ensure even water distribution and root system development. No additional materials shall be placed on the surface of the grid blocks.

(a) Mowing and trimming shall be done as often as conditions dictate. Maximum height of lawn shall not exceed 2 inches. The final cutting height shall be 1 1/2 inches with all cuttings removed.

(b) Adequate and proper care shall be provided to the turf. Adequate and proper care shall include the labor, materials, and equipment necessary to keep the planted areas in a primate condition including, but not limited to, mowing; trimming; removal of grass clippings, litter and debris; irrigation; fertilizer; and fungicide applications; weed control; repair and reseeding damaged areas; and maintenance of proper soil moisture and soil drainage systems installed as part of the work.

(c) The Contractor shall furnish all necessary equipment and labor necessary to complete the work as specified in the Project Manual.

8-03.21(3) CEILAR EDGING

The Contractor shall install 2 inch by 4 inch cedar edging for each curbed area as required and indicated on the Drawings. Edging shall be installed with the top of the item is level with the top of the existing curbs or the top of the existing sidewalks and curbs. Edging shall be secured with 2 inch by 2 inch by 1 1/2 inch cedar stakes in

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accordance with the detail shown on the Drawings, driven to the base of the items and attached to the cedar edging with eight penny galvanized common nails.

8-03.21(19) BOLLIARDS

The Contractor shall install bollards of the type specified on the Drawings. Bollards shall be installed where indicated on the Drawings or designated by the Engineer and in accordance with the requirements specified in the Project Manual and shown on the Drawings.

Bollards shall be installed true to line and grade and set in a plumb position from all angles.

The Contractor shall furnish one package with each removable bollard.

8-03.21(19B) WOOD BOLLARDS

The tops of concrete footings for wood bollards shall be formed and become level with surrounding surfaces.

8-03.21(19C) CONCRETE BOLLARDS

The Contractor shall construct reinforced concrete bollards where shown on the Drawings. Bollards shall be of the size and shape indicated in the Drawings.

Bollards shall be set in excavated holes true to line and grade in a plum position with backfill thoroughly tamped around them.

8-03.22(1) BENCHES

The Contractor shall install benches of the type indicated on the Drawings and specified in the Project Manual. Benches shall be located where indicated on the Drawings or designated by the Engineer. Final location of benches shall be verified by the Engineer prior to placement.

8-03.22(1) TREE GRATES

The Contractor shall install tree grates in locations indicated on the Drawings or designated by the Engineer. Tree grates shall meet the requirements of Section 9-14.14 and Standard Plan No. 130. Tree grates shall be installed in a line parallel to the curb.

When specified on the Drawings or the Project Manual, a concrete curb shall be constructed around each tree pit and separated from the surrounding sidewalk by a through gravel base. The collars shall be reinforced with two number four reinforcing bars on all sides and a 1/4 inch x 1/4 inch x 5/8 inch angle-iron frame molded and welded at the corners and in the center. Concrete collar with welded concrete pipe. The angle-iron frame shall be 5 1/2 inch x 5 1/2 inch and shall be used on all sides to receive the 4 inch x 4 inch tree grate.

8-03.22(2) RELOCATE TREE

The Contractor shall perform the work in accordance with good engineering practice. The tree shall be relocated while in a dormant state (after November 15th or first frost and before April 1st).

8-03.22(3) CEDAR EDGING

The Contractor shall install 2 inch by 4 inch cedar edging for each curbed area as required and indicated on the Drawings. Edging shall be installed with the top of the item is level with the top of the existing curbs or the top of the existing sidewalks and curbs. Edging shall be secured with 2 inch by 2 inch by 1 1/2 inch cedar stakes in

8-03.23(1) TREE PRUNING PROCEDURE

No construction work around trees maintained by the Seattle Engineering Department will be permitted without prior permission from the Tree Arboretum’s office. Call 984-0642 to apply for a permit to work around the tree root structure (minimum of 72 hours notice must be given prior to actual work).

However, under no circumstances will root structure 2’ or greater be cut. All tree roots 2’ or greater shall be hauled under. Roots must be cut cleanly. No ripping or tearing of the root structure will be allowed. See Section 147-16(2) regarding restoration of plant damage and soil stockpiling adjacent to trees.

8-03.23(2) MEASUREMENT

Bid items of work completed pursuant to Contract Document will be measured as indicated in Section 8-01.31(1). Measurement of Quantities unless otherwise provided for by individual measurement paragraphs of this section. The pay quantities for plant materials will be determined by counts of the number of satisfactory plants in each category accepted by the Engineer.

Seeded lawns and seedlings will be measured by ground slope measurement in square feet of actual lawn completed, established, and accepted.

Measurement for "Planting Sel", "Type", and "Muck, Bark" shall bearcy cubic yards per solid cubic yard and cubic yard shall be based on cubic yardage at the point of delivery. The Contractor shall notify the Engineer at least 24 hours prior to the material delivery to ensure the Engineer’s presence for measurement at the time of delivery. No payment will be made for material deliveries not witnessed by the Engineer.

8-03.24 PAYMENT

Compensation for the cost necessary to complete the work described in Section 8-04 will be made at the unit contract price bid only for the items listed or referenced below:

(1) "Tree, Type, Sizes," per each.
(2) "Scrub, (Type), Sizes," per each.
(3) "Grass, (Type), Sizes," per each.
(4) "Landscape Establishment, Minimum Bid $____, per lamp arm.
(5) "Planting Sel, Type," per cubic yard.
(6) "Muck, Type," per cubic yard.
(7) "Paver Block, Sizes," per each.
(8) "Lawn Edging, Materials," per linear foot.

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The unit contract price for "Boulevard (Type)" shall include all costs to furnish and install the boulevard of the type and size specified.

The contract price for "Bench" shall include all costs for the work required to furnish and install bench of the type and size specified.

The unit contract price for "Tree Grate" shall include all costs for the work required to furnish and install tree guard specified.

The unit contract price for "Boulevard Tree," "Boulevard Tree Guard Cover," and "Tree Grate" shall include all costs for the work required to remove, protect, store and replace the tree, shrub, or ground cover.

Payment for clearing and grubbing shall be in accordance with Section 240.5.

Payment for establishing the subgrade of planting areas prior to actual planting by excavation or embankment construction shall be in accordance with Section 240.5.

Payment for fill material of the type specified shall be the cubic yard in accordance with Section 411.5.

The unit contract price for "Seedling Lawn Installation," and "sodding" shall include all costs for the work required to prepare the area, plant sod, and the lawn, and establish lawn areas as specified in Section 402.31(b) and 402.31.5.

No additional payment will be made for the work required to remove, reseed, reestablish, or otherwise alter the area when directed by the Engineer to meet the requirements of Section 402.31.5.

When the bid item "Seedling Lawn Installation," is included in the Bid Form, sodding in lieu of seeding for lawn installation, in accordance with Section 402.31.6, shall be paid at the unit contract price for "Seedling Lawn Installation" and no additional payment will be made.

Any incidental work required to complete the seeded lawn installation or sod installation, as specified herein but not specifically mentioned, shall be incidental to, and all costs therefor shall be included in the unit contract price for the turf item.

Any incidental work required to complete the roadside planting specified herein, but not specifically mentioned in these Specifications, shall be incidental to the roadside planting, and all costs therefore shall be included in the unit contract price of the bid items.

SECTION 8-03.3 IRIGATION SYSTEM

8-03.3.1 DESCRIPTION

This work shall consist of furnishing and installing a sprinkler system in accordance with the Specifications and the details shown on the Drawings and Standard Plans.

The Contractor or subcontractor shall be a licensed lawn sprinkler contractor or irrigation system contractor who has performed work similar to that shown in the City's work and is in compliance with all applicable laws and ordinances.

The materials shall be furnished and installed in accordance with the specifications and the standard plans.

8-03.3.2 MATERIALS

The materials shall be furnished and installed in accordance with the specifications and the standard plans.

8-03.3.4 PIPING

All lines shall be minimum of 18 inches below finished grade. The piping shall be supported from the bottom of the pipe or as shown in the Drawings. All live mains to be constructed under existing pavement shall be placed in concrete jackets under pavement unless otherwise noted in the Drawings. All PVC pipe placed under pavement shall be placed in concrete. The conduit shall extend a minimum of 1 foot beyond the edge of the pavement. All jackings operations shall be performed in accordance with the approved jacking plan. Where possible, mains and laterals or section piping shall be placed in the same trench. All lines shall be placed a minimum of 3 feet from the face of concrete sidewalks, curbs, guardrail, walls, fences, or traffic barriers.

All lines shall be capped and their locations marked with metal stakes and plaque to provide reference for future drawings upon completion of the work.

8-03.3.5 JOINTING

During construction, pipe ends shall be plugged or capped to prevent entry of dirt, rocks, or other debris.

All galvanized steel pipe shall have sound, clean cut, standard pipe threads well fitted. All pipe shall be reamed to the full diameter and holes chased before assembly. Threaded joints shall be constructed using either a nonhardening, non-setting multipurpose sealant orrivets applied or paste as recommended by the pipe manufacturer. All threaded joints shall be made tight with wrenches without the use of handle extensions. Joints that leak shall be cleaned and remade with new material. Caulking or thread cement to make joints tight will not be permitted.

All PVC, pipe, couplings, and fittings shall be hand and installed in accordance with the manufacturer's recommendation. The outside of the PVC pipe shall be chamfered to a minimum of 1/16 inch by approximately 22 degrees. Pipe and fittings shall be joined by solvent weld.

Solvents used must penetrate the surface of both pipe and fitting which will result in complete joints at the joint. Use solvent and cement only as recommended by the pipe manufacturer.

On plastic to metal connections, work the metal connection first. Use a nonhardening compound on threaded connections. Connections between metal and plastic are to be threaded with standard female PVC adapters with threaded schedule 80 PVC pipe only.

Due to the nature of the work, the Contractor shall exercise care in handling, loading, unloading and storing to avoid tampering with, distorting, or otherwise damaging the pipe or fittings. The Contractor shall be responsible for any damage done to the pipe or fittings while in transit, in storage, or otherwise.
Cement Concrete Curbs, Curb and Gutter

8-03.3(12) AS HUILT DRAWINGS AND SYSTEM ORIENTATION

Upon completion of the work, the Contractor shall submit complete drawings showing the location of all curbs, gutters, or other drawings necessary for the Engineer to prepare correct drawings to show the work as constructed. These drawings shall be shown conforming in size to the provisions of Section 106.3.

The Contractor shall conduct a training and orientation session covering the operation, adjustment, and maintenance of the irrigation system. The as-built drawings shall be reviewed and all features explained. At this session, the Contractor shall provide the Engineer with parts lists and service manuals for all equipment. The Contractor shall notify the Engineer in writing two weeks prior to the training and orientation sessions and time and date of the session shall be subject to approval of the Engineer.

8-03.3(13) SYSTEM OPERATION

The irrigation system shall be completely installed, tested, and automatically operated as per a schedule in a unit area except as otherwise specified in the Drawings or approved by the Engineer. The Contractor shall be fully responsible for all maintenance, repair, testing, inspecting, and automatic operation of the entire system until the final work is completed as per the final specifications in Section 106.11.

This responsibility shall include, but not be limited to, diagnosing the system prior to winterizing and at the reasonable times in the spring and at other times as ordered by the Engineer.

For the life of the contract, the Contractor shall be responsible for having automatic inspections and tests performed on all cross connection control devices as required and specified by the Department of Social and Health Services, Health Services.

8-04.3 MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be accepted, provided in Section 106.1 of Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein Section 8.

8-05.3 PAYMENT

Compensation for the cost necessary to complete the work described in Section 8-05 will be made at the unit contract prices bid only for the pay items listed or referenced below:

1. "Irrigation System, Automatic," per h.m. ft. or
2. "Irrigation System, Manual," per h.m. ft.
3. "House Base Assembly," per each
4. "Valve Box, Plastic," per each.

The unit price for "Irrigation System, Automatic" shall include all costs for the work required to furnish, install, and test a completely functional system and including excavation, backfill, control, valves, drives, conduit, wiring and piping.

The unit contract price for "House Base Assembly," shall include all costs for the work required to furnish and install the type and size of the specified type.

The unit contract price for "Valve Box, Plastic," shall include all costs for the work required to furnish and install the type and size specified.

8-04.3(1) GENERAL

8-04.3(1A) ERECTING FORMS

Before erecting forms, the subsurface shall be properly compacted to the specified compaction value.

Forms, wood or steel, shall be staked securely in place, true to line, and grade.

Sufficient support shall be given to the form to prevent movement in any direction, resulting in the loss of the concrete or the concrete placement. Forms of Type 108 and 1108C shall not be set until the subsurface has been compacted within 1 inch of the established grade. Forms shall not be left in place longer than is needed to set the concrete. The top of the form shall not depart from grade more than 1/16 inch when checked with a 3-foot straightedge. The alignment shall not vary more than 1/16 inch in 10 feet. Immediately prior to placing concrete, forms shall be carefully inspected for proper grouting, alignment and rigid construction. Adjustments and repairs as needed shall be completed before placing concrete.

8-05.5 CONSTRUCTION REQUIREMENTS

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8.04 CEMENT CONCRETE CURB, CEMENT CURB AND GUTTER

8.04.3(1) PLACING CONCRETE
The subgrade shall be properly compacted and brought to specified grade before placing concrete. The subgrade shall be thoroughly compacted immediately prior to the placement of concrete. Concrete shall be spaded and tamped thoroughly into the forms to provide a dense, compacted concrete free of air pockets. The exposed surfaces shall be floated, finished and troweled longitudinally with a fiber hair brush approved by the Engineer.

The rate of concrete placement shall not exceed the rate at which the various placing and finishing operations can be performed in accordance with those specifications.

If concrete is to be placed by the extruded method, the Contractor shall demonstrate to the satisfaction of the Engineer that the machine is capable of placing a dense, uniformly compacted concrete to exact section, line and grade.

8.04.3(1) DOWELS
Dowels shall be placed in the pavement slab as detailed on Standard Plan No. 413.

The dowel bars shall be set while the concrete is still plastic enough to allow the dowels to be fully inserted.

8.04.3(1) STRIPPING FORMS AND FINISHING
The form face of the curb shall be stripped at such time in the early curing as will enable inspection and correction of all irregularities that appear. Forms may be removed on the day following the pour if the concrete has set sufficient to retain its true shape and removed causes no chipping or splitting. When forms are removed before the expiration of the curing period, the edges of the concrete shall be protected with moist cort, or sprayed with curing compound. The face of the curb shall be troweled with a tool cut to the exact section of the curb and at the same time diagonally with the edge, grade and alignment of the curb. The exposed surface of the curb shall be brushed with a fiber hair brush.

8.04.3(1) CURING
White pigment or transparent curing compounds shall be applied to all exposed surfaces immediately after finishing. Transparent curing compounds shall contain a color dye of sufficient strength to render the film distinctly visible on the concrete for a minimum of 4 hours after application. White pigment curing cementing cannot be used. The curing period for any form is removed, a coat of curing compound shall be applied immediately to the exposed surface. The curing compound shall be applied in sufficient quantity to obscure the natural color of the concrete. Additional coats shall be applied if the Engineer determines that the coverage is not adequate.

The concrete shall be cured for the minimum period of time to set forth in Section 6.04.3.1(2) and 6.04.3.1(3).

8.04.3(1) EXPANSION AND DUMMY JOINTS
Joists shall be constructed in the manner shown on Standard Plan No. 411 and at locations to match joints in concrete pavement. In no case shall joints exceed 15 feet center to center. They shall be cleaned and edged as shown on the Drawings and as further specified in Section 5.46. All expansion and construction joints shall extend entirely through the curb section above the pavement surface. Joint filler in the curb shall be normal to the pavement and in flat bed contact with pavement joint filler. Joints shall match existing transverse joints or cracks in existing pavement.

8.04.3(1) FINISHED WORK
The work shall be performed in a manner which results in a curb or curb and gutter constructed to specified line and grade, unobtrusive in appearance and structurally sound. Curb forms with unusually bulges, ridges, low spots in the gutter or other defects shall be removed and replaced by the Contractor if the Engineer considers them to be irremovable. When checked with a 1/16" straightedge, grade shall not deviate more than 1/8 inch, and alignment shall not vary more than 1/4 inch.

8.04.3(2) CURB BLOCK-OUTS AT CURB RAMPS
At intersections where new concrete curb to be constructed and curb ramps are to be provided under the contract, the Contractor shall block out the new curb at the locations of the new curb ramps. The locations and limits of the depressed curb when other than shown on Standard Plan Nos. 425 and 422 shall be designated by the Engineer.

8.04.3(3) TYPE 410A CURB
Separate curb shall be constructed as shown on the Standard Plan No. 420.

8.04.3(4) TYPE 410B CURB AND GUTTER
Curb and gutter shall be constructed as shown on Standard Plan No. 410 as a compacted subgrade prepared in accordance with applicable subgrade specifications for concrete pavement in Section 5.46. The placing, consolidating, jointing, finishing and curing of the concrete shall comply with the requirements for concrete subgrade as specified in Section 8.04.3(3) except that the top of the gutter shall be troweled and 1/4" brushed parallel to the curb.

Curb and gutter may be constructed by the extruded method. The curb and gutter shall conform to the curb and gutter as specified in the Project Manual. When extruded curb and gutter is called for in the Project Manual, it shall be used in a curb, or the curb may be extruded upon the gutter section in which case steel dowels shall be provided as specified in Section 8.04.3(2) or 8.04.3(3).

8.04.3(5) TYPE 410C CURB

8.04.3(6) EXTRUDED CURB

8.04.3(6) MOUNTABLE CURB
Mountable curb for traffic circles shall be constructed with the alignment and configuration as shown on Standard Plan No. 413.

8.04.4 MEASUREMENT
Bid items of work completed pursuant to Contract Documents will be measured as provided in Section 10.1.1 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein. The measurement for curb, or curb and gutter of the type specified will be by the linear feet along the front face of the curb for the length constructed, including that portion installed through driveways and curb ramps.

Where curb ramps or driveways are "cut in" areas of existing improvements where adjacent curb will remain, no measurement for curb will be made.

8.04.5 PAYMENT
Compensation for the cost necessary to complete the work described in Section 8.04 will be made at the unit contract prices listed only for the pay items listed or referenced below:

8.04.5.1 Curb, Cement Curbstone, per linear foot.
8.04.5.2 Curb, Cement Concrete, Mountable, per linear foot.
8.04.5.3 Curb and Gutter, Cement Concrete, per linear foot.

The unit contract price for "Curb, Cement Concrete", "Curb and Gutter, Cement Concrete", and "Curb, Cement Concrete, Mountable" shall include all costs for the work required to construct the curb or curb and gutter of the size and type specified, including trenching and grading and excavating grounds for driveways, when this work is required.

8.04.5.4 Curb and Gutter shall be provided at the prices at which it is placed. That portion of the pavement slab underneath the curb shall be paid for as concrete pavement in accordance with Section 5.46.5.

8.04.5.5 CEMENT CONCRETE CURB ON EXISTING PAVEMENT
Cement concrete curb constructed on existing pavement shall be placed at the existing pavement location where indicated on the Drawings or designated by the Engineer, as shown on Standard Plan Nos. 410, 411 and 412.

The curb and gutter shall be placed at 10" long, and it is placed in rigid pavement of concrete.

Holes shall be grouted with either type and finished with a concrete wall. Holes shall be left open to allow for water from water, particles of concrete and other debris from the pavement to drain through the hole. Grout shall be applied around the perimeter of the curb and gutter to the existing pavement.

8.04.5.6 MATERIALS
Materials shall meet the requirements of the following Sections:

8.04.5.6.1 Aggregate:
8.04.5.6.2 Fine Aggregate:
8.04.5.6.3 Water: 28 psi or minimum 1/1-2% aggregate for cement concrete shall meet the requirements of Grading for Fine Aggregate as specified in Section 8.03.1(1). Transparent curing compound as specified in Section 8.03.2 shall be used. Air-entrained concrete shall be used as specified in Section 8.03.2.6 except that air content shall be a minimum of 3 percent and a maximum of 6 percent by volume.

Tie bars shall be deformed steel bars meeting the requirements of Section 5.07. The bars shall be free from rust, loose mill scale, dirt, grease or other defects affecting the strength or bond with the concrete.

8.06.3 CONSTRUCTION REQUIREMENTS
8.06.3(1) PREPARATION OF PAVEMENT SURFACE
8.06.3(1) A EXTRUDED ASPHALT CONCRETE CURB
The asphalt pavement shall be dry and cleaned of loose or deleterious material. Immediately after cleaning the pavement surface, a tack coat of cutback or emulsified asphalt shall be applied to the asphalt base area of the pavement at the rate of 0.8 to 0.9 gallons per 15 linear feet of curb area, depending on the width of curb and age of pavement. Care shall be taken to prevent applying too wide or too heavy a tack coat.

8.06.3(1) B EXTRUDED CEMENT CONCRETE CURB
The pavement shall be dry and cleaned of loose or deleterious materials prior to curb placement. At the Contractor's option, concrete curbs shall be anchored to the existing pavement either by placing steel or tie bars one foot on each side of every joint, or by using an adhesive.

8.06.3(2) VACANT
8.06.3(2) EQUIPMENT FOR LAYING CURB
8.06.3(2) A EXTRUDED ASPHALT CURB
The machine for laying the curb shall be of the self-propelled type equipped with a material hopper, distributing screw, and adjustable curb turning devices capable of laying and compacting the hot-mix asphalt concrete to the line, grades and cross section shown in Standard Plan No. 412, and an in an even homogenous manner free of honeycombs.

8.06.3(2) B EXTRUDED CEMENT CONCRETE CURB
Extruded cement concrete curb shall be placed, shaped and compacted true to file and grade with an approved extrusion machine. The extrusion machine shall be capable of shaping and thoroughly compacting the concrete to the required cross section.

8.06.3(2) C MIXING AND PLACING
8.06.3(2) A THE BARS FOR CEMENT CONCRETE CURB
At the Contractor's option concrete curbs shall be anchored to the existing pavement either by placing steel or tie bars one foot on each side of every joint, or by using an adhesive.

Tie bars shall meet the dimensions shown on Standard Plan No. 412. Th adhesive shall meet the requirements of Section 8.26 for Type II epoxy resin.
Extruded Asphalt Concrete

8-06-3(4R) Extruded asphalt concrete curb

The asphalt concrete mixture shall be homogeneously mixed in a continuous operation to avoid segregation and water absorption. The mixture shall be compacted at temperatures of at least 290 degrees F. Each hopper load of the asphalt concrete mix shall be run through the curb laying machine, properly sized and compacted to form and properly compact the asphalt concrete curb.

8-06-3(4C) Extruded Cement Concrete Curb

The cement concrete mixture shall be homogeneously mixed to uniform with Section 545 when delivered to the hopper of the curb machine. Each hopper load of the cement concrete mix shall be run through the curb laying machine, properly sized to form and properly compact the cement concrete curb.

8-06-3(2) Joints

8-06-3(2A) Extruded Asphalt Concrete Curb

Under conditions warranted, asphalt cement concrete construction at the specified temperature shall be continuous on one section or to eliminate curb joints. However, where conditions are such that this is not possible, the joints between successive day work shall be carefully made in such a manner as to ensure a continuous bond between the old and new sections of the curb. Contact surface of the previously constructed curb shall be painted with a uniform coat of hot bituminous material immediately prior to placing the fresh asphalt concrete curb material against the old joint.

8-06-3(2B) Extruded Cement Concrete Curb

Joints in the extruded cement concrete curb shall be spaced at 150 linear feet or shall match existing transverse joints or cracks in existing pavements. Joints shall be cut vertically and in a depth of 5 inches as shown on Standard Plan No. 412. Joints shall not exceed 12 inches in any one section. Application shall be as specified in Section 543.3

8-06-3(6) CURING - Extruded Concrete Curb

Temporary liquid curing compound shall be used. Sufficient pigment shall be present so that the sprayed compound will be easily visible. Application shall be as specified in Section 543.3

8-06-3(7) BARRIACADES AND SAFEGUARDS

8-06-3(7A) Extruded Asphalt Concrete Curb

The newly placed curb shall be protected from traffic by barricades or other suitable means until the fresh asphalt concrete mixture has been displaced and the mixture has attained its proper degree of hardness.

8-06-3(7B) Extruded Cement Concrete Curb

The newly placed curb shall be protected from traffic by barricade or other suitable means until the fresh cement concrete mixture has been displaced and the mixture has attained its proper degree of hardness.

8-06-3(8A) Extruded Asphalt Concrete Curb

Section 545 shall apply where specific details are required and where such provisions have not been included in Section 8-06.

8-06-3(8B) Extruded Cement Concrete Curb

Section 545 shall apply where specific details are required and where such provisions have not been included in Section 8-06.

8-06-3(8C) SUBSTITUTION

The Contractor may substitute extruded cement concrete curb for asphalt concrete curb upon receiving written permission from the Engineer. There will be no charge in unit contract price if such substitution is allowed.

8-06-4 MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured as provided in Section 1001 Measurement of Quantities unless otherwise provided for in individual measurement paragraphs herein. The extruded concrete curb will be measured by the linear foot along the front face of the curb and returns.

8-06-5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 605 will be made at the unit contract price bid only for the pay items listed or referenced below:

(1) "Extruded Curb, Material," per linear foot.

The unit contract price for "Extruded Curb, Material" shall include all costs for the work required to furnish and install extruded concrete curb as specified.

8-07 SECTION PRECAST TRAFFIC CURB AND BLOCK TRAFFIC CURB

8-07-1 DESCRIPTION

This work shall consist of furnishing and installing precast cement concrete traffic curb and precast cement concrete block traffic curb in sections and type specified in the drawings, and in accordance with those specifications and Standard Plan No. 453 and 454. Traffic curb shall be installed in the locations indicated in the drawings or as designated by the Engineer. The curb face shall be painted with approved traffic paint, either yellow or white, as specified on the drawings or designated by the Engineer.

8-07-2 MATERIALS

Materials shall meet the requirements of the following Sections:

<table>
<thead>
<tr>
<th>Material</th>
<th>Standard No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paint Formula</td>
<td>929</td>
</tr>
<tr>
<td>Precast Traffic Curb</td>
<td>918</td>
</tr>
<tr>
<td>Block Traffic Curb</td>
<td>918</td>
</tr>
<tr>
<td>Water Resistant Compound</td>
<td>918</td>
</tr>
<tr>
<td>Sodium Metasilicate</td>
<td>918</td>
</tr>
</tbody>
</table>

8-07-3 INSTALLATION REQUIREMENTS

8-07-3(1) INSTALLING CURBS

The curb shall be fully bedded for its entire length and breadth on a mortar bed composed of one part portland cement and two parts of approximately 1:2 by volume of crushed gravel or concrete. The finished grout bed of the curb shall be entirely filled with the mortar. The entire curb shall be cleaned from the pavement surface by washing.

8-07-3(2) FURTHER PROVISIONS

8-08 PLASTIC TRAFFIC BUTTONS AND LANE MARKERS

8-08-1 DESCRIPTION

This work shall consist of furnishing and installing plastic traffic buttons and lane markers with an epoxy adhesive in accordance with these Specifications and Standard Plan Nos. 708 and 710.

8-08-2 MATERIALS

Materials shall meet the requirements of the following Sections:

<table>
<thead>
<tr>
<th>Material</th>
<th>Standard No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic Traffic Buttons</td>
<td>9-21</td>
</tr>
<tr>
<td>Lane Markers Type 1</td>
<td>9-21</td>
</tr>
<tr>
<td>Lane Markers Type 2</td>
<td>9-26</td>
</tr>
<tr>
<td>Adhesive</td>
<td>9-26</td>
</tr>
</tbody>
</table>

Color of traffic buttons and Type 1 lane markers shall match the color of the pavement markings on which they are installed. The color of applicable pavement markings are set forth in Section 8-22.
Bonding shall be considered satisfactory when adhesive bonding is to a minimum bond strength of tension of not less than 10 pounds per square inch for both Type I and Type II plastic traffic button. Flexible guide posts shall be installed according to the manufacturer's recommendations. A reasonable time prior to installation, the Contractor shall provide the Engineer with the manufacturer's recommended installation procedures. Only one type of flexible guide post shall be used on each project.

If the ground adjacent to the posts is disturbed in any manner, it shall be backfilled to the level of the existing surface and thoroughly compacted. The surface of the ground adjacent to the post shall be replaced with like materials, including bituminous treatment if previously present.

Compensation for the cost necessary to complete the work described in Section 8.11 will be made at the unit contract price bid only for the pay items listed or referenced below:

- (a) "Beam Guardrail, (Type)," per linear foot.
- (b) "Weathering Steel Beam Guardrail, (Type)," per linear foot.
- (c) "Beam Guardrail Anchor, (Type)," per each.
- (d) "Post, Treated Timber, 10 inch x 10 inch, per each.
- (e) "Post, CRT Treated Timber, per each.
- (f) "Access Control Gate, per each.
- (g) "Rebate Beam Guardrail, per linear foot.

The unit contract price for "Beam Guardrail Anchor, (Type)", Weathering Steel Beam Guardrail, (Type) shall include all costs for the work required to furnish and install the beam guardrail, including all standard posts which attach the guardrail to concrete or masonry structures.

The unit contract price for "Beam Guardrail Anchor, (Type)", shall include all costs for the work required to furnish and install the anchor as specified, including excavation, backfilling, compaction, disposal of excavated material, and surface restoration. Where Type 2 anchors are required, the additional depth of post embedment shall be included in the unit contract price of the anchor.

The unit contract price for "Post, CRT Treated Timber, 10 inch x 10 inch, per each" shall include all costs for the work required to furnish and install the 10 inch x 10 inch treated timber post or alternate W15 x 15 steel post and fasteners to the guardrail, including surface restoration.

The unit contract price for "Access Control Gate" shall include all costs for the work required to furnish and remove and relocate the beam guardrail posts with guards as specified.

"Access Control Gate" shall include all costs for the work required to furnish and install the access control gate as specified, including excavation, backfilling, compaction, and surface restoration.

The unit contract price for "Beam Guardrail Anchor, (Type)", shall include all costs for the work required to furnish, install and use of the option of the Contractor.

The Contractor shall submit for approval of the Engineer each additional detailed plans and shop drawings of all guardrail fittings, posts, and assemblies as may be required by the Engineer.

The access control gates shall be placed to line and grade as shown on the plans and specifications submitted to the Engineer. After the posts have been set, the holes shall be backfilled with suitable material and the material thoroughly tamped.
8-12.2 MATERIALS
Materials shall meet the requirements of the following sections:
Concrete Class C... 602
Steel and Gages... 915
Wire and Gates... 516
Gates shall be of diamond woven wire mesh mounted on steel posts.
Fence shall be of barbed wire or barbed wire combined with wire mesh fastened to posts. Steel posts and steel braces, or wood posts and wood braces may be used provided only one type shall be selected for use in any contract.
Gates shall consist of a steel frame or frames covered with chain link or wire mesh.

8-12.3 CONSTRUCTION REQUIREMENTS
8-12.3.1 GENERAL
Clearing of the fence line will be required. Clearing shall consist of the removal of trees, posts, brush, brush,...

8-12.3.3 CHAIN LINK FENCE AND GATES
8-12.3.3A POSTS
Posts shall be placed at intervals of not exceed 14 feet. All posts shall be placed in a vertical position excr...
Cement Concrete Sidewalks

Lost or damaged castings resulting from the Contractor's operations or workmanship and not in accordance with the Drawings shall be replaced with a new 100 casting at the Contractor's own expense.

SECTION 8-14 CEMENT CONCRETE SIDEWALKS

8-14.1 DESCRIPTION

This work shall consist of constructing cement concrete sidewalks, thicknessed edges for sidewalks, monolithic curb and sidewalk, curb caps, and bus shelter pads, including excavation for the depth of the sidewalk and subgrade preparation, in accordance with these Specifications and as shown on the Drawings and Standard Plan No. 420 through 421, or as designated by the Engineer.

8-14.2 MATERIALS

Materials shall meet the requirements of the following Sections:

- Concrete Concrete Class 552 (4)
- Portland Cement
- Aggregate
- Premixed Joint Filler
- Concrete Casing Materials and Accessories
- Slump of the concrete mix shall not exceed 5/12 inches.
- Lamp black colorading agent for matching the color of newly constructed cement concrete sidewalks to the color of adjacent existing cement concrete sidewalks shall be added to the concrete during mixing in an amount not to exceed 1/12 pounds per cubic yard of concrete. No lamp black shall be used in curb ramps.

8-14.3 CONSTRUCTION REQUIREMENTS

8-14.3.1 GENERAL

The contractor shall not place curb in the sidewalk section unless otherwise directed by the Engineer.

8-14.3.2 EXCAVATION AND SUBGRADE

Excavation for sidewalks shall be as described in Section 8-03. Where designated by the Engineer, unsuitable material in the subgrade shall be removed and replaced with selected native materials.

8-14.3.3 FINISHING

Surfaces shall be finished with a broom or broom brush to smooth and finish the surface of the sidewalk to the surface shown on the Drawings.

Additional requirements for placing and finishing concrete in cold weather shall be as specified in Section 5-05.3.16.

Cement for the curb section shall be a minimum 4,5 inches and sidewalk shall be as specified in Section 8-04.310.

8-14.3.4 PLACING AND FINISHING CONCRETE

The concrete shall be spread uniformly between the forms and thoroughly compacted with a small shock board. Through joints and dummy joints shall be located and constructed in accordance with the Standard Plan. In construction of through joints, the premixed joint filler shall be adequately supported until the concrete is placed on both sides of the joint.

Whenver castings are located in the sidewalk area, joints shall be installed at the casting location to center patching of the sidewalk. If spalling of joints or scoring is needed, the installation of joint material would be unsuitable the Contractor shall install other to strengthen the sidewalk section as required.

Dummy joints shall be 3/12 inches in depth and shall be positioned in true alignment at right angles to the line of the sidewalk and be normal to and finish with the surface. Where the sidewalks will be contiguous with the curb, it shall be constructed with a 1/8 inch radius edge as shown on Standard Plan No. 420.

After the concrete has been thoroughly compacted and leveled, it shall be flushed with water from a hose at the proper time with a metal float. Joint shall be edged with a 1/4 inch radius edger and non-tracking compound coated with a 1/12 inch radius edge.

Depending on the type, the sidewalk shall be divided into panels by scoring 1/4 inch deep in the manner indicated on Standard Plan No. 420. If designated then working the premixed joint filler into the groove. Premixed joint filler for both through and dummy joints shall be positioned in true alignment at right angles to the line of the sidewalk and be normal to and finish with the surface. Where the sidewalks will be contiguous with the curb, it shall be constructed with a 1/8 inch radius edge as shown on Standard Plan No. 420.
CEMENT CONCRETE SIDEWALKS

8-14.3(3) CURING AND PROTECTION

Concrete materials and procedures specified in Section 5-03.01.05 of this Section shall be used except that while pavement materials are stored, unloaded, or otherwise not in use, their surfaces shall not be exposed to sunlight.

The Contractor shall apply the curing agent as specified in Section 8-14.3(2), which is intended to maintain the desired surface characteristics for attachment of the decorative aggregate. Where the field has been cleaned, the area shall be adequately protected during the curing period.

The sidewalk shall be protected against damage or defacement by any means that it has been accepted by the Owner. Sidewalks which are not acceptable to the Engineer because of damage or defacement, shall be removed and replaced by the Contractor if the requirements for curing in hot weather shall be as specified in Section 5-03.01.11. Additional requirements for curing in cold weather shall be as specified in Section 8-14.03.

8-14.3(6) THROUGH AND CONTRACTING JOINTS

Standard locations for through joints for sidewalks are:
(a) At street margins produced and at 200 ft. or 280 foot intervals.
(b) To separate concrete driveways, driveways, curb ramps, and their landings from sidewalks.
(c) Around the vertical barrier of hedges, balcony, air conditioning units, poles and large diameter underground utility cover castings where located in the sidewalk area.
(d) Longitudinally between concrete walls, curbs, paved planting strips and solid masonry or concrete walls where they shall not.
(e) To maintain as feasible, the through joints in the adjacent pavement and curb when sidewalk abuts curb.

Transverse contraction joints (mummy joints) shall be constructed in concrete material 1/4 inch to 2 inches wide, and set at approximately 15-foot intervals, or as decided by the Architect shall be spaced to avoid excessive spa spacing.

Transverse and longitudinal through joints as shown on Standard Plan No. 400 shall be 1/2 inch thickness minimum non-extruding joint material, cut to a width equal to the full depth of the concrete slab. The joint shall be located, parallel to the surface and with the bottom edge embedded in the slab. All joints shall be in straight alignment, except those placed in curved locations as required by the Architect.

Contracting joints for sidewalks shall conform to the applicable requirements for through joints for pavement except for shallower joint width as specified on Standard Plan No. 422. The top edge shall be 1/4 inch below the finished surface of the sidewalk. All lines will joint spacing exceed 15 feet.

8-14.3(7) CURB RAMP, TYPE 1

Curb ramps, Type 1 shall be installed at sections where the Drawings call for installation of curbs ramps along with new sidewalk installed as part of the same contract.

Curb ramp locations will be designated on the Drawings or shall be designated in the field by the Engineer. Where curb ramps are to be constructed, the Contractor shall construct monolithic depressions for curb ramps as indicated on Standard Plan No. 422. Curb ramps shall be constructed separately from the sidewalk to produce a definite break line between the ramp and the sidewalk. A 3/8 inch non-extended joint material shall be installed between the curb ramp and the sidewalk with joints as specified in Section 8-14.3.

The flat-shaped sidewalk areas shall be finished with a finishing material to the face of the curb ramp. The sidewalk area between the finished lines shall be laid with construction material of the same thickness as the adjacent sidewalk area, in accordance with the approved plans. The sidewalks shall have a finish thickness of 2 inches along the face of the thickness of the sidewalks. The measurement for payment of thickness edge of the sidewalks shall be made with the edge of the sidewalk shall be made with an inch as described in accordance with Table 8-15.1.

8-14.5 MATERIALS

Payment for sidewalk drains shall be made in accordance with Section 7-40.5.

Payment for monolithic curb and sidewalk or monolithic curb, gutter, curb and sidewalk shall be made for the individual bid items as described in Section 8-14.4.

Measurements of sidewalks for the various plans of sidewalks shall be used as bid for sidewalk subgrade shall be the ton as recorded in conformed quantity tickets per Section 8-15.1.

Measurement for monolithic curb and sidewalk shall be considered as three component sections as follows:
(a) The first component, "Sidewalk, Concrete Curb" shall comprise that portion of the combined section beginning 6 inches behind face of curb and shall be the actual square yards of sidewalk constructed.
(b) The second component, "Curb, Concrete Curb" shall comprise that portion of the combined section beginning at back of curb and extending to the face of the curb, and shall be the actual linear feet of curb constructed, as measured along the front edge.
(c) The third component, "Sidewalk, Thickened Edge" shall comprise the triangular cross-section portion of the combined section below the bottom of sidewalk and backing the back of the curb section. The thickened edge shall be the actual linear feet of thickened edge constructed, as measured along the face of the thickened edge.

8-14.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 8-14 will be made at the unit contract prices bid only for the pay items listed or referenced below:

(i) "Sidewalk, Concrete Curb", per linear yard.
(ii) "Sidewalk, Thickened Edge", per linear foot.
(iii) "Curb, Concrete Curb", per each.
(iv) "Sidewalk, Thickened Edge", per each.

The unit contract price for "Sidewalk, Concrete Curb" shall include all costs for the work required to construct the sidewalks as specified including the earth work required to excavate material to the specified depth of the sidewalk to the subgrade, subgrade preparation, and furnishing and installing downtown pavers and planting strips.

Payment for the volume of earth work involved in excavating to the required depth of the sidewalk shall be made in accordance with Section 2-03.

All costs for the plantings shall be estimated and contained in the unit price for building materials specified in the unit price for "Sidewalk, Concrete Curb".

8-15.1 DESCRIPTION

This work shall consist of furnishing and placing riprap protection of the type specified at the locations and in conformity with the lines and dimensions shown in the Drawings or established by the Engineer.

Riprap will be classified as heavy loose riprap, light loose riprap, hand placed riprap, sack riprap, and concrete slab riprap.

8-15.2 MATERIALS

Materials shall conform to the requirements of the following:

(i) Filter Blanket 90 lbs.
(ii) Green Backfill for Drains 90 lbs.
(iii) Heavy Loose Riprap 92 lbs.
(iv) Light Loose Riprap 92 lbs.
(v) Hand Placed Riprap 92 lbs.
(vi) Sack Riprap 92 lbs.
(vii) Slab Riprap 92 lbs.
(viii) Quarry Spalls 92 lbs.

Filter blankets shall meet the gradation requirements for Baltimore.

8-15.3 CONSTRUCTION REQUIREMENTS

The foundation shall be prepared below proposed scour or cover to levels shown on the Drawings, and no stone shall be placed or compacted until it is approved by the Engineer. Excavation below the level of the intersection of the slope of cut or fill and the adjacent marked ground surface or the channel floor or slope shall be classified as ditch excavation in accordance with Section 2-03. The bottom of the ditch shall be cleared to the lines and grades as shown on the Drawings.

8-15.3(3) LOOSE RIPRAP

Loose riprap shall be placed in such a manner that all relatively large stones shall be essentially in contact with each other, and all voids filled with the material to provide a well-graded compacted mass. The stone shall be dumped on the slope in a manner that will ensure riprap to achieve the specified thickness in one operation. When dumping or placing, care shall be used to avoid disturbing the underlying material. Placing in layers parallel to the slope will not be permitted. A 1/2 inch tolerance for loose riprap will be allowed from slope plane and grade lines in the finished surface.

8-15.3(3) HAND PLACED RIPRAP

The stones shall be laid by hand on prepared slopes to such thickness as may be ordered by the Engineer. The riprap shall be placed in a manner that will ensure riprap to achieve the specified thickness in one operation by digitizing a trench and placing a course of the largest stones therein. Each stone shall be placed so that it shall rest on the slope of the
8-15 RIFRAP

enamorment and not wholly on the stone below, and it shall be thoroughly tamped or driven in place. The exposed face of 18 inches placed riprap shall be made as smooth as the shape and size of the stones will permit and shall not vary more than 1 inch in thickness from the place surfaces on the required slope.

8-15.3(4) SACK RIPRAP

Sack riprap shall be deposited in the trench and on the slope of the embankment to be protected in accordance with the Drawings or as directed by the Engineer.

The concrete shall be placed in the sacks to a uniform volume leaving sufficient room for easily tacking the sacks. The sacks shall then be placed in longitudinal rows in the trench and on the slope to lie parallel with the slope. In placing the sacks on the slope, their outside faces shall be laid against a heavy timber header or screed so that each layer will be true to line and grade. The heel end of the sack shall be turned under and the sack firmly pressed into place against the header or screed. Sacks in the longitudinal rows shall be placed to the bottom of one sack adjacent to the top of the next sack. Joints shall be staggered in successive rows. Sack riprap shall not be placed in freezing weather, and work damaged by frost shall be removed and replaced by the Contractor.

8-15.3(5) CONCRETE SLAB RIPRAP

Concrete slab riprap shall consist of concrete placed in slabs 4 inches thick unless otherwise shown in the Drawings or directed by the Engineer.

A trench of the dimensions shown in the Drawings or as stated by the Engineer shall be dug at the toe of the slope.

The forms shall be of the depth of the concrete to be placed.

The panel length shall be 10 feet unless otherwise shown in the Drawings, and the concrete shall be placed in alternate panels, care being taken not to injure the concrete in place when constructing the forms. Expansion joint material will not be required at the joints.

Concrete will be limited to a 1/2 inch radius. Concrete slab riprap shall consist of concrete placed in the form specified in 8.15.3(2).

8-15.3(6) QUARRY SPALLS

Quarry spalls shall be placed in ditches and on slopes to be used as described in the Drawings or as directed by the Engineer. After placement, the quarry spalls shall be compacted by tracked equipment making a minimum of three passes.

8-15.3(7) FILTER BLANKET

When required, a filter blanket shall be placed on the exposed slope or area to the full thickness specified in the Drawings using methods which will not cause segregation of the filter blanket. The surface of the filter blanket shall be even and free from mounds or Hiows. Allowance for filters of filter materials, when required, shall be placed using methods which will not cause mixing of the materials in the different layers.

8-15.4 MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured as provided in Section 10.1. Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein this Section.

Loose riprap will be measured by the ton of riprap actually placed.

Fixed riprap will be measured by the cubic yard of riprap actually placed.

Blanket material will be measured by the cubic yard in the basing conveyance at the point of delivery on the project.

Sack riprap will be measured by the cubic yard. The number of cubic yards of sack riprap placed shall be computed from the number of sacks of cement actually used in the concrete mix and the yield per bale of cement as determined by the Engineer from actual predetermined measurements.

Concrete slab riprap will be measured by the cubic yard based on the dimensions of the slabs placed and accepted.

Quarry spalls will be measured by the ton of spalls actually placed.

8-15.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 8.15 will be made at the unit contract prices bid only for the pay items listed or referenced below:

(1) "Heavy Loose Riprap," per ton.
(2) "Light Loose Riprap," per ton.
(3) "Hand Placed Riprap," per cubic yard.
(4) "Sack Riprap," per cubic yard.
(5) "Concrete Slab Riprap," per cubic yard.
(6) "Quarry Spalls," per cubic yard.
(7) "Filter Blanket," per cubic yard.

The unit contract price for "Heavy Loose Riprap," "Light Loose Riprap," "Hand Placed Riprap," "Sack Riprap," and "Concrete Slab Riprap" shall include all costs for the work required to furnish and install the riprap of the type specified including all excavation and backfill above the level of the intersection of the slope to be riprapt and the adjacent original ground or the channel floor or channel alone as specified in Section 8.15.3(2). When it is necessary to dump and sort concrete to be placed in the slope, the method of depositing and compacting shall result in a compact, dense, and impervious concrete which will show a uniform plate surface.

All costs in connection with constructing the slope except for grading, backfilling, and drainage, as specified in Section 8.15.3(2), shall be included in the unit contract price for "Concrete Slab Riprap".

The unit price for "Quarry Spalls" shall include all costs for the work described in Section 8.15.3(6) except for grading.

The unit contract price for "Filter Blanket" shall include all costs for the work described in Section 8.15.3(7).

Payment for ditch excavation as defined in Section 8.15.3(2) will be made in accordance with Section 2.9.3.

8-16.2 MATERIALS

Materials shall meet the requirements of the following Sections:

Concrete Class B
Concrete Protection
Semi-Open Concrete Masonry Units Slope Protection
Poured Portland Cement Concrete Slope Protection
Pre-cast Poured Portland Cement Concrete Slope Protection

8-16.3 CONSTRUCTION REQUIREMENTS

8-16.3(1) FOOTING AND PREPARATION OF SOPE

The footing for the slope protection shall be constructed in accordance with Sections 8.3(1) and 8.4(2).

The surface on which applications is to be made shall be thoroughly compacted and nearly trimmed to line and grade as necessary to conform to the detail in the Drawings.

8-16.3(2) PLACING SEMI-OPEN CONCRETE MASONRY UNITS

The masonry masonry units shall be placed in a uniform pace and in each such one that they rest firmly and evenly against the slope with no rocking. The concrete masonry units shall be placed in horizontal parallel courses, and successive courses shall turn joints with the preceding course to form a running bond.

Both these methods of constructing concrete shall be finished by means of a wood float and shall be stripped with a rustication joint as shown in the Drawings.

Curing shall be performed in accordance with Section 5-05.3(3).

8-16.3(4) PNEUMATICALLY PLACED CONCRETE

(a) Workers: Only workers experienced in pneumatically placing the concrete shall be employed and satisfied evidence of such experience shall be furnished when requested by the Engineer.

(b) Equipment: The Contractor shall furnish the Engineer with two copies of the manufacturer's specifications and operating instructions for the equipment used. Before placement of any portion of the slope protection, the type of equipment and method of operation shall be approved by the Engineer.

(c) Proportions of Materials: The cement/cement ratio shall be 4.5 parts sand to 1 part cement based on loose dry volume.

The pressure shall be maintained at a constant pressure which shall be at least 15 psi above atmospheric pressure at the nozzle. For lengths of hose up to 100 feet, atmospheric pressure at the gun shall be 45 psi or greater. Pressure shall be increased 5 psi for each additional 3 feet of hose required. A steady pressure shall be maintained.

8-16.5 MEASUREMENT

Compensation for the cost necessary to complete the work described in Section 8.16 will be made at the unit contract prices bid only for the pay items listed or referenced below:

(1) "Concrete Slope Protection", per square yard.

The unit contract price for "Concrete Slope Protection" shall include all costs for the work required to construct the slope protection as specified in Section 8.16 including the work required to construct the footing.

SECTION 8-17 VACANT

SECTION 8-18 CEMENT CONCRETE STAIRWAYS, LANDINGS AND STEPS

8-18.1 DESCRIPTION

This work shall consist of constructing, on a prepared compacted subgrade, cement concrete stairways, landings, and steps, and such subsidiary work as may be necessary, including the construction of handrails, in accordance with the Specifications and in conformity with the lines, grades, and cross sections indicated on the Drawings, Standard Plan Nos. 440, 441 and 442, or established by the Engineer.
8.18 MATERIALS

Materials shall meet the requirements of the following Sections:

Non-structural Cement Concrete
Portland Cement
Aggregates
Joint Materials
Curing Materials

Concrete shall be Class C-34.4 for steps and stairways. Landings shall be Class C-3.4.

Galvanized steel pipe railing shall be fabricated from standard weight steel pipe meeting the requirements of ASTM D-692 and D-1430. After fabrication, the railings shall be hot-dipped galvanized per ASTM A 123.

Aluminum railings shall comply with the requirements of Section 9G6.3.2. Wood railings shall be as indicated on the Drawings or as directed by the Engineer.

8.18.3 CONSTRUCTION REQUIREMENTS

8.18.3.1 SITE PREPARATION AND GRADING

At locations where cement concrete stairways, landings, or steps are to be constructed, the area shall be cleared, graded, excavated and graded in accordance with Sections 2G0.10 and 2G0.20 to the limits indicated on the Drawings or as directed by the Engineer.

8.18.3.2 SUBGRADE PREPARATION AND FORMWORK

The necessary subgrade preparation and construction required in the construction of cement concrete stairways, landings, and steps shall meet the requirements for pavement subgrade preparation set forth in Section 2G0.10 except that wood formwork shall be laid not less than 2 inches above the tops of sidewalks and shall be removed from forms or from the forms a minimum distance of 3 inches.

Reinforcing steel for cement concrete stairways shall be placed as shown on Standard Plan No. 44. The steel shall be anchored to the wall form with an anchor wire not less than No. 18 gauge at each bar lap or crossing and be rigidly supported above the concrete during the concrete placement.

8.18.3.4 HANDRAIL

Handrails shall be of welded steel pipe construction with a minimum fluid line of 1.5 inches and shall be 2 inches above the top of the tread. The installed handrail shall be true in alignment, on proper grade, and with posts plum.

8.18.3.5 PLACING CONCRETE, FINISHING AND CURING

Placing, finishing and curing shall conform to the applicable requirements in Sections 5G0.3, as they would apply to concrete stairway construction.

8.18.5 PAYMENT

Compensation for the costs necessary to complete the work described in this Article 8-18 shall be paid at the unit cost contract specified in Section 8-18.8 and shall be paid for separately herein necessary to construct a stairway in accordance with Standard Plans for Type 440 Stairway, except with a width of other than 8 feet.

The unit contract price for "Stairway, Cement Concrete, Special" shall include all costs for the work described in Section 8-18.8 and not otherwise provided for separately herein necessary to construct a stairway in accordance with Standard Plans for Type 440 Stairway, except with a width of other than 8 feet.

The unit contract price for "Handrail, Type of" shall include all costs for the work required to finish, fabricate and install the handrail along the stairway or sidewalk as specified.

The unit contract price for "Steps, Cement Concrete" shall include all costs for the work required to construct concrete steps as specified.

The unit contract price for "Cement Concrete Driveway and Alley Return" shall include all costs for the work described in Sections 8-19.8 and 8-19.9 and the work specified in Standard Plans for Type 440 Stairway, except with a width of other than 8 feet.

Payment for concrete stairways and landings shall be made in accordance with Standard Plans for Type 440 Stairway. Payment for concrete stairways and landings shall be made in accordance with Standard Plans for Type 440 Stairway.

Payment for concrete landings and walkways shall be made in accordance with the close cross section indicated on Standard Plans for Type 440 Stairway.

Reinforcing steel shall be considered as incidental to the unit cost for stairway construction.

SECTION 8.19 CEMENT CONCRETE DRIVEWAY AND ALLEY RETURN

8.19.1 DESCRIPTION

This work shall consist of cement concrete driveway and alley return constructed at the locations shown on the Drawings and as directed by the Engineer, and shall be in accordance with these Specifications and Standard Plans No. 440 and shall be constructed in accordance with the close cross section indicated on Standard Plans for Type 440 Stairway.

The number of private driveways may be increased over that shown on the Drawings, if required by the Engineer. Sufficient notice of the additional installations will be given by the Engineer at least ten days prior to the date on which the private driveways along with other construction in the same general area will be put in final grading. The final grading shall be in place with a top 8-inch levee of sand or gravel base.

The particular type of driveway or alley return to be used shall be that which is specified in the Drawings and included in the Bid Form.

Driveway and alley return shall be furnished in accordance with Standard Plans No. 440 and as shown in the Drawings.

The return and the curb shall be poured monolithically.

8.19.2 MATERIALS

Materials shall meet the requirements of the following Sections:

Non-structural Cement Concrete
Portland Cement
Aggregates
Joint Materials
Cement
Curing Materials and Admixtures
Water

The concrete mix shall be as specified for Class G-1, or Class G-2/1 and the slump of the concrete shall not exceed 3 inches.

8.19.3 CONSTRUCTION REQUIREMENTS

8.19.3.1 EXCAVATION AND SUBGRADE

Where directed by the Engineer, unsuitable material in the subgrade shall be removed to a specific depth and backfilled with select materials which shall be compacted by Method 2, as specified in Section 2G0.301.1.5.

Subgrade preparation for driveways and the required compaction shall conform to the applicable requirements in Sections 5G0.3.20 and to provide a firm, sound subgrade, acceptable to the Engineer.

8.19.3.2 FORMS AND FINISHING

Forms for the straight sections of the driveway or alley return shall have a minimum thickness of 2 inches and be equal to the nominal depth of the concrete. Forged or 1-inch lumber may be used on slab. All forms shall be securely braced and fastened to true form grade points.

A template shall be set upon the forms and the subgrade shall be bedded in compacted gravel as required. The subgrade shall then be compacted to the approved grade. Prior to placement of the concrete, the subgrade shall be thoroughly dampened.

8.19.3.3 PLACING AND FINISHING CEMENT CONCRETE DRIVEWAY

The concrete shall be spread uniformly between the forms and thoroughly compacted with an approved type of vibratory paddle. Through joints and contraction joints shall be located and constructed in accordance with the Standard Plans. In the construction of through joints, the premolded joint filler shall be adequately supported until the concrete is placed on both sides of the joint.

Contract joints (dowm joint) shall be formed with a tee bar by first cutting a groove in the concrete to a depth equal to, but not greater than the joint filler material and then working the premolded joint filler material into the joint and consolidating it. Premolded joint filler for both through and dorm joints shall be handled in true alignment and at right angles to the center line of the driveway or alley return.

After the concrete has been thoroughly compacted and leveled, it shall be finished with wood float and finished at the Engineer's option. The concrete shall be finished to a 2-inch radius edge of the driveway or alley return edges shall be finished to a 1/2-inch radius.

The surface shall be brushed in a transverse direction in relation to the center line of the driveway or alley return with a Siber brush of approved type.

Driveway and alley return shall not be constructed at the same time the pavement is placed unless authorized by the Engineer.

8.19.3.4 CUREING AND PROTECTION

The curing materials and procedures specified in Sections 5G0.13 and 5G0.15 shall be used. The driveway and the alley return shall be protected against damage or deterioration of any kind until acceptance by the Owner. Any temporary or other coverings used for this purpose, shall be removed and be replaced by the Contractor.

Before placing any concrete, the Contractor shall have on the job site enough protective paper to cover the pour of an entire day, in event of rain or otherwise unsuitable weather conditions.
8-19.4 MEASUREMENT

The items of work completed pursuant to Contract Documents will be measured as provided in Section 1-89.1 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein this Section.

8-19.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 8-19 will be made at the unit contract prices listed or referenced below:
(1) "Driveway, Cement Concrete, (Thickness)," per yard.
(2) "Driveway, Cement Concrete, HES, (Thickness)," per square yard.

The unit contract price for "Driveway, Cement Concrete, (Thickness)" and "Driveway, Cement Concrete, HES, (Thickness)" shall include all costs for the work required to construct the driveway as specified, including excavation and subgrade preparation.

Payment for all returns will be made as "Driveway, Cement Concrete, (Thickness)."

Payment for excavation below the prepared subgrade and additional selected materials will be made as "Common Excavator" in accordance with Section 201.3 and "Mineral Aggregates, (Type)" specified for bitumen in accordance with Section 401.5. However, payment will not be allowed for any excavation nor for the additional material required below the specified grade resulting from segregation of the Contractor.

SECTION 8-20 VACANT

SECTION 8-21 PERMANENT SIGNING

8-21.1 DESCRIPTION

8-21.2 MATERIALS

Materials shall meet the requirements of the following sections:
(1) Sign Marking Materials
(2) Sign Marking Paint

8-21.3 CONSTRUCTION REQUIREMENTS

8-21.3(1) SIGN INSTALLATION

The multiple panel signs and sign structures shall be installed in accordance with the Drawings, the Standard Plans, and signing details included in the Appendix of the Project Manual.

The sign shall be mounted level and face is the direction indicated on the Drawings or designated by the Engineer.

8-22 PAVEMENT MARKING

8-22.1 DESCRIPTION

This work shall consist of furnishing and installing permanent markings upon the roadway surface at locations shown in the Drawings, or where shown in the Appendix of the Project Manual, in accordance with those Specifications and Standard Plans.
8-22

PAVEMENT MARKING

No. 710, 711, 712, 720a(b) and 721. Pavement markings shall be: (a) clearly visible, (b) of uniform width, and (c) of uniform color.

8-22.1(2) PAVEMENT MARKING DESIGNATIONS

Pavement markings are defined as follows:

ITEM

DESCRIPTION

1. PAINT

2. USAGE

L.1

Two parallel solid 4-inch yellow stripes with 6-inch space between stripes

L.2

Solid 4-inch yellow stripe

L.3

Dashed 6-inch yellow stripe (10 feet paint with 20 feet skip)

L.4

Solid 4-inch yellow stripe with parallel dashed 4-inch yellow stripe (10 feet paint with 20 feet skip) with 4-inch space between the two paint stripes

L.5

Dashed 6-inch white stripe (10 feet paint with 20 feet skip)

L.6

4-inch white stripe

L.7

4-inch white stripe

L.8

4-inch white stripe

L.9

4-inch white stripe

L.10

4-inch white stripe

L.11

4-inch red curb stripe

L.12

4-inch yellow curb stripe

L.13

Curb combination curb stripe (5 feet red - 4 feet yellow, 3 feet red)

L.14

Left and right arrow combination

L.15

Left arrow

L.16

Right arrow

L.17

Through arrow

L.18

Left and through arrow combination

L.19

Right and through arrow combination

L.20

"ONLY" legend

L.21

"OK" legend

L.22

Pedestrian symbol

L.23

Bicyclist symbol (include arrow)

L.24

Disabled person symbol

L.25

"Bus" legend

L.26

"Curb" legend

L.27

Curbstone legend

L.28

Diamond symbol

L.29

Curb and sidewalk legend

B. THERMOPLASTIC (DEDENOTED BY "T" SUFT)

L.47

4-inch white stripe Crosswalk

L.48

5-inch white stripe

L.49

6-inch white stripe

L.50

6-inch white stripe

L.51

Left and right arrow combination

L.52

Left arrow

L.53

Right arrow

L.54

Through arrow

L.55

Left and through arrow combination

L.56

Right and through arrow combination

L.57

"ONLY" legend

L.58

"OK" legend

L.59

Pedestrian symbol

L.60

Bicyclist symbol (include arrow)

L.61

Disabled person symbol

L.62

"Bus" legend

L.63

"Curb" legend

L.64

Curbstone legend

L.65

Diamond symbol

L.66

Curb and sidewalk legend

B. PRESSURE SENSITIVE TAPE (DEDENOTED BY "T" SUFT)

L.105

Various stripe

L.115

4-inch white curb tape

L.125

4-inch yellow curb tape

L.135

4-inch combination curb tape (5 feet red - 4 feet yellow, 3 feet red)

L.145

4-inch white tape

PAVEMENT MARKING MARKING MATERIALS

8-22.2 MATERIALS

Materials shall meet the requirements of the following sections:

Pavement Marking Materials 9-29

8-22.3 CONSTRUCTION REQUIREMENTS

8-22.3.1 PRELIMINARY SPOTTING

The Engineer will provide the preliminary layout for permanent pavement marking alignment following paving operations by the Contractor. Preliminary layout will consist of providing the Contractor with necessary control points, at intervals agreed upon with the Contractor, which will enable the Contractor to complete the preliminary spotting of the pavement marking alignment before painting begins. Control points for crosswalks will be marked near or adjacent to the curb. Control points for stop lines will be marked near or adjacent to the curb at the curb line. Control points for legend and symbols shall be the responsibility of the Contractor. Legend and symbols shall be located in accordance with Standard Plan No. 720 through 727, Drawings, or as designated by the Engineer. Approval by the Engineer shall be obtained before installation begins. Preliminary spotting to guide the striping machine is required for all longitudinal lines except where a clearly visible separation is present.

Permanent pavement markings such as crosswalks, stop lines, center lines, legends and lane stripes shall be installed by the Contractor within 5 days, weather permitting, after preliminary layout of the control points has been completed by the Engineer. Temporary pavement marking tape for centerline or lane lines or other pavement markings, if required by the Engineer, shall be installed in accordance with Section 5-445.3(7). Temporary pavement marking tape shall meet the requirements of Section 9-254.3.

8-22.3.2 PREPARATION OF SURFACES

Surface dirt and all contaminants within the areas to receive pavement markings shall be removed. Large areas of tar, grease or foreign materials may require sandblasting, steam cleaning, power washing, or chemical stripping to accomplish complete removal. Gross brushing curb painting shall be trimmed to the back edge of curb and the curbs cleaned of foreign material before painting.

Existing pavement markings shall be completely removed. Cleaning and removal methods used shall not damage the pavement surface to a depth or width greater that is not required to provide adequate bond between the pavement and the pavement marking material. The pavement surface shall be approved by the Engineer before application of the markings.

8-22.3.3 PAINTED PAVEMENT MARKING

8-22.3.4 GENERAL

Equipment used in the application of the pavement markings shall be designed and operated to produce painted pavement markings of uniform quality meeting the requirements specified.

Traffic paint shall be applied at a rate of not more than 100 square feet per gallon (approximately 15 miles per hour). This rate is effectively 15 gallons of paint per mile of 30-foot wide lane, which will be the basis for the measurement of yield. A tolerance not to exceed minus 10 percent will be allowed for film thickness or yield in paint application.

On "loch type" crosswalks, pedestrian and bicyclist symbols (including right arrows), while sharp and shall be painted with a brush coat or paint over fresh paint at a rate of approximately 1 pound per 20 square feet.

8-22.3.5 TOLERANCES FOR STRIPES

The allowable tolerances for line striping are as follows:

(a) Length of Stripe: The longitudinal accumulative error within a 300 foot length of line stripe shall not exceed plus or minus 4 inches.

(b) Width of Stripe: The width of stripe shall not vary more than plus or minus 1/4 inch.

(c) Lane Width: The lane width, which is defined as the lateral width from the edge of pavement to the center of the lane line or between the centers of parallel and successive lane lines, shall not vary from the widths shown in the Drawings by more than plus or minus 4 inches.

8-22.3.6 THERMOPLASTIC PAVEMENT MARKING

8-22.3.6.1 TYPE "A" INSTALLATION

The thermoplastic pavement marking shall be applied to an initially dry pavement surface after sufficient time has elapsed to insure that the primer, if required, has adequately dried and further curing of the primer will not adversely affect the thermoplastic material.

Thermoplastic material shall be applied in accordance with the manufacturer's recommended temperature ranges for ambient air temperature, pavement temperature, and temperature of the material applied.

Hot-laid thermoplastic material shall be applied to the pavement by a gravity or an extrusion method, or a combination of both. If the stripe width is obtained by more than one application, the adjacent applications shall be applied together with no apparent overlap or gap.

Glass beads shall be applied separately to the thermoplastic material as it is being placed. The glass beads shall be uniformly distributed over the entire width of the thermoplastic material so that objectionable irregularities in the material's reflectorization will not be present. This independent application of beads shall be applied uniformly at the rate of 1 pound for every 20 square feet of pavement marking. The dispenser shall be located behind and controlled simultaneously with the pavement marking operation die such that the beads will be imbedded in the pavement marking to a depth of at least 1/2 the bead diameter.

8-22.3.6.3 TYPE "B" INSTALLATION

Type "B" prefabricated thermoplastic material shall be applied to the pavement in a manner which will provide a uniform surface over the various widths required. At application, the ambient air temperature shall be within the range recommended by the manufacturer.

Type "B" thermoplastic shall be applied completely coated with a precoated, factory applied adhesive or it may be furnished with separate adhesive as specified by the manufacturer. Whether precoated or supplied separately, the adhesive shall be such as to allow the thermoplastic material to be extruded or applied on the pavement surface before permanently fixing it in its final position with a downward pressure.

When completed, the painted markings shall not be less than 0.06 inches (1.5 millimeters) in thickness, exclusive of any precoated adhesive material, and shall have a uniform cross- sectional configuration.
If the required pavement marking width is 12 inches or more, it may be fabricated from 3inch or 6inch wide material. Longitudinal spaces will be permitted, provided the gap at any point does not exceed 1/16 inch.

Excav thermostatic material left on the pavement shall be removed and the pavement shall be recontor to the condition of the operation.

8.22.3(3) PRESSURE SENSITIVE TAPE PAVEMENT MARKING

Application procedures for pressure sensitive tape shall be as recommended by the tape manufacturer.

8.22.4 MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured as provided in Section I-49.1 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein this Section.

Measurement for "Pavement Marking, Paint, (Width) Stripes" shall be by the linear foot of foot stripe, except dashed center lines and dashed lane lines will be measured as continuous lines with no deduction for the unainted area caused by the split pattern specified.

Measurement for "Pavement Marking, Paint, Legend/Symbol" will be by each legend or symbol.

Measurement for "Pavement Marking, Thermoplastic, Inch stripe" will be by the linear foot of inch stripe actually placed.

Measurement for "Pavement Marking, Thermoplastic, Legend/Symbol" will be by each legend or symbol.

The legends "ONLY" and "0" will be measured as 1 unit each.

The symbol "Bicyclist with Arrows" will be measured as 1 unit each.

Strip lines, 16 or 24 inches wide and comprised of multiple 8-inch wide stripes, will be measured by the linear foot of 8-inch stripe.

Measurement for "Pavement Marking, Pressure Sensitive Tape" will be by the linear foot of tape.

8.22.5 PAYMENT

Costs for the cost necessary to complete the work described in Section 8.22 will be made at the unit contract price bid only for the pay items listed or referenced below:

(1) "Pavement Marking, Paint, (Width) Stripes," per linear foot.
(2) "Pavement Marking, Paint, Legend/Symbol," per each.
(3) "Pavement Marking, Thermoplastic, Inch stripe," per linear foot.
(4) "Pavement Marking, Thermoplastic, Legend/Symbol," per each.
(5) "Pavement Marking, Pressure Sensitive Tape," per linear foot.

The unit contract prices for the above listed bid items shall include all costs for the work required to furnish and install the types of pavement marking as specified.

SECTION 8.26 ROCK PROTECTION FENCE

8.26.1 DESCRIPTION

This work shall consist of furnishing and constructing rock protection fence at the locations shown in the Drawings, or where directed by the Engineer, in accordance with these Specifications and the details shown in WSDOT Standard Plan No. D-6.

Rock protection fences shall be diamond woven wire mesh mounted on steel cable and steel posts.

8.26.2 MATERIALS

Materials shall meet the requirements of the following Sections:

Rock Protection Fence 9.16

8.26.3 CONSTRUCTION REQUIREMENTS

8.26.3(1) POSTS

Posts shall be spaced as shown in WSDOT Standard Plan No. D-6. In determining the post spacing, measurement will be made parallel to the slope of the existing ground and all posts shall be placed in a vertical position except where designated otherwise by the Engineer.

All posts shall be set to concrete Class C, and the footings shall be composed to avoid water.

Where solid rock is encountered without an overburden of soil, posts shall be set a minimum of 18 inches into the solid rock. The hole shall have a minimum diameter one inch greater than the largest dimension of the post section to be set. The posts shall be cut before installation to lengths which will give 2 feet of post above ground.

After the post is set and plumbed, the hole shall be filled with concrete consisting of one part portland cement and three parts clean, well graded sand. The gravel shall be thoroughly worked into the hole so as to leave no voids. The gravel shall be crowded to carry water away from the post. Where posts are set in the above manner, concrete footings will not be required.

Where solid rock is covered by overburden of soil or loose rock or surfacing materials, the posts shall be set to the full depth of 3 feet unless the penetration into solid rock reaches the minimum depth specified shown, in which case the depth of penetration may be increased.

8.26.3(2) FENCE

8.26.3(3) CHAIN LINK FABRIC

8.26.4 MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured as provided in Section I-49.1 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein this Section.

The length of rock protection fence shall be the number of linear feet of installed fence in the position specified excluding the length of the end anchorage.

8.26.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 8.36 will be made at the unit contract price bid only for the pay items listed or referenced below:

(1) "Rock Protection Fence (Position)," per linear foot.

The unit contract price for "Rock Protection Fence (Position)" shall include all costs for work required to furnish and install rock protection fence as specified in Section 8.36.

SECTION 8.29 WIRE MESH SLOPE PROTECTION

8.29.1 DESCRIPTION

This work shall consist of constructing wire mesh slope protection in accordance with these Specifications and the details shown in WSDOT Standard Plan No. D-6 and in conformance with this Sections and the Drawings or established by the Engineer.

8.29.2 MATERIALS

Materials shall meet the requirements of the following Sections:

Wire Mesh Slope Protection 9.29

8.29.3 CONSTRUCTION REQUIREMENTS

8.29.3(1) ANCHORS

The Contractor shall install anchors of the type shown in conformance to the layout shown in the Drawings. The spacing and number of the anchors and cables as shown in the Drawings are approximate only, and the Engineer will arrange the spacing in such a manner as to hold the wire mesh against the slope. Backfill material shall be thoroughly compacted.

8.29.3(2) CABLE ASSEMBLY

The cable assembly shall be in place before the wire mesh is attached. The bottom cable shall not be tensioned. No cable assembly will be allowed.

8.29.3(3) WIRE MESH

The wire mesh shall be fastened to the completed cable assembly as shown in the plans and as directed by the Engineer. Rigging on the wire mesh shall be placed in a single row centered on the wires. Horizontal members joined, two or more rolls of mesh shall be made by removing a horizontal wire and rewinding through the end of the fabric to form a continuous mesh. All top and bottom laps shall be made by folding the mesh to the outside, away from the slope, to avoid the possibility of falling material hanging up for the slope. The bottom of the mesh shall be laced at such material digested under the mesh can delta freely from the bottom of the mesh. The bottom of the mesh shall be laced at such material digested under the mesh can delta freely from the bottom of the mesh. The bottom of the mesh shall be laced at such material digested under the mesh can delta freely from the bottom of the mesh.

8.29.4 MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured as provided in Section I-49.1 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein this Section.

Measurement of anchors will be per each for the completed anchor. Anchor types will not be differentiated.

Galvanized wire mesh will be measured by the square foot of the completed area.

Galvanized wire rope will be measured by the linear foot of wire rope actually used in the completed project.

8.29.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 8.29 will be made at the unit contract price bid only for the pay items listed or referenced below.
ILLUMINATION AND ELECTRICAL SYSTEMS

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(1) "Wire Mesh Slope Protection Anchor" per each.
(2) "Galvanized Wire Mesh," per square foot.
(3) "Galvanized Wire Cable," per linear foot.

The unit contract price for "Wire Mesh Slope Protection Anchor" shall include all costs for the work required to furnish and install the anchors of the type required, as specified herein and as shown in the Drawings, including removing obstructions, excavating, drilling, backfilling and grading.

The unit contract price for "Galvanized Wire Mesh" and "Galvanized Wire Cable" shall include all costs for the work required to furnish and install the wire mesh and cable, including all rings, u-bolts, thimbles, wire rope, clips, hog rings, and any work necessary to complete the wire mesh slope protection as set forth in these Specifications and as shown in the Drawings.

SECTION 8-30 ILLUMINATION AND ELECTRICAL SYSTEMS

8-30.1 DESCRIPTION

This work shall consist of furnishing and installing a complete and functional electrical/street lighting system as indicated on the Drawings and in accordance with these Specifications and Standard Plan No. 543 and 570 through 575.

All final connections or energizing of electrical street lighting systems to overhead secondary or to secondary in vaults or handholes will be made by City Light.

All permits for electrical work other than street lighting and signals shall be obtained by the Contractor at Contractor's expense.

The Contractor shall furnish the electrical service from the electrical connection at the Municipal Building, City of Seattle, in accordance with Section 107.6.

8-30.2 APPLICABLE CODES

The work shall be performed in accordance with the applicable provisions of the following codes:

(a) City of Seattle Department of Lighting Material Standards, Construction Standards, and Requirements for Electrical Service Connection.

(b) State of Washington Electrical Code, chapter 260:44 WAC.

(c) City of Seattle Electrical Workers Safety Rules, chapter 260:45 WAC.

(d) Edison Electric Institute (EEI).

(e) National Electric Code.

The Contractor shall be familiar with the wires and voltages present within the construction area and the application of these requirements.

8-30.3 DRAWINGS

The Contractor shall submit shop drawings for the following items in accordance with Section 106.3.

(a) Luminaires (Include photometric and socket position)

(b) Lamps

(c) Wire Connector

(d) Wire Connectors

8-30.3(1) GENERAL

The work required for installation of electrical/luminance system shall be shown as shown on the Drawings, the Standard Plans, the construction standards and in accordance with the following provisions.

All wiring shall be in accordance with ASTM 123 and 132.

Only state certified electricians shall perform electrical installations.

Wire clearances shall be in accordance with Seattle City Light requirements.

To maintain safe traffic conditions, existing luminaires shall remain in service until cut-over to new luminaires can be accomplished. Roadways shall not be opened to traffic without the recommendation of the Director of Lighting System operating property.

All welding of steel and aluminum structures shall be in accordance with AWSSTP "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," Section 1.4.2 for Steel and Section 1.5.5 for Aluminum. All steel structures shall be protected as required in Section B of the above referenced book.

8-30.3(2) LUMINAIRES

The luminaire glassware, reflector and lamp shall be thoroughly cleaned before installation so that the luminaire face shall be warmed and adjusted according to the manufacturer's recommendations. The luminaire reflector will be level in the transverse roadway axis and parallel to the roadway grade to the longitudinal roadway axis. The luminaire shall be installed with all bolts and nuts according to Construction Standard 103.9.

8-30.4 BRACKET ARMS

Bracket arms shall be installed at the location indicated on the Drawings. Mounting point of the bracket on wood poles shall be located in a position to provide the required mounting height of the luminaire above the pavement surface as indicated on the Project No. 575. The mounting height shall be adjusted to provide required wire clearances.

Wood pole bracket arms shall be attached by one through bolt and two lag bolts. Through bolts in wood pole shall be cut to not more than 3 feet and shall be left exposed beyond the cap nut. The exposed end shall be made flush and countersunk approved by the Engineer. These through bolts shall not be used to mount any other equipment.

At locations where the existing bracket arm is to be used, any yellow tape around the arm shall be removed. (This tape was used to indicate luminaires intentionally disconnected in late 1977 to conserve wood steel bolts.

Bracket arms on steel poles shall be attached with galvanized bolts.

Bracket arms on aluminum shall be attached with stainless steel bolts.

8-30.4(3) RELOCATING EQUIPMENT

When equipment is to be relocated, the Contractor shall furnish and install all required materials, hardware and equipment required to complete the new installation. The new equipment required to complete the installation shall be of the same quality and type as hardware required in these Specifications as shown on the Drawings.

8-30.5(1) Wiring, Fuseing and Splicing

The Contractor shall provide wiring from luminaires to points in the foundations and to the source of secondary power. (Note: for MI cable, refer to Section 8-30.5(3))

The Contractor shall coil 8 feet of wire at the source of secondary power to allow for connections by Seattle City Light.

The Contractor shall coil 3 feet of excess conductor in all Type X, 1, 2, 3 or 4 Hot-dips.

8-30.5(3) MINERAL INSULATED (MI) CABLE

Mineral Insulated (MI) cable shall be installed as described in the NEC Section 350-B with the following exceptions.

Each "XIP" conductor shall have an in-line fuseholder and fuse located between the grounding eye and the MI cable, with the fuse securing the hanging and grounding of the MI cable. The electrical underground shall be fused and protected at each pole and shall be fused as required. Each lead wire shall be protected at the pole by a fuse 300 amperes through the pole hardware for servicing.

The splice to the earth lead enclosed in conduit, shall be covered with plastic molding.

Bird control shall be installed near the roadway and within City Light Vault. Voltages present are as high as 25,000 volts, and the vault wiring will not be degrounded while the Contractor is working. City Light safety watch standards shall be adhered to while working in vaults. Call Seattle City Light at 386-1864 for Safety Watch 48 hours in advance of entry into a City Light Vault.

When conduits, either cable or single, are being installed, care shall be exercised not to exceed tension limitations recommended by the manufacturer. Conductors may be pulled directly by hand. If conductors are pulled by mechanical means, a dynamometer with drop-rod pull shall be used on every pull. On mechanical pulls, either the insulation shall be stripped off each conductor, and conductors turned into a pulling eye and evenly spaced before pulling or a cable grip shall be used. The pulling force shall be applied directly to the conductor.

Secondary insulator racks required for new construction shall be in accordance with Material Standard 695.1 and installed in accordance with Construction Standard 104.

Where new cable will be installed in existing conduits which contain wire, the Contractor shall protect existing wiring from damage due to pulling new cable. Cable pulling conduits shall be used to minimize cable pulling tensions and adverse effects on existing terminations, jackets and shields. Care shall be exercised in pulling cable into vaults and vaults securely from sharp edges may be present.

Aluminum wire and connectors shall be prepared and coated with an acid-inhibiting compound.

Where triple grip is installed overhead to feed only one street light, the two hat leads shall be pulled into the vault (troubled) at each pole.

Wire terminations shall be made to the method that will not "ring" or nudge the wire. "Sizing" shall be done for rejection of the splice.

Spliced joints shall be mechanically and electrically secure. Splices shall not be made in the field. Individual splice or termination of extra leads shall be insulated and made safe.

All cables shall be marked in handable or access points with field point circuit number.

For where ground splices, the connector shall be torqued to the manufacturer's recommended load. The support and termination of extra leads shall be covered with rubber insulating and water resistant tape. The rubber insulating and water resistant tape shall be covered with a protective banding. The assembly shall be protected with a layer of electrical tape at the point of application. The electrical tape and the before mentioned electrical tape shall be cramped in accordance with the manufacturer's specifications.

Each splice shall be covered with a protective banding. The electrical tape shall be covered with the cover. The cover shall be black in color. The splice and the cover shall be black in color.

The circuit number shall be marked in the cover.

Where raceways are installed on poles a separate circuit shall be provided.

8-30(3) 8-30(4) MINERAL INSULATED (MI) CABLE
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9-30.3(7) GROUNDING AND BONDING

All metallic apparatuses containing electrical conductors, including cabinets, metallic conduit, metal poles, pedestals, and junction boxes, shall be made mechanically and electrically secure to form a continuous system which shall be effectively grounded.

Where conduit (including soil conduit) systems are used, all metallic apparatuses shall be electrically bonded by a separate insulated ground conductor.

Where parallel electrical circuits exist in an electrical conduit, the equipment grounding conductor shall be sized as determined by the rating of the largest overcurrent device serving any circuit contained in the conduit. Only one equipment grounding conductor is required in any conduit.

The equipment grounding conductor shall be sized as indicated on the Drawings. Minimum size shall be #14 copper.

All conduit runs with phase conductors (with the exception of the run from the riser to the first handhole) shall have a ground wire installed in the conduit unless noted otherwise on the Drawings.

A ground wire shall interconnect all ground rods in each circuit. Grounding of the equipment grounding conductors throughout the system shall be by approved ground clamps. Metal conduit ground wires and the service neutral shall be bonded and grounded at the service entrance point as required under the NEC and the City of Seattle Electrical Code.

Only one wire shall be installed under any ground clamp.

Ground rods shall be installed in firm undisturbed earth. In II or in areas with poor soil conditions, extensions shall be added until the rod cannot be removed by hand. Minimum spacing between ground rods shall be 6 feet.

8-30.308 REMOVAL AND SALVAGE OF EXISTING EQUIPMENT

Refer to Section 4.2.5(S)G and 2.0.37(C).

8-30.309 FIELD TESTING

Prior to completion of the work, the Contractor shall make the following tests on all electrical circuits:

(a) Test for grounds in each circuit by physically examining the insulation to ensure that all required ground jumpers, devices and apparatuses are in place, that they are electrically bonded and electrically firm, and that they meet the requirements of Article 250 of the National Electrical Code.

(b) Insulation resistance tests with all readings recorded when performed by the Electrician. The insulation shall be performed after all field connections have been made.

(c) A functional test in which it is demonstrated that each and every part of the system functions as specified or intended herein. The functional test shall be performed after all field connections are made.

8-30.4 MEASUREMENT

Bid items of work completed pursuant to Contract Documents will be measured as provided in Section 10.1 Measurement of Quantities unless otherwise provided for by individual measurement paragraphs herein this section.

8-30.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 8-30 will be made at the unit contract prices bid only for the per item listed or referenced below:

(1) "Luminaire, High Pressure Sodium, (Wattage)," per each.

(2) "Luminaire, High Pressure Sodium, (Wattage), Underdeck Mounted," per each.

(3) "Luminaire, High Pressure Sodium, (Wattage), Wall Mounted," per each.

(4) "Bracket Arm, (Length)," per each.

(5) "Replaces Luminaire," per each.

(6) "Replaces Bracket Arm," per each.

(7) "Bracket Arm, (Length)," per each.

(8) "Wiring, Street Lighting," per lump sum.

The unit contract price for "Luminaire, High Pressure Sodium, (Wattage)," shall include all costs for the work required to install and install these luminaire units specified in Sections 9-31.10 and 9-31.10 including wiring to the conduit.

The unit contract price for "Bracket Arm, (Length)," shall include all costs for the work required to furnish and install the bracket arm, including hardware.

The unit contract price for "Replaces Luminaire," shall include all costs for the work required to remove the item and reinstall the item at the new location, including hardware, and cleaning and repositioning relocated luminaries.

The lump sum contract price for "Wiring, Street Lighting," shall include all costs for the work required to furnish and install the wiring for the street light system as specified from the service points to the luminaire fixture holder, including wires, splices, tape, hook-up, access wire for connections, and any other material for a complete lighting system.

All final connections or energizing of electrical street lighting systems to overhead secondary or to secondary in vaults or handholes will be made by City Light at no cost to the Contractor.

All costs for the return and replacement of material or equipment found to be defective within the guaranteed period shall be at the Contractor’s expense.

All costs for furnishing and installing hardware not specifically called out, but required to complete the work shall be included in the unit contract prices for the bid items comprising the improvement.
The Contractor shall be present at such turn-on time, with materials and tools necessary to correct any malfunctions which may occur. Turn-on and any subsequent work will necessitate turning off the signal system. All new vehicular pedestrian and illuminated signals shall be covered (faced) completely with 6 mil opaque polyethylene sheeting until the new signals are ready to be energized. A small diameter hole (e.1 inch) shall be cut into the opaque plastic cover in front of each vehicular signal lens to allow for a visual check of indications during performance testing. Immediately after turn-on or cut-over all existing vehicular and pedestrian signals that have been deactivated shall be sacked or removed. The old signal heads shall not obscure the new traffic controls at any time.

8.31.3.1D TECHNICAL ASSISTANCE

The Contractor shall be present at such turn-on time, with materials and tools necessary to correct any malfunctions which may occur. Turn-on and any subsequent work will necessitate turning off the signal system. All new vehicular pedestrian and illuminated signals shall be covered (faced) completely with 6 mil opaque polyethylene sheeting until the new signals are ready to be energized. A small diameter hole (e.1 inch) shall be cut into the opaque plastic cover in front of each vehicular signal lens to allow for a visual check of indications during performance testing. Immediately after turn-on or cut-over all existing vehicular and pedestrian signals that have been deactivated shall be sacked or removed. The old signal heads shall not obscure the new traffic controls at any time.

8.31.3.1E CONTROLLER ASSEMBLY

The Contractor shall install the controller cabinet. Upon signal turn-on or cut-over the controller cabinet shall be installed as indicated in the Drawings and as specified herein. The controller shall be supplied 48 hours in advance of energizing of the unit in order that it may be present. After signing the City's functions test report, the Contractor shall pick up the controller cabinet at 10:00 6th Avenue South.
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TRAFFIC SIGNAL SYSTEM

(c) Each controller assembly type shall be environmentally tested in accordance with Section 309 of the National Electrical Manufacturer's Association (NEMA) Standard T-84 for Traffic Control Systems, Part 2, "Environmental Standard for Automatic Equipment of the Controller Assembly Type, Environmental Testing." The Environmental test shall be made by an independent laboratory.

The Contractor shall submit the manufacturer's certified test report on delivery of the controller assembly to the City for functional testing.

If a failure occurs in any step of the testing, the manufacturer shall record the failure and take corrective measures. If a failure occurs in the same controller unit or any other major segment (i.e., signal control unit, load switching unit, detector units, controller unit, etc.) of the controller assembly more than once, that unit or segment of the assembly shall be completely replaced by a new unit. Repairs shall be made as soon as practicable and testing shall ensure to the continuity of the test.

A failure shall be defined as any occurrence which results in other than normal operation of the equipment. A failure is considered to be, but not limited to the following:

(i) If the controller unit sequence improperly or exhibits improper internal or phase without proper call through remote switch, time clock or startup routine.
(ii) If any timing is disrupted or defies more than +100 milliseconds from its setting.
(iii) If a load switch produces an incorrect signal indication.
(iv) If the controller monitor, after receiving a simulated green/green and walk/conduct conflict for each phase or other monitored anomalies, fails to perform in the prescribed manner.
(v) If any auxiliary equipment does not operate properly.

8-31.32(J) CITY OF SEATTLE FUNCTIONAL TEST

PROCEDURE

The functional test for the City of Seattle will require at least 3 working days of satisfactory operation.

The functional test will be performed by the controller assembly to the City of Seattle Engineering Department Traffic Control Shop at 1400 Weller St., Seattle, WA 98105. The City will then initiate a functional test using the City's "Functional Test Procedure for Controller Assembly Installations." The Contractor shall obtain the City's approval to perform the test.

The Contractor shall test each controller assembly by the City of Seattle by the functional test procedure outlined in Section 309 of the National Electrical Manufacturer's Association (NEMA) Standard T-84 for Traffic Control Systems, Part 2, "Environmental Standard for Automatic Equipment of the Controller Assembly Type, Environmental Testing." The Environmental test shall be made by an independent laboratory.

A failure shall be defined as any occurrence which results in other than normal operation of the equipment. A failure is considered to be, but not limited to the following:

(i) If any part of the controller assembly fails to meet the Specifications or operates in other than normal operation, the test shall be discontinued.

The Contractor shall make immediate arrangements to correct or modify the equipment within seven working days of notice of the failure. The Contractor shall then notify the City of Seattle that repairs or replacement cannot be made within 30 days and shall be replaced by a new assembly. The Contractor shall make adjustments and must be in compliance with the Functional Test Procedure outlined in Section 309 of the National Electrical Manufacturer's Association (NEMA) Standard T-84 for Traffic Control Systems, Part 2, "Environmental Standard for Automatic Equipment of the Controller Assembly Type, Environmental Testing." The Environmental test shall be made by an independent laboratory.

8-31.32(A) GENERAL

Signal heads shall not be installed at any intersection earlier than 14 calendar days prior to turnouts or cut out.

8-31.32(B) SIGNAL HEADS, VEHICLE AND PEDESTRIAN

8-31.32(3) PEDESTRIAN SIGNAL HEADS

Pedestrian signal heads shall be installed to focus on the center of the far end of the crosswalk which it is associated with and at a point 5 feet above the sidewalk lighting. Pedestrian signal heads shall be mounted so that the bottom of the housing is 5 feet above the sidewalk, unless otherwise noted.

The Contractor shall use a "Class A" type mounting assembly for pedestrian signal heads. Where horizontal orientation does not present a signal head conflict, heads shall be mounted at the same elevation above grade.

8-31.3(B) VEHICLE SIGNAL HEADS

If the signal head mounting assembly for vehicle signal heads is to be installed on the pole, the signal shall be mounted to the pole at the elevation above the sidewalk, unless otherwise noted.

Mounting: The bottom of the signal head shall be mounted on the pole at a point 18 inches from the sidewalk.

The signal head shall be mounted so that the bottom of the housing is 5 feet above the sidewalk, unless otherwise noted.

The signal head shall be mounted so that the bottom of the housing is 5 feet above the sidewalk, unless otherwise noted.

8-31.3(C) DETECTOR LOOP

8-31.3(C)(1) LOOP WIRE

Vehicle detector loops shall be marked-out on the roadway by the Contractor as shown on the Drawings as and when directed in Section 309 of the National Electrical Manufacturer's Association (NEMA) Standard T-84 for Traffic Control Systems, Part 2, "Environmental Standard for Automatic Equipment of the Controller Assembly Type, Environmental Testing." The Environmental test shall be made by an independent laboratory.

At least 48 hours notice shall be given to the Engineer in advance of installation of the loop. The Contractor shall not saw out or cut detector loops until the location has been verified by the Engineer.

One continuous unbroken length of loop wire shall be used to avoid possible shorting of the wire. The Contractor shall not install any joint or splice in any detector loop installation.

The loop wire shall be laid in a saw cut or trench and shall be covered with a minimum of 2 inches of concrete or other suitable material to avoid abrasion or damaging the installation. In order to reduce abrasion of the loop wire in the saw cut, the following steps shall be taken:

(i) The loop wire is to be bent around each side of the saw cut or trench as it is laid.

(ii) The saw cut shall be taped at each 3 feet along the wire.

(iii) The saw cut shall be filled with a quick drying high strength highway concrete patching material, approved by the Engineer.

(iv) The saw cut shall be covered with a pavement or any other material capable of accommodating the installation.

8-31.3(C)(3) INDUCTION TESTING AT THE TIME OF INSTALLATION

Before the loop wire is laid, the Contractor shall test the loop as follows:

(i) The loop wire shall be in the correct location and the loop shall be connected to the terminal block or terminal box, as applicable.

(ii) The loop wire shall be tested for continuity and proper grounding.

(iii) The loop wire shall be tested for proper operation and response to the presence of vehicles.

(iv) The loop wire shall be tested for proper performance in accordance with the Specifications.

(v) The loop wire shall be tested for proper performance in accordance with the Specifications.

8-31.3(C)(4) LOOP LEAD-IN

Each loop lead-in shall have its own shield lead-in cable to the controller cabinet. Connections for parallel, series or series-parallel wiring of detector loops of the loop wire shall be made in the handbook and the controller cabinet may be made of any material that will not react with the wire. The loop lead-in shall be connected to the controller cabinet by a shield lead-in cable to the controller cabinet. The loop lead-in shall be connected to the controller cabinet by a shield lead-in cable to the controller cabinet. The loop lead-in shall be connected to the controller cabinet by a shield lead-in cable to the controller cabinet. The loop lead-in shall be connected to the controller cabinet by a shield lead-in cable to the controller cabinet. The loop lead-in shall be connected to the controller cabinet by a shield lead-in cable to the controller cabinet. The loop lead-in shall be connected to the controller cabinet by a shield lead-in cable to the controller cabinet. The loop lead-in shall be connected to the controller cabinet by a shield lead-in cable to the controller cabinet. The loop lead-in shall be connected to the controller cabinet by a shield lead-in cable to the controller cabinet.
such precautions as necessary and as directed by the Engineer, to ensure that the desired readings are obtained. Inadequate readings shall be recorded on the as-built drawings showing the location for each loop and one copy filed in the controller cabinet.

8.31(3)(D) LOOP CONTINUITY TESTING
The completed loop and leads configuration after ordering shall be checked for continuity, using a suitable tester that will not affect the voltage rating of the leads-in and loop wire rating.

The Contractor shall also perform a megger test on the loop and leads configuration to determine that the resistance to ground is 10 megohms or greater. If resistance to ground, prior to placing the sealant in less than 10 megohms, all splice points and wires should be inspected for insulation damage and corrective measures taken as directed by the Engineer. After the slot has been sealed, the Contractor will perform the resistance and continuity tests again. If the continuity and resistance tests do not meet the provisions requirements, the Contractor shall make such corrective measures as directed by the Engineer until the desired readings are obtained.

8.31(3)(E) INDUCTANCE TESTING AT THE CONTROL CABINET
After all splices are complete and the continuity test is complete, the Engineer will test the inductance of the loop and leads cable at the controller cabinet to ensure the inductance is within the acceptable range of plus or minus 15 percent of the calculated inductance. If the inductance does not fall in the acceptable range, then the Contractor shall make necessary adjustments as directed by the Engineer until the desired readings are obtained. Inductance readings shall be recorded on the as-built drawings showing the readings for the total loop plus lead.

8.31(3)(F) INTERIOR ILLUMINATED SIGN
Interior illuminated signs shall be covered (wrapped) completely at time of setting to protect from painting. All sign is ready to be energized by the Engineer and the Contractor is responsible for the condition of the sign when it is ready to be energized. The sign shall be mounted as indicated on Standard Plan No. 2644. The sign shall be mounted on ordinary tools and capable of being serviced without tools. The sign shall be not be damaged in any manner as to not damage the cable. The sign shall be a minimum of 161/2 feet and a maximum of 19 feet above the roadway. On unclassified routes the minimum shall be 18 feet. The sign shall be adjusted in the field as directed by the Engineer. Signs shall be plumbed as viewed from the direction in which the roadway approaches.

8.31(3)(G) INTERIOR ILLUMINATED CROSSWALK SIGN
The Contractor shall call for an intersection check-out after completing the control unit cabinet installations along with all other overhead and underground connections. The Contractor shall be present and assist with the check-out by ensuring each field circuit and insulation as necessary to complete readiness of the installation. If the crosswalk sign unit is found to be incomplete or inadequate, the Contractor will be notified of the deficiencies.

The Contractor shall have all traffic controls (i.e., pavement markings, channelization and signage) in place prior to the installation of the crosswalk sign.

The crosswalk sign unit shall be provided with an adjustable connection that permits incremental tilting of at least 10 degrees above or below the horizontal while maintaining common vertical axis through couplers and mounting. Terminal connection shall be held in place by a 5 degree adjustment about the mounting axis in 5 degree increments.

The crosswalk sign unit shall be connected to the splice way by means of 2 cable clamps, balance clamps and suspension fittings in accordance with Standard Plan No. 400a. The sign to the splice wire after loading shall be 6 percent plus minus 1 percent of the design load. The sign shall be attached to the poles such that the Crosswalk Sign Unit mounted at the lowest point on the sign will not require a pipe extension. The bottom of the Crosswalk Sign Unit mounted at the lowest point on the sign shall be a minimum of 24-6/7 feet and a maximum of 19 feet above the roadway. On designated truck routes the minimum shall be 18 feet.

Cable feeding the splice wire mounted crosswalk sign unit shall be securely attached to the splice wire by means of performed lasting spaced no more than 18 inches apart. The performed lasting rods shall be of the proper size to hold the cable snug against the splice wire, with no intervening gaps between the cable and the splice wire and shall give a neat appearance without displaying obtrusive pickups. Dip loops shall be held at the point of entrance to signal heads and consist entrance fittings to allow moisture to drip from the cable rather than run down the cable into the entrance. Where the dip loop from the pole outlet to the splice wire exceeds 18 inches, the cable shall be secured to the pole with four large permanent cable hangers to give a neat appearance.

All electrical cable for traffic signal facilities passing through handholes, junction boxes, conduit boxes, vaults and manholes shall be properly identified. Each cable shall be identified as to its function by using 3 wraps of colored plastic tape. The color representation shall be as follows:

<table>
<thead>
<tr>
<th>Cable Function</th>
<th>Tape Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian Signal Cable</td>
<td>Red</td>
</tr>
<tr>
<td>Driver Pedestrian Signal</td>
<td>Yellow</td>
</tr>
<tr>
<td>Push Button Control Circuit</td>
<td>Green</td>
</tr>
<tr>
<td>Pedestrian Circuit</td>
<td>Brown</td>
</tr>
<tr>
<td>Telephone Circuit</td>
<td>White</td>
</tr>
<tr>
<td>Service</td>
<td>Orange</td>
</tr>
</tbody>
</table>

Fire Prevent Code

Colored tape identification shall also apply to cables spliced in pigtails and individual bases and aerial splices. Each cable shall be identified with the appropriate colored tape within 6 inches of splice.

Loop cable passing through Seattle City Light handholes, manholes and vaults shall be identified with stainless steel insulated markers secured in the cable at each end of the marker by the appropriate colored tape. The markers shall be clearly visible and legible and shall be located at the center of the enclosed length of cable. In manholes and vaults, markers shall also be attached approximately 2 feet from each cable entry point. The cable marker shall indicate "SED SERVICE" for Traffic Signal Service cable, or "SED SIGNAL" for all other traffic signal cable usage.

Wires in manholes and vaults shall be done in accordance with the National Electric Safety Code and City Light Standards. Cable being installed in pipelines and vaults with existing power cable should be racked on the wall opposite the power cable. If cable must be racked on the same wall with power cable, it shall be mounted above the power cable, maintaining a minimum separation of 4 to 6 inches above the concrete of the ceiling of the vaults and hermetically sealing to allow air to enter the vaults, adhering to all safety regulations.

Requirements for building, designing, and erecting shall be in accordance with City Light Construction Standard U428. Some of the requirements are:

(a) Backsop must be placed.
(b) Maintain proper cable separation.
(c) Each signal cable should be marked with the existing cable.
(d) Elevation changes may be made below each other cable.
(e) Use existing cable, it is available with the conduit for installation in 4600 spool, with 28 inch spool allowing for future cable expansion.
(f) Use NM cable should be on an end wall, 28 ft from the end of the vault and back into the line of the ceiling of the vault.

Care shall be exercised in working near and within any City Light Vault. Voltage present are as high as 26,000 volts, and the vault wall will be de-energized whenever the Contractor is working. City Light Utilities will not be energized while working in vaults. Seattle City Light shall be called at 366-6000 for safety watch 48 hours in advance of any entry into any City Light Vault.
8-31.3.10 GROUNDING AND BONDING

Metallic equipment shall be grounded, including cabinets, metallic conduit, metal poles, and junction boxes. Grounding shall be made by connecting each with an electrical conductor so as to assure a continuous grounding system which shall be effectively grounded.

Where conduit systems are employed, all metallic equipment shall be electrically bonded as required by Article 250 of the NEC.

The equipment grounding conductor shall be in all cases be installed in accordance with Article 250 of the NEC. All required conduit systems are considered as being installed by the installation of a ground wire at the junction box nearest each pole or conduit in addition to the service ground wire. No "overstated" of equipment grounding conductors must be required. Where a ground wire is run directly to the ground rod at the junction box nearest the pole or conduit shall not be required if metallic conduit other than Type B will be used in the line to the service ground conductor. All conduit systems are considered as being installed by the installation of a continuous electrical ground wire adjacent to metal conduit or metal tubing.

All electrical terminations shall be tightened to the manufacturer's specified torque values.

All terminals shall be marked with field wiring numbers printed on back or front mounting brackets.

Connection of service wires to City Light wires shall be by City Light wires.

All conductors at every termination and all terminal strips shall be permanently tagged with identifying circuit numbers corresponding to the Signal Wiring Diagram. Wire markers shall be continuous type wired to the circuit numbers. Wire markers shall be applied within 6 inches of the termination.

8-31.3.10(P) PEDESTRIAN PUSH BUTTON CABLE

The cable sheath shall be grounded to the ground system at the controller end only. The cable sheath between cabinet and splice shall be continuous. Otherwise, intermediate junction boxes shall be used to prevent grounding either in such junction box or in any conduit.

8-31.3.10(E) ELECTRICAL SERVICE CONNECTIONS

8-31.3.11(1) POLE LINE HARDWARE INSTALLATION

Spans shall be inscribed above METRO trolley wires with plastic coated wire with additional 6-3 wire insulating material exclusively as an aerial distribution system which is totally aluminum. Electrical conductors shall be used for insulating the final conductor to the final electrical distribution. Aluminum wire shall be self-contained and allow for easy accessibility. Metal conduit shall be installed at each pole. The metal conduit shall be self-contained and shall be installed at each pole.

The service neutral shall be connected to the ground in the controller. The service neutral shall be self-contained and shall be installed at each pole. The service neutral shall be connected to the ground in the controller.

The Engineer shall be notified when the Contractor is ready for the electrical or mechanical connection. The electrical service connection to the overhead secondary or underground vault service wires shall be made by City Light.

Terfer wire shall be mounted a minimum of 18 feet above ground level on the building or structure. On steel poles, no lag or through bolts shall be used.

When existing equipment is to be relocated, the Contractor shall furnish and install all necessary new materials and equipment (including all hardware) required to install the salvaged equipment in the new installation. Any new hardware required to complete the installation shall be of the same quality and type as hardware required in these specifications for all other new work.

All traffic signals, flashing beacons, and illuminated signs to be relocated shall be cleaned, repainted, and reinstalled in the same condition as equipment.

8-31.3.13 REMOVAL AND SAVAGE OF EXISTING EQUIPMENT

(a) Test for continuity of each circuit.
(b) Test for grounds in each circuit which consists of the physical examination of the installation to ensure that all ground jumpers, devices and connections do exist and are mechanically firm, meeting the requirements of Article 230 of the National Electrical Code.
(c) A megger test on each circuit between the conductor and ground with all switchboards, panel boards, fuse holders, switches, receptacles and all current devices in the electrical wiring and grounds recorded. The megger test shall be performed with all wiring installed but current disconnected. The test shall be made to control, control, meter, load switches, or other plug connected accessories. The Contractor shall furnish the Engineer with 3 copies of the test results identifying observed readings with their respective locations prior to any checkout of the installation to be turned on or cut over. One copy shall be filed in the contract and the other two copies in the possession of the Contractor and the Contractor shall furnish one copy of the test to the Engineer.

The insulation resistance on all electrical circuits whose nominal voltage is between 115 volts and 600 volts other than direct buried cable shall not be less than 6 megohms. The insulation resistance on all circuits with total conductor lengths of more than 2,000 feet, shall not be less than 8 megohms for those lines on single conductor lines with 2,000 feet or less.

Any changes in the above stated minimum requirements must be approved in writing by the Engineer. Only those changes which are made in writing are valid. The final test shall be made in writing.

8-31.3.12(1) FINAL INSPECTION

As soon as practical following the completion of the entire work, it will be examined by the Engineer. The Contractor will be notified when the examination is to be made. The Contractor shall submit, at this time, any as-built wiring diagrams for field wiring and/or controller assembly wiring revisions.

If the inspection reveals any defects in the work as specified and as detailed on the drawings, such defects shall be repaired or unsatisfactory work be restored as the Engineer may direct before final acceptance. No extension of the contract time will be granted because of the time required to remedy such defects.

8-31.4 MEASUREMENT

The items of work completed pursuant to Contract Documents will be measured as and when specified in Section 14.01 Measurement of Quantities unless otherwise specified for by individual measurement paragraphs herein this Section. Measurement for "Detector Loop, Grom" will be by jump sum for each measurement. Measurement for "Detector Loop, Grom" will be by each complete installation.

8-31.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 8-31 will be at the unit contract prices listed only for the pay items listed or referenced below:

8-31.6 TERMINATIONS

All electrical terminations shall be tightened to the manufacturer's specified torque values.

All circuits shall be permanently tagged with identifying circuit numbers corresponding to the Signal Wiring Diagram. Wire markers shall be continuous type wired to the circuit numbers. Wire markers shall be applied within 6 inches of the termination.

All conductors at every termination and all terminal strips shall be permanently tagged with identifying circuit numbers corresponding to the Signal Wiring Diagram. Wire markers shall be continuous type wired to the circuit numbers. Wire markers shall be applied within 6 inches of the termination.

The cable sheath shall be grounded to the ground system at the controller end only. The cable sheath between cabinet and splice shall be continuous. Otherwise, intermediate junction boxes shall be used to prevent grounding either in such junction box or in any conduit.

Spans shall be inscribed above METRO trolley wires with plastic coated wire with additional 6-3 wire insulating material exclusively as an aerial distribution system which is totally aluminum. Electrical conductors shall be used for insulating the final conductor to the final electrical distribution. Aluminum wire shall be self-contained and allow for easy accessibility. Metal conduit shall be installed at each pole. The metal conduit shall be self-contained and shall be installed at each pole. The metal conduit shall be self-contained and shall be installed at each pole.

The service neutral shall be connected to the ground in the controller. The service neutral shall be self-contained and shall be installed at each pole. The service neutral shall be connected to the ground in the controller.

The Engineer shall be notified when the Contractor is ready for the electrical or mechanical connection. The electrical service connection to the overhead secondary or underground vault service wires shall be made by City Light.
If an intersection is found to be incomplete or inadequate, in accordance with Section 8-03.172, the Contractor will be charged the actual costs to the City for the unfinished portion. The Contractor will not be billed for the inspection which indicates the signal system is ready for flashing or covering.

SECTION 8-32 POLES, PEDESTALS AND FOUNDATIONS

3.2.1 DESCRIPTION

3.2.1.1 GENERAL

This work shall consist of furnishing and installing poles, luminaries, extensions, pedestals, posts, mastarms, concrete foundations and back guy assemblies as indicated on the Drawings and in accordance with these Specifications and Standard Plan Nrs. 5, 540, 541, 543 and 546 through 548. Pedestals will not be loaded before concrete foundations have set 7 days. Signal related poles shall not be installed until after turn-on or ceramics.

3.2.1.2 APPLICABLE CODES

See Section 8.30.102 for applicable codes.

3.2.1.3 SHOP DRAWINGS

The Contractor shall submit shop drawings in accordance with Section 104.3 for the following material:
(a) All metal poles
(b) Not covers
(c) Mast arms
(d) Luminaries
(e) Anchor bolts, nuts, washers
(f) Bolt anchors

All drain poles or street light only poles which deviate from the Drawings shall include certification by a Licensed Professional Engineer that the metal poles meet all structural requirements.

3.2.2 MATERIALS

Materials shall meet the requirements of the following Sections:
Concrete for foundation 5-46
Poles, Mastarms, Pedestals, and Foundations 8-332
Buck Guy Assemblies

All poles will be subject to inspection at the point of manufacture and at the point of delivery. Inspection and acceptance at the point of manufacture shall not relieve the Contractor of the responsibility to furnish material in accordance with the Specifications.

All materials, and equipment supplied under this Specification shall be guaranteed against defective workmanship and material for a period as indicated in Section 104.10. The Contractor shall be responsible for the return and replacement of any equipment found to be defective within the guarantee period, including labor, freight, shipping and delivery. All material returned to the supplier under the guarantee shall be repaired or replaced and returned to the City by the Contractor at no cost to the City. All charges made because of the provisions will be made by City Light at no cost to the Contractor.

3.2.3 CONSTRUCTION REQUIREMENTS

3.2.3.1 POLIES

Wood poles will be set at the depth indicated in the following table:

<table>
<thead>
<tr>
<th>Length of Pole</th>
<th>Minimum Depth</th>
<th>Set Depth in Rock Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 ft.</td>
<td>3.0 ft.</td>
<td>3.0 ft.</td>
</tr>
<tr>
<td>35 ft.</td>
<td>3.5 ft.</td>
<td>3.5 ft.</td>
</tr>
<tr>
<td>40 ft.</td>
<td>4.0 ft.</td>
<td>4.0 ft.</td>
</tr>
</tbody>
</table>

After each wood pole is set in the ground to the specified depth, the space around the pole shall be backfilled with selected earth or sand, free of rocks and other deleterious material, placed in layers approximately 4 inches thick. Each layer shall be tamped and thoroughly compacted. The poles shall be rated as necessary to be plumb as defined in Section 8.33.103 after loading.

3.2.3.2 FOUNDATIONS

3.2.3.2.1 GENERAL

Foundations shall be Class 5 (0-1/2) concrete and be of the size and configuration indicated on the Drawings. Foundations shall be constructed in undisturbed ground by placing concrete in auger-bored holes or rectangular holes. Concrete shall be placed against undisturbed earth. In unstable ground, metal forms may be used for the top 18 inches of foundation. Each foundation shall be poured in one continuous pouring operation. For purposes of this requirement, delays of more than 20 minutes are not acceptable as one continuous pour. When new excavations are near an existing foundation the Contractor shall provide temporary support for the existing structure until the new concrete has cured.

Anchor bolts shall be set in concrete in place and held in a vertical position with the specified bolt projection and at the specified bolt circle to match the exact bolt pattern of the items to be installed. The top of the bolts shall all be at the same elevation. A concrete cap shall be cast over the top of the bolts and a wood or steel template shall be used at the upper end of the anchor bolt to maintain the correct bolt pattern and spacing. The lower template shall be bolted or welded to the anchor bolt required in the foundation. Anchor bolt(s) in the beam after fabrication.

Prior to placing concrete, all projecting anchor bolts shall be tapped with a corrosion protection tape from a point 6 inches below the top of the foundation to the top of the bolt. This shall be in accordance with Material Standard 792.3 and shall remain permanently in place. Nuts and washers shall be installed over the tape. Immediately after concrete is placed, the location of each anchor bolt shall be marked with a paint conforming to the bolt pattern of the bases of the poles. Concrete shall be of a minimum 3,000 psi strength and cured after the concrete is placed.

Concrete shall be mixed with a ready-mixed concrete plant. A minimum of 12 hours shall be allowed before placing the concrete. Poles shall be set in the bottom foundation and a concrete cap shall be placed over the top of the bases of the poles. Concrete shall be cured in accordance with the specifications. An alternative application of a non-destructive testing film with a pressure sensitive adhesive back may be used when approved by the Engineer.

RECOMMENDED POLE SETTING DEPTH

Length of Pole | Minimum Depth | Set Depth in Rock Feet |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>30 ft.</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>35 ft.</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>40 ft.</td>
<td>4.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

3.2.3.3 GREAT BASIN GENERAL

After each wood pole is set in the ground to the specified depth, the space around the pole shall be backfilled with selected earth or sand, free of rocks and other deleterious material, placed in layers approximately 4 inches thick. Each layer shall be tamped and thoroughly compacted. The poles shall be rated as necessary to be plumb as defined in Section 8.33.103 after loading.
CONDUCT AND TRENCHING

SECTION 8.33

8.33.1 DESCRIPTION

8.33.1.1 GENERAL

The scope of conduct trenching, and furnishing and installing conduit, conduit junction boxes, and handholes for street lighting, traffic, and irrigation systems indicated on the Drawings and as specified in these Specifications and Standard Plans Nos. 306, 306A, and 501.

8.33.1.2 APPLICABLE CODES

See Section 8.36.1.2 for applicable codes.

8.33.2 SHOP DRAWINGS

The Contractor shall submit Shop Drawings for the following in accordance with Section 145.5:

(a) Conduit and Fittings
(b) Conduit Junction Boxes
(c) Stand-off Brackets
(d) Insulated Electrical Cabling System
(e) Expansion Fittings
(f) Weatherhead
(g) Seal and Sealing Compounds
(h) Gasketing Rubber Matting
(i) PVC Coatings to be field installed
(j) Hangers
(k) Flexible Conduit

8.33.2.2 MATERIAL

Materials shall meet the requirements of the following Sections:

Conduits 9.366
Handholes 9.364
Fittings 9.368

8.33.3 CONSTRUCTION REQUIREMENTS

8.33.3.1 TRENCHING

Excavation required for the installation of conduit, foundation, and other materials shall be performed in such a manner as to cause the least possible injury to the streets, sidewalks, and other improvements. Trenches shall not be excavated at any time other than between 6:30 a.m. and 2:00 p.m. on weekdays. Trenching operations shall be in accordance with the requirements of Section 5.18 and 9.14 respectively. Excavated trenches shall be backfilled with sand, and reclaimed at the base of the trench. All backfilled trenches shall be compacted in accordance with the requirements of Section 2.18.

8.33.3.2 DEEPENING

Conduit shall be installed as noted on the Drawings. When installing conduit under existing pavement or sidewalks, where the conduit shall be installed the requirements of Sections 2.18.3 and 3.18.3, and Section 245.2 shall be met for the installation of conduit. During the construction of the project, restoration shall conform with the requirements of Sections 5.18 and 9.14 respectively. The Contractor shall be responsible for providing all materials, labor, and equipment necessary to install the conduit and ensure that the project is returned to an acceptable condition.

8.33.3.3 BURIAL DEPTH

When a new pole is not present, or whose height is below the minimum required for safe operation, the new pole shall be installed at least 36 inches below ground level and parallel to the finished ground level. The pole shall be set in concrete and have a minimum height of 12 feet above the finished grade. The pole shall be anchored to prevent movement due to wind or other forces.

8.33.3.4 RESTORATION

When trenching operations are completed, the Contractor shall be responsible for restoring the area to its original condition. The Contractor shall be required to provide all necessary equipment and materials, labor, and supervision necessary to complete the restoration work. The Contractor shall be responsible for ensuring that the restored area is in compliance with all applicable codes and regulations.

8.33.3.5 HANDHOLES

Handholes shall be installed at the locations indicated on the Drawings. The Contractor shall be responsible for providing all necessary equipment and materials, labor, and supervision necessary to complete the installation of handholes. The Contractor shall be required to provide all necessary equipment and materials, labor, and supervision necessary to complete the restoration work. The restored area shall be in compliance with all applicable codes and regulations.
CONDUIT AND TRENCHING

Suitable marker stakes or nails shall be set flush with the ground to locate the ends of conduits which may be buried so the exact location of the ends of the conduits is made known to the workmen. Each end shall be marked with the name of the utility company. Conduits buried in concrete shall be placed a minimum of 18 inches from the edge of the curb or sidewalk. The utility company shall be responsible for the maintenance of the conduits as may be necessary to ensure the safety of the public.

CONDUIT AND TRENCHING

All conduits shall be of the insulated type. The conduits shall be of the proper size for the service to be furnished. A minimum of 2 inches of concrete shall be placed over the conduit to protect it from damage. The conduits shall be of a type approved by the local electrical inspector.

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The conduit shall be of the insulated type. The conduit shall be of the proper size for the service to be furnished. A minimum of 2 inches of concrete shall be placed over the conduit to protect it from damage. The conduits shall be of a type approved by the local electrical inspector.

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DEFINITIONS AND TESTS

DIVISION 9
MATERIALS

SECTION 9-00 DEFINITIONS AND TESTS

9-00.1 FRACTURE
Fractured aggregate is defined as aggregate particles which have one or more fractured faces. A face will be counted as fractured whenever either or more of the projected area of the particle is comprised of a fractured face when viewed normal to the fractured face.

9-00.2 WOOD WASTE
Wood waste is defined as all material which, after drying to constant weight, has a specific gravity of less than 1.0.

9-00.3 TEST FOR WEIGHT OF GALVANIZING
At the option of the Engineer, the weight of zinc in ounces per square foot required by the various galvanizing specifications may be determined by an approved magnetic thickness gage suitably checked and demonstrated for accuracy, in lieu of the other methods specified.

9-00.4 SIEVE ANALYSIS OF AGGREGATES
Sieve analysis for acceptance of aggregate gradation shall be performed by procedures described in WSDOT Test Method 104 as follows:

(a) Procedure A (dry-sieved testing) shall be the sole basis of acceptance for portland cement concrete aggregate, aggregate for BIT, and for aggregate for MCP that is being stockpiled for use on a future contract. All other aggregate may be accepted based on Procedure A or as provided below.

(b) Procedure B (partial washed testing, with correlation) may be used as the basis of acceptance for all aggregate other than those described in item (a) above.

(c) Procedure C (dry sieving, with correlation) may be used for informational testing or acceptance testing for all aggregates except as restricted in item (a) above. In case of disputed results obtained by Procedure C, Procedure A shall be the reference test method.

9-00.5 DUST RATIO
The dust ratio is defined as the percent of material passing the U.S. No. 200 sieve divided by the percent of material passing the U.S. No. 4 sieve.

9-00.6 SAND/SLT RATIO
The sand/silt ratio is defined as the percent of material passing the U.S. No. 15 sieve divided by the percent of material passing the U.S. No. 200 sieve.

9-00.7 GALVANIZED HARDWARE, AASHTO M 232
An acceptable alternate to hot-dip galvanizing in accordance with AASHTO M 232 will be zinc coatings mechanically deposited in accordance with AASHTO M 398, providing the minimum thickness of zinc coating is not less than that specified in AASHTO M 232, and the process will not produce hydrogen embrittlement in the base metal. Sampling and testing will be made by the Engineer in accordance with commonly recognized national standards and methods used in the laboratory of the Seattle Engineering Department.

SECTION 9-01 PORTLAND CEMENT

9-01.1 TYPES OF CEMENT
Cement shall be classified as Type II cement or Type III cement.

9-01.2 SPECIFICATIONS

9-01.2(1) TYPE II PORTLAND CEMENT
Type II cement shall conform to the requirements for Type II cement of the Standard Specifications for Portland Cement, AASHTO M 85, except that the content of ash shall not exceed 0.75 percent by weight calculated as Na₂O plus 0.658 Kg.

Type II cement shall meet the requirements of the above specifications for compressive strength and for time of setting by the Vicat method, AASHTO T 131.

9-01.2(2) TYPE III PORTLAND CEMENT
Type III cement in cloth bags shall not be used. Type III cement shall conform to the requirements for Type III cement of the Standard Specifications for Portland cement, AASHTO M 85, except that the content of ash shall not exceed 0.75 percent by weight calculated as Na₂O plus 0.658 Kg. It shall meet the requirements of the above specifications for compressive strength and for time of setting by the Vicat method, AASHTO T 131.

9-01.2(3) LOW ALKALI CEMENT
The percentage of ashes in low-alkali cement shall not exceed 0.60 percent by weight calculated as Na₂O plus 0.658 Kg. This limitation shall apply to all types of Portland cement. Percentage of ashes shall be determined in accordance with ASTM Designation C114.

9-01.3 TESTS AND ACCEPTANCE
Cement may be accepted by the Engineer based on the manufacturer's Certification of Cement Shipment indicating full conformance to the specifications. All shipments of the cement to the Contractor or concrete supplier shall be accompanied by a Certification of Cement Shipment. The concrete supplier or Contractor shall supply three copies of this certificate and submit all three copies to the Engineer.

Each mixing facility or plant emitting Portland cement shall be equipped with a suitable means or device for obtaining a representative sample of the cement. The device shall enable the sample to be readily taken in proximity to the cement weigh hopper and from a container or conveyer holding only cement.

Cement will be tested using samples taken at the job site by the Engineer for submission to the Materials Laboratory for testing.

9-01.4 STORAGE ON THE WORK SITE
The cement shall be stored on the site in a manner so as to permit easy access for inspection and identification. Cement shall be adequately protected at all times from rain and dampness. Cement which, in the opinion of the Engineer, contains lumps that will not be pulverized in the mixer shall be rejected.

Type III portland cement stored by the Contractor for a period longer than 30 days, or Type II portland cement stored by the Contractor for a period longer than 60 days, shall be rejected if the contractor has lost strength during the period of storage, as shown by tests of the Seattle Engineering Department, sufficient additional cement shall be added to the mix to overcome such loss, or the cement may be rejected. The amount of cement to be added to the mix shall be determined by the Engineer.
SECTION 9-02 BITUMINOUS MATERIALS

9-02.1 ASPHALT MATERIAL

9-02.1.1 GENERAL
Asphalt furnished under these specifications shall not have been distilled at a temperature high enough to injure by burning or to produce flocks of carbonaceous matter, and upon arrival at the work, shall show no signs of separation into lighter and heavier components.

6-02.1(2) MEDIUM-CURING (MC) LIQUID ASPHALT

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>WSDOT Test Method</th>
<th>MC-70</th>
<th>MC-250</th>
<th>MC-800</th>
<th>MC-3000</th>
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</thead>
<tbody>
<tr>
<td>Kinematic Viscosity at 140°F psi</td>
<td>202</td>
<td>70-140</td>
<td>200-350</td>
<td>800-1600</td>
<td>3000-6000</td>
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<tr>
<td>Flash Point (Dual) Min.°F</td>
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<td>100</td>
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<tr>
<td>Water Content Max. %</td>
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<td>Distillation volume %</td>
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<td>0.20</td>
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<tr>
<td>to 100°F</td>
<td>65.40</td>
<td>65.50</td>
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<td>to 200°F</td>
<td>73.46</td>
<td>73.52</td>
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<tr>
<td>to 300°F</td>
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<tr>
<td>to 375°F</td>
<td>86.00</td>
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<tr>
<td>to 475°F</td>
<td>90.60</td>
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<tr>
<td>Residue at 600°F %</td>
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<td>94.00</td>
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</tbody>
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<table>
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<tr>
<th>Characteristic</th>
<th>WSDOT Test Method</th>
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<th>MC-250</th>
<th>MC-800</th>
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<tbody>
<tr>
<td>Absolute viscosity at 60°F poise</td>
<td>203</td>
<td>300-1200</td>
<td>300-1200</td>
<td>300-1200</td>
<td>300-1200</td>
</tr>
<tr>
<td>Ductility, cm/min. at 77°F Min.</td>
<td>213</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<td>Solubility in Trichloroethylene Min. %</td>
<td>214</td>
<td>99.9</td>
<td>99.9</td>
<td>99.9</td>
<td>99.9</td>
</tr>
</tbody>
</table>

The material shall be usable when heated to a temperature recommended in Section 5-03.20.

9-02.1(3) RAPID-CURING (RC) LIQUID ASPHALT

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>WSDOT Test Method</th>
<th>RC-70</th>
<th>RC-250</th>
<th>RC-800</th>
<th>RC-3000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinematic Viscosity at 140°F psi</td>
<td>202</td>
<td>70-140</td>
<td>200-350</td>
<td>800-1600</td>
<td>3000-6000</td>
</tr>
<tr>
<td>Flash Point (Dual) Min.°F</td>
<td>207</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Water Content Max. %</td>
<td>217</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Distillation volume % of total distillate to 300°F</td>
<td>211</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>to 375°F Min.</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>to 475°F Min.</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>to 600°F Min.</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Residue at 600°F volume by difference Min. %</td>
<td>55</td>
<td>65</td>
<td>70</td>
<td>75</td>
<td>80</td>
</tr>
<tr>
<td>Properties of residue from distillation to 600°F</td>
<td>203</td>
<td>100-2400</td>
<td>100-2400</td>
<td>100-2400</td>
<td>100-2400</td>
</tr>
<tr>
<td>Ductility, cm/min. at 77°F Min.</td>
<td>213</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Solubility in Trichloroethylene Min. %</td>
<td>214</td>
<td>99.0</td>
<td>99.0</td>
<td>99.0</td>
<td>99.0</td>
</tr>
</tbody>
</table>

The material shall not be used when heated to a temperature recommended in Section 5-03.20.

9-02.1(4) PAYING ASPHALT

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>WSDOT Test Method</th>
<th>AR-4000W</th>
<th>AR-2000W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute viscosity at 60°F poise</td>
<td>203</td>
<td>2500-5000</td>
<td>1500-2500</td>
</tr>
<tr>
<td>Kinematic Viscosity at 77°F psi, Min.</td>
<td>202</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Penetration at 77°F 100g/5 sec. min.</td>
<td>201</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>Percent of original penetration at 77°F Max.</td>
<td>202</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>Ductility of 60°F (1 cm/min.) cm. min.</td>
<td>213</td>
<td>10</td>
<td>20</td>
</tr>
</tbody>
</table>

Test on Original Asphalt:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>WSDOT Test Method</th>
<th>AR-4000W</th>
<th>AR-2000W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flashpoint (Cleveland Open Cup) °F min.</td>
<td>206</td>
<td>440</td>
<td>425</td>
</tr>
<tr>
<td>Solubility in Trichloroethylene, % min.</td>
<td>214</td>
<td>99.0</td>
<td>99.0</td>
</tr>
</tbody>
</table>

† TPO may be used but RTFC Shall be the referee method.

† Original penetration as well as penetration after RTFC loss will be determined by WSDOT Test Method 202.
**REJUVENATING (RECYCLING) AGENTS**

The rejuvenating agent shall be a liquid emulsion of selected refined petroleum oil approved for use by the Materials Laboratory. Rejuvenating agents shall meet the following specifications for the grade designated:

<table>
<thead>
<tr>
<th>Test Method</th>
<th>RA 5</th>
<th>RA 10</th>
<th>RA 15</th>
<th>RA 25</th>
<th>RA 50</th>
<th>RA 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2171</td>
<td>200</td>
<td>400</td>
<td>1000</td>
<td>4000</td>
<td>5000</td>
<td>10,000</td>
</tr>
<tr>
<td>D2172</td>
<td>10,000</td>
<td>15,000</td>
<td>20,000</td>
<td>35,000</td>
<td>40,000</td>
<td>60,000</td>
</tr>
</tbody>
</table>

*Note: The use of ASTM D175 has not been studied in the context of this specification; however, it may be applicable. In cases of dispute, the reference method shall be ASTM D2172.*

**HOT MIX RECYCLING AGENTS**

<table>
<thead>
<tr>
<th>HOT MIX RECYCLING AGENTS</th>
<th>Test Method</th>
<th>RA 5</th>
<th>RA 10</th>
<th>RA 15</th>
<th>RA 25</th>
<th>RA 50</th>
<th>RA 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2017</td>
<td>200</td>
<td>400</td>
<td>1000</td>
<td>4000</td>
<td>5000</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>D2171</td>
<td>10,000</td>
<td>15,000</td>
<td>20,000</td>
<td>35,000</td>
<td>40,000</td>
<td>60,000</td>
<td></td>
</tr>
</tbody>
</table>

*Note: The final acceptance of recycling agents meeting this specification is subject to the compliance of the reconstituted asphalt blends with the requirements in Section 902 for the class of asphalt mix required.*
9-02-25.5 ASPHALT EMLUSION

9-02.25.5(1) GENERAL

The asphalt emulsion shall be in accordance with the requirements of Section 501.1.1, except that the minimum softening point shall be 177°F.

9-02.25.5(2) TEST PROCEDURE

The emulsion shall be in accordance with the following requirements:

- Test on emulsion:
  - CQUb
  - CQUb-late

- Settled by distillation:
  - 285 min.
  - 340 min.

- Sieve Test, retained on No. 10:
  - 0.35 max.
  - 0.208 max.

- pH:
  - 6.5 max.
  - 6.5 max.

- Settled for 5 days:
  - 0.03 max.
  - 0.03 max.

- Particle Content:
  - Positive
  - Positive

- Test on residue:
  - Penetration at 77°F: 100 sec. 45.0
  - 55.0

- Solubility in Toluenediethylether: 375 min.

- Density at 77°F:
  - 0.03 max.
  - 0.44 min.

- Emulsions shall pass all ASTM Specifications for Curing Emulsions.

- Curing Emulsion, Grade A, SSA, SSA-116, Water Striping Test for Cured Saturated Emulsions shall also be applied to determine test for curing, and shall be in accordance with the test of a given aggregate.

- Latex Modified Emulsion:

In addition to the requirements for CQUb-late above, the latex modified emulsion shall have added to it a bituminous binder. The binder shall be reflective of the properties of laterite meetings:

- Non-Valuable:
  - 64.0

- Viscosity, mls Brookfield, 60 RPM:
  - 120-1300

- Particle size, micron:
  - 1.0

- Free water present, %:
  - 0.6

- Odor:
  - Very slight

- Specific Gravity:
  - 1.0

- Loss On Ignition:
  - 5.0

- Proportion to Asphalt Emulsion: 0.1% by weight - depending on aggregate and job demands.

9-03.1 AGGREGATES FOR PORTLAND CEMENT CONCRETE

9-03.1.1 GENERAL REQUIREMENTS

Portland cement concrete: aggregates shall be manufactured from local rock, sand, or soil and gravel in accordance with the provisions of Section 501.1.1. They shall possess the characteristics of shape and size such that the concrete, resulting from a mixture of fine and coarse aggregate, that, when specified, shall exhibit the workability which is satisfactory to the Engineer. Regardless of compatibility with all other specified materials, if the concrete is not a workable character, or does not exhibit a proper surface when finished, either the fine or coarse aggregate, or both, will be rejected, and shall be altered as required by the Engineer.

If, in the judgment of the Engineer, on the basis of previous experience or laboratory tests, concise aggregate from a given source is not as durable with the alkali in portland cement, concrete containing, including test of only fine cement may be required as a condition of approval.

9-03.1.2 FINE AGGREGATE FOR PORTLAND CEMENT CONCRETE

9-03.1.2(A) GENERAL

Fine aggregates shall consist of sand or gravel, cementitious, approved by the Engineer, having hard, strong, durable particles for coarse aggregate, and shall be free from any deleterious materials. The aggregate shall be free from harmful materials, such as clay, mica, silt, organic matter, or other deleterious matter. When required by the Engineer, the fine aggregate shall be subjected to the necessary tests and analysis.

9-03.1.2(B) DELETERIOUS SUBSTANCES

The amount of deleterious substances in the washed aggregate (except as noted in the following table) shall be as follows:

- (a) Particles of specific gravity less than 1.85 shall be no greater than 10.0 percent by weight.
- (b) Organic matter, by colorimetric test, shall not be greater than 0.10 percent by weight.
- (c) Chlorides shall not be greater than 0.05 percent by weight.
- (d) Sulfates shall not be greater than 0.05 percent by weight.
- (e) Carbonates shall not be greater than 0.05 percent by weight.

9-03.1.2(C) GRADING

Fine aggregate shall be regularly graded from coarse to fine in two sizes and when separated by means of the U.S. Standard sieves shall meet the following grading requirements expressed as percentages by weight. Class I shall be used unless otherwise specified.

<table>
<thead>
<tr>
<th>Class</th>
<th>Max. Min.</th>
<th>Max. Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>II</td>
<td>90</td>
<td>50</td>
</tr>
<tr>
<td>III</td>
<td>80</td>
<td>50</td>
</tr>
<tr>
<td>IV</td>
<td>75</td>
<td>50</td>
</tr>
</tbody>
</table>

9-03.1.3 DELETERIOUS SUBSTANCES

- The amount of deleterious substances shall not exceed the following:
- (a) Particles of specific gravity less than 1.85 shall be no greater than 10.0 percent by weight.
- (b) Organic matter, by colorimetric test, shall not be greater than 0.10 percent by weight.
- (c) Chlorides shall not be greater than 0.05 percent by weight.
- (d) Sulfates shall not be greater than 0.05 percent by weight.
- (e) Carbonates shall not be greater than 0.05 percent by weight.
- (f) Oxides of sulfur shall not be greater than 0.05 percent by weight.

9-03.1.3(C) WEAR IN LOS ANGELES MACHINE

Coarse aggregate shall not have a percentage of wear in the Los Angeles machine of 10 percent over 50 revolutions.
9-03.12D GRADING

Coarse aggregate for Portland cement concrete when permitted by means of laboratory tests shall conform to one of more of the following gradings as called for elsewhere in the Specifications, Project Manual or in the Drawings:

Graging 0.2 0.4 0.6 0.8 1.0

9-03.12F CONCRETE STRENGTH

Concrete made from coarse aggregate, graded to comply with the requirements of these Specifications, when combined with the specified proportions of cement and the fine aggregate proposed for use with the coarse aggregate, shall develop compressive and flexural strengths at age of 14 days of not less than 30 percent of that developed by concrete made from the same cement and washed sand and gravel from Inlandco, Washington, of the same grading and mixed in the same proportion and to the same consistency.

The increase of compressive and the use of admixture will not be permitted for the purpose of qualifying aggregates.

9-03.2 VACANT

9-03.3 VACANT

9-03.4 AGGREGATE FOR BITUMINOUS SURFACE TREATMENT

9-03.4.1 GENERAL REQUIREMENTS

Aggregate for bituminous surface treatment shall be manufactured from live rock, talus, or gravel, in accordance with Section 3-01, which meets the following test requirements:

Los Angeles Wear, 500 Rev. 30% max.
Degradation Factor 30% max.

9-03.4.2 GRADING

9-03.4.2D TESTING REQUIREMENTS

Aggregate for asphalt treated base shall comply with the following test requirements:

Sieve Size Percent Passing
0.075 100
0.05 60
0.03 25
0.015 20
0.01 10

9-03.12F USE OF SUBSTANDARD GRADINGS

Coarse aggregate containing more than the maximum percentage passing any sieve may be accepted provided the cement content of the finished concrete is increased at the discretion of the Engineer.

The average of three successive tests shall be within the percentage stated above. Coarse aggregate shall consist of pieces of greater size than one half the maximum sieve size for the specified grading measured along the line of greatest dimension.

Acceptance of grading and quality of the aggregate will be based on sampling taken from stockpiles at the concrete plant. The exact point of acceptance will be determined in the field by the Engineer.

9-03.12F USE OF STANDARD GRADINGS

9-03.4.2D CRUSHED STONE

Crushed Stone

9-03.4.2D PASSENGER SCAVENGE PARTS

Percent Passing

9-03.4.2D SANDBOX PARTS

PASSENGER SCAVENGE

Test Pass Pass Pass Pass Pass

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9-03.4.2D SANDBOX PULLER

Test Pass Pass Pass Pass Pass

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AGGREGATES

The aggregate shall be of usual size and shall be clean, uniform in quality, and free from mud, rock, barns, and other deleterious materials.

Crushed screenings shall be substantially free from adherent coatings. The presence of a thin, firmly adhering film of weathered rock shall not be considered as coating unless it exists on more than 30 percent of the surface area of any site between successive laboratory tests.

The portion of aggregate for bituminous surface treatment shall be free of more than 1 percent deleterious materials by weight.

9-03.5 VACANT

9-03.6 AGGREGATES FOR ASPHALT TREATED BASE (ATB)

9-03.6.1 GENERAL REQUIREMENTS

Aggregate for asphalt treated base shall be manufactured from live rock, talus, or gravel, in accordance with the provisions of Section 3-01 that meet the following test requirements:

Los Angeles Wear, 500 Rev. 30% max.
Degradation Factor 30% max.

9-03.6.2 GRADING

9-03.6.2D TESTING REQUIREMENTS

Aggregates for asphalt treated base shall comply with the following test requirements:

Sieve Size Percent Passing
0.075 100
0.05 60
0.03 25
0.015 20
0.01 10

9-03.6.2D SANDBOX PARTS

PASSENGER SCAVENGE

Test Pass Pass Pass Pass Pass

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9-03.6.2D SANDBOX PULLER

Test Pass Pass Pass Pass Pass

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AGGREGATES

The aggregate shall be of usual size and shall be clean, uniform in quality, and free from mud, rock, barns, and other deleterious materials.

Crushed screenings shall be substantially free from adherent coatings. The presence of a thin, firmly adhering film of weathered rock shall not be considered as coating unless it exists on more than 30 percent of the surface area of any site between successive laboratory tests.

The portion of aggregate for bituminous surface treatment shall be free of more than 1 percent deleterious materials by weight.

9-03.5 VACANT

9-03.6 AGGREGATES FOR ASPHALT TREATED BASE (ATB)

9-03.6.1 GENERAL REQUIREMENTS

Aggregate for asphalt treated base shall be manufactured from live rock, talus, or gravel, in accordance with the provisions of Section 3-01 that meet the following test requirements:

Los Angeles Wear, 500 Rev. 30% max.
Degradation Factor, Wearing Course 30% max.
Degradation Factor, Other Courses 30% max.

It shall be uniform in quality, substantially free from wood, barns, and other deleterious materials, and adherent coatings. The presence of a thin, firmly adhering film of weathered rock shall not be considered as coating unless it exists on more than 30 percent of the surface area of any site between successive laboratory tests.

Aggregate removed from depots contaminated with various types of waste shall be washed, processed, selected, or otherwise treated to remove sufficient wood waste so that the oven-dried material retained on a 1.4 inch square sieve shall not contain more than 1 percent by weight of material with a specific gravity less than 1.0.

9-03.6.2 TEST REQUIREMENTS

Aggregates for asphalt concrete shall meet the following test requirements:

Class of Asphalt Concrete

Fraction, by weight (See Note 20) 30 20 15 10 5
Sand Equivalent Min. 45 45 45 45 45

9-03.6.2D TESTING REQUIREMENTS

Aggregates for asphalt treated base shall be manufactured from live rock, talus, or gravel, in accordance with the provisions of Section 3-01 that meet the following test requirements:

Los Angeles Wear, 500 Rev. 30% max.
Degradation Factor, Wearing Course 30% max.
Degradation Factor, Other Courses 30% max.

It shall be uniform in quality, substantially free from wood, barns, and other deleterious materials, and adherent coatings. The presence of a thin, firmly adhering film of weathered rock shall not be considered as coating unless it exists on more than 30 percent of the surface area of any site between successive laboratory tests.

Aggregate removed from depots contaminated with various types of waste shall be washed, processed, selected, or otherwise treated to remove sufficient wood waste so that the oven-dried material retained on a 1.4 inch square sieve shall not contain more than 1 percent by weight of material with a specific gravity less than 1.0.

9-03.6.2D TEST REQUIREMENTS

Aggregates for asphalt treated base shall comply with the following test requirements:

Class of Asphalt Concrete

Fraction, by weight (See Note 20) 30 20 15 10 5
Sand Equivalent Min. 45 45 45 45 45

9-03.6.2D TESTING REQUIREMENTS

Aggregates for asphalt treated base shall comply with the following test requirements:

Class of Asphalt Concrete

Fraction, by weight (See Note 20) 30 20 15 10 5
Sand Equivalent Min. 45 45 45 45 45

9-03.6.2D PASSING SCAVENGE PARTS

Percent Passing

0.075 100
0.05 60
0.03 25
0.015 20
0.01 10

9-03.6.2D SANDBOX PULLER

Test Pass Pass Pass Pass Pass

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9-03

9-03.1(D) GRADING

Course aggregate No. 5 shall not be used under any circumstances where the combined amount passing any sieve exceeds the following:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>2/3&quot; square</th>
<th>1/4&quot; square</th>
<th>1/2&quot; square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot; #4</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1/8&quot; #4</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1/8&quot; #4</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

9-03.1(C) CONCRETE STRENGTH

Concrete made from course aggregate, grouted to comply with the requirements of these specifications, when combined with the specified proportions of cement and the fine aggregate proposed for use with the coarse aggregate, shall develop compressive and flexural strengths at 14 days of not less than 50 percent of that developed by concrete made from the same cement and washed sand and gravel from the same source, Washington, of the same grading and mixed in the same proportions and to the same consistency.

The increase of cement content or the use of admixtures will not be permitted for the purpose of qualifying aggregates.

9-03.2 VACANT

9-03.3 VACANT

9-03.4 AGGREGATES FOR BITUMINOUS SURFACE TREATMENT

9-03.4(1) GENERAL REQUIREMENTS

Aggregates for bituminous surface treatment shall be manufactured from ledge rock, talus, or gravel, in accordance with Section 346, which meets the following test requirements:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>1/4&quot; square</th>
<th>1/32&quot; square</th>
<th>1/8&quot; square</th>
<th>1/16&quot; square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot; square</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1/32&quot; square</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

9-03.4(2) GRADING AND QUALITY

The material shall conform to the grading and quality when placed in hauling vehicles for delivery to the job site. The Engineer shall determine acceptance of the material and grading quality at the time of construction placement and during placement into a temporary stockpile. The gradation and quality of the aggregates will be based on samples taken from the stockpile.

When the aggregates are combined within the limits set forth in Section 340.5(2) and mixed in the laboratory with the designated grade of asphalt, the mixture shall be capable of meeting the following test values:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>1/4&quot; square</th>
<th>1/32&quot; square</th>
<th>1/8&quot; square</th>
<th>1/16&quot; square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot; square</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1/32&quot; square</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

9-03.5 VACANT

9-03.6 VACANT

9-03.7 VACANT

9-03.8 AGGREGATES FOR ASPHALT TREATED BASE (ATB)

9-03.8(1) GENERAL REQUIREMENTS

Aggregates for asphalt treated base shall be manufactured from ledge rock, talus, or gravel, in accordance with the provisions of Section 346, which meet the following test requirements:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>1/4&quot; square</th>
<th>1/32&quot; square</th>
<th>1/8&quot; square</th>
<th>1/16&quot; square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot; square</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1/32&quot; square</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

9-03.8(2) GRADING

Aggregates for asphalt treated base shall meet the following requirements for grading:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot; square</td>
<td>100</td>
</tr>
<tr>
<td>1/32&quot; square</td>
<td>100</td>
</tr>
<tr>
<td>1/8&quot; square</td>
<td>100</td>
</tr>
<tr>
<td>1/16&quot; square</td>
<td>100</td>
</tr>
</tbody>
</table>

9-03.9 VACANT

9-03.10 VACANT
### 9-03.8(c) GRADATION—IMMEDIATE USE

The Contractor may furnish aggregates for use on the same Contract from a single stockpile or from multiple stockpiles. The gradation of the aggregates may differ from the sizes specified in Section 9-03.8(f) if the completed mixture complies in all respects with the pertinent requirements of Section 9-03.8(f).

Acceptance of the aggregate gradation shall be based on samples taken from the final mix.

### 9-03.8(d) GRADING—FUTURE USE

When produced for future work on other Contracts, aggregate for Classes B, E, or F asphalt concrete, shall be furnished and stockpiled separately in the following applicable sizes: 1/4 inch to 1/2 inch, 1/2 inch to 1 inch, 1 inch to 2 inches, and 2 inches to 4 inches. The aggregates produced shall meet the grading requirements set forth in the table below. Acceptance of the aggregate shall be based on gradation tests at the time of stockpiling.

#### COARSE AGGREGATE

<table>
<thead>
<tr>
<th>Class of Asphalt Concrete</th>
<th>B</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Size</td>
<td>5/8&quot;/3/4&quot;</td>
<td>1/4/1/2&quot;</td>
<td>1/4&quot;/3/8&quot;</td>
<td>3/8&quot;/1/2&quot;</td>
<td>1/2&quot;/1&quot;</td>
</tr>
<tr>
<td>Percent Passing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/4&quot;/1/2&quot;</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>3/8&quot;/1/2&quot;</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1/2&quot;/1&quot;</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1/2&quot;/1/2&quot;</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1/2&quot;/1/4&quot;</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

All percentages are by weight.

### 9-03.8(e) BLENDING SAND

In the production of aggregate for asphalt concrete there is often a necessity of material passing the U.S. No. 40. When this occurs, blending sand in an amount specified by the Engineer may be used to make up this deficiency, provided that a satisfactory fit is made, including factors such as particle size distribution and shape. It is of utmost importance that such sand, when used, conform to the requirements specified in Section 9-03.8(e) as shown in the Product Manual. The new aggregate shall meet the general requirements listed in Section 9-03.8(f) if it shall meet the aggregate fracture and sand equivalent requirements as listed in Section 9-03.8(d).

### 9-03.8(f) PROPORTIONS OF MATERIALS

The materials of which asphalt concrete is composed shall be of such sizes, gradings, and quantities that, when proportioned together, they will produce a well graded mixture within the requirements listed in the table which is to be furnished by the Contractor for the determination of a Project Mix Design, the Contractor shall submit to the Engineer representative samples of the various aggregates to be used along with gradation data showing the particle size gradation and variation of the aggregates as produced together with proposed mixing ratios and average gradation of the combined mix. The initial asphalt content shall be determined by the Engineer from the aggregate data and provided.

The percentages of aggregate include mineral filler, when used, to refer to the compacted dry mix. The percentage of asphalt refers to the complete asphalt concrete mixture.

### 9-03.8(c) GRADATION—RECYCLED ASPHALT PAVEMENT AND MINERAL AGGREGATE

Asphalt concrete plantings and old asphalt concrete utilized in the production of asphalt concrete shall be sized prior to entering the mixture so that a uniform and thoroughly mixed asphalt concrete is produced in the mixture. If there is evidence of the old asphalt concrete not breaking down during the blending and mixing of the asphalt concrete, the Engineer may elect to modify the maximum size entering the mixture. No contamination by deleterious materials will be allowed in the old asphalt concrete used.

The gradation for the new mineral aggregate used in the production of the asphalt concrete shall be the responsibility of the Contractor, and when combined with recycled material the combined material shall meet the gradation specifications required for the specified Class A as listed in Section 9-03.8(a) or as shown in the Product Manual. The new aggregate shall meet the general requirements listed in Section 9-03.8(f) if it shall meet the aggregate fracture and sand equivalent requirements as listed in Section 9-03.8(d).

### 9-03.8(d) BLENDING SAND

In the production of aggregate for asphalt concrete there is often a necessity of material passing the U.S. No. 40. When this occurs, blending sand in an amount specified by the Engineer may be used to make up this deficiency, provided that a satisfactory fit is made, including factors such as particle size distribution and shape. It is of utmost importance that such sand, when used, conform to the requirements specified in Section 9-03.8(e) as shown in the Product Manual. The new aggregate shall meet the general requirements listed in Section 9-03.8(f) if it shall meet the aggregate fracture and sand equivalent requirements as listed in Section 9-03.8(d).

The percentages are by weight.

### 9-03.9(3) SHOULDER BALLAST

Shoulder ballast shall meet the requirements of Section 9-03.9(d) for ballast, except that the gradation shall meet the requirements of Section 9-03.9(e) for Mineral Aggregate Type 1. The portion of crushed asphalt concrete used shall be crushed by the Engineer.

### 9-03.9(3) CRUSHED SURFACING

Except as otherwise specified below, crushed surfacing shall be manufactured from ledge rock or talus obtained from sources approved by the Engineer. Crushed surfacing shall meet the requirements of Section 9-03.16 for Mineral Aggregate Type 1.

### 9-03.9(d) BALLAST

Ballast ballast shall be manufactured from ledge rock or talus obtained from sources approved by the Engineer. Crushed surfacing shall be a well graded mixture with no naturally occurring fines and shall be applied on each section in accordance with the specifications and standards that are to be furnished by the Engineer or Contract Documents.

When approved by the Engineer, Mineral Aggregate, Type 1 or 2 may be utilized for roadway ballast in lieu of Mineral Aggregate, Type 14.

Ballast shall be a totally crushed material with no naturally occurring fines and shall be applied in material retained on each sieve size 1/4 inch above and if that sieve retains more than 5 percent of the total sample.
9-03.0(4) MAINTENANCE ROCK

Maintenance rock shall meet all requirements of Sections 9-03.03, 9-03.06, and 9-03.09, except that if it also meets the following specifications for grading:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot; square</td>
<td>100</td>
</tr>
<tr>
<td>1/4&quot; square</td>
<td>55.70</td>
</tr>
<tr>
<td>U.S. No. 40</td>
<td>10.50</td>
</tr>
<tr>
<td>U.S. No. 200</td>
<td>1.75</td>
</tr>
</tbody>
</table>

All percentages are by weight.

9-03.0(5) SAND FILLER

Sand filler shall consist of naturally occurring sand grains, preferably angular, screened from natural deposits at meeting the requirements of Section 9-03.14 for Filter Aggregate Type 11.

9-03.10 AGGREGATE FOR GRAVEL BASE

Gravel base shall meet the requirements of Sections 9-03.13 and 9-03.14 for Filter Aggregate Type 11.

9-03.11 CRUSHED GRAVEL

Crushed gravel shall be manufactured by mechanical crushing, washed gravel, and shall meet the gradation requirements of Section 9-03.15 for Filter Aggregate Type 15, 25, and 24 through 24. The number of fractured surfaces and the minimum percent of crushed particles required have the fractured surfaces specified are as follows:

<table>
<thead>
<tr>
<th>Mineral Aggregate Type</th>
<th>Number of Minimum Percent Required</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fractured Surfaces</td>
</tr>
<tr>
<td></td>
<td>1G 2 or more 90%</td>
</tr>
<tr>
<td></td>
<td>2G 2 or more 90%</td>
</tr>
<tr>
<td></td>
<td>21 1 or more 75%</td>
</tr>
<tr>
<td></td>
<td>22 1 or more 75%</td>
</tr>
<tr>
<td></td>
<td>23 1 or more 75%</td>
</tr>
<tr>
<td></td>
<td>24 2 or more 55%</td>
</tr>
</tbody>
</table>

9-03.12 GRAVEL BACKFILL

Gravel backfill shall consist of crushed, partially crushed, or naturally occurring granular material depending on the type and project specifications. The aggregate shall be specified by the Engineer or the Contract Documents.

The page numbers 281 & 282 were transposed in the book.
9-03.12(1) GRAVEL BACKFILL FOR FOUNDATIONS

Gravel backfill for foundations, Class A, shall meet the requirements of Section 9-03.9 and 9-03.16 for Material Aggregate Type 2 or Material Aggregate Type 14, whichever is specified.

9-03.12(1B) CLASS B

Gravel backfill for foundations, Class B, shall conform to the requirements of Section 9-03.12(2) for Mineral Aggregate Type 17.

9-03.12(2) GRAVEL BACKFILL FOR WALLS

Gravel backfill for walls shall consist of free draining sand and gravel, or naturally occurring gravel or screened sources, having such characteristics of size and shape that it will compact readily and meet the requirements of Section 9-03.16 for Mineral Aggregate Type 17.

9-03.12(2) GRAVEL BACKFILL FOR PIPE BEDDING

Pipe bedding material shall meet the requirements of Section 9-03.16 for Mineral Aggregate Type 9 and Material Aggregate Type 22 as specified on the Drawings and Standard Plan No. 38.

Gravel bedding, Mineral Aggregate Type 9 shall consist of screened sand, gravel, or other inert materials, or combinations thereof, from sources approved by the Engineer. The aggregate shall have hard, strong, durable particles free from adherent coatings. The particle shall be washed thoroughly to remove clay, loam, shale, organic matter, or other deleterious substances. The amount Of deleterious substances in the washed, dry gravel shall not exceed values specified in Section 9-03.12(3).

Gravel bedding, Material Aggregate Type 22 shall be manufactured from screened crushed gravel. The finished product shall be clean, uniform in quality and free from sand, soil, roots, and other deleterious materials. The crushed aggregate shall be unaffected free from adherent coatings. The presence of a thin, firmly adhering film of weathered rock shall not be considered as coating unless it exists on more than 50 percent of the surface area of any size between successive laboratory sieves. The portion of Material Aggregate Type 22 retained on a 1/4 inch sieve shall not contain more than 0.1 percent deleterious materials by weight.

9-03.12(4) GRAVEL BACKFILL FOR DRAINS

Gravel backfill for drains shall meet the requirements of Section 9-03.12(3), 9-03.12(6), and 9-03.16 for Mineral Aggregate Type 20 except the percent by weight passing the U.S. No. 200 sieve specified in Section 9-03.12(3) shall not be greater than 0.2 percent.

9-03.12(5) PIT RUN SAND AND GRAVELS

Pit run sand and gravels shall consist of free draining granular materials obtained from naturally occurring deposits or manufactured from screened gravel.

Pit run sand shall meet the requirements of Section 9-03.16 for Mineral Aggregate Type 10.

Pit run gravel shall meet the requirements of Section 9-03.16 for Mineral Aggregate Type 15.
AGGREGATES

9-03.12(6) WASHED SAND AND GRAVELS
Washed sand and gravel shall meet the gradation requirements of Section 903.16 for Mineral Aggregate Types A, B, C, D, E, F, G, and H, whichever is specified. Washed sand and gravel shall consist of screened sand, gravel or other inert materials, or combinations thereof, from sources approved by the Engineer, having hard, durable particles free from adhering clays. The materials shall be washed thoroughly to remove clay, loam, shale, organic matter, or other deteriorative substances. The amount of deleterious substances in the washed sand or gravel shall not exceed the values specified in Section 903.12(6) for Mineral Aggregate Types A, B, C, D, E, F, G, and H, whichever is specified.

9-03.13 BACKFILL FOR SAND DRAINS
9-03.13(1) SAND DRAIN BACKFILL
Backfill for sand drains shall conform to the following grading:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot; square</td>
<td>90-100</td>
</tr>
<tr>
<td>1/4&quot; square</td>
<td>65-100</td>
</tr>
<tr>
<td>U.S. No. 10</td>
<td>40-100</td>
</tr>
<tr>
<td>U.S. No. 50</td>
<td>30</td>
</tr>
<tr>
<td>U.S. No. 100</td>
<td>0-20</td>
</tr>
<tr>
<td>U.S. No. 200</td>
<td>0-10</td>
</tr>
</tbody>
</table>

All percentages are by weight.

9-03.13(2) SAND DRAINAGE BLANKET
Aggregates for the sand drainage blanket shall consist of granular material, free from wood, bark, or other extraneous material, and shall meet the following requirements for grading:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/3&quot; square</td>
<td>90-100</td>
</tr>
<tr>
<td>1/2&quot; square</td>
<td>65-100</td>
</tr>
<tr>
<td>U.S. No. 10</td>
<td>40-100</td>
</tr>
<tr>
<td>U.S. No. 50</td>
<td>30</td>
</tr>
<tr>
<td>U.S. No. 100</td>
<td>0-20</td>
</tr>
<tr>
<td>U.S. No. 200</td>
<td>0-10</td>
</tr>
</tbody>
</table>

All percentages are by weight. The portion of backfill for sand drains and sand drainage blanket retained on a 1/4 inch square sieve shall consist not more than 0.50 percent by weight of wood waste.

9-03.14 GRAVEL BORROW
Unless otherwise specified on the Drawings or in the Project Manual, gravel borrow shall meet the requirements of Section 903.12(2) and the grading requirements in Section 903.16 for Mineral Aggregate Type A. It is required by the Contractor, the screen size may be increased if it is determined by the Engineer that larger size aggregate will be satisfactory for the specified backfilling or embankment construction.

9-03.15 TEST METHODS FOR AGGREGATES
The properties enumerated in these Specifications shall be determined in accordance with the following methods of test:

- **Sampling**
  - ASHTO T 2
- **Tests**
  - Sieve Analysis of Fine and Coarse Aggregates
  - Moisture Content
  - Specific Gravity
  - Sand Factor
- **Test Method**
  - WSDOT Method No. 101

JOINT AND CRACK SEALING MATERIALS

9-04.17 ROCK
Rock for constructing new rock facings shall be large, broken pieces of igneous rock. Rock material shall be reasonably selected pieces of rock sound and resistant to weathering. Rock shall be free of soft, weathered material and seams of red rock susceptible to deterioration. When broken into pieces weighing 50 to 100 pounds and tested for soundness with sodium sulfate in accordance with ASHTO T64A, the loss through a 1 inch sieve after 6 cycles shall not exceed 35 percent by weight.

The density of rock material shall be a minimum of 160 pounds per cubic foot. The size categories for rock shall be as follows:

<table>
<thead>
<tr>
<th>Size</th>
<th>Approx. Minimum</th>
<th>Approx. Average</th>
<th>Approx. Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-ton rock</td>
<td>500 to 1000</td>
<td>700 to 800</td>
<td>900 to 1200</td>
</tr>
<tr>
<td>Two-ton rock</td>
<td>1000 to 1500</td>
<td>1200 to 1400</td>
<td>1500 to 1800</td>
</tr>
<tr>
<td>Four-ton rock</td>
<td>1500 to 2200</td>
<td>1800 to 2000</td>
<td>2100 to 2500</td>
</tr>
</tbody>
</table>

Rocks less than 1 cubic foot in volume or weighing less than 160 pounds shall not be used.

SECTION 9-04 JOINT AND CRACK SEALING MATERIALS

9-04.1 PREMOLDED JOINT FILLERS

9-04.1(1) ASPHALT FLUID FILLER FOR CONSTRUCTION AND LONGITUDINAL JOINTS IN CONCRETE PAVEMENTS
Premolded joint filler for use in contraction and longitudinal joints shall be 1/4 inch thick and shall consist of a suitable asphalt material placed as asphalt-entrained paper or asphalt-entrained felt. It shall be sufficiently rigid for easy installation in summer months and not too brittle for handling in cold weather.

Premolded joint filler shall meet the requirements of ASTM Standard 1996 or ASSTO Designation M32.

9-04.1(2) PREMOLDED JOINT FILLER FOR EXPANSION JOINTS
Premolded joint filler for through joints shall be 3/4 inch thick and as wide as the depth of the pavement.

Premolded joint filler shall meet the requirements of ASTM Standard D175 or ASSTO Designation M33.

9-04.1(3) VACANT

9-04.1(4) ELASTOMERIC EXPANSION JOINT SEALS
Premolded elastomeric expansion joint seals shall conform to the requirements of ASSTO M 220 and shall be formed by an expansion process with uniform dimensions and smooth exterior surfaces. The cross-section of the seal shall be shaped to allow adequate compression within of the seal, as approved by the Engineer.

9-04.2 JOINT SEALANTS

9-04.2(1) JOINT SEALANTS FOR SAWED CONSTRUCTION JOINTS
Joint sealants for sawed contraction joints shall meet the requirements of Section 904.1(4) or ASTM D 1870, Concrete Joint Sealer, Hot Process Type, C or D, as determined by the Engineer.

9-04.2(2) VACANT

9-04.2(3) VACANT

9-04.3 Joints for Sawed Construction Joint
9-04.3(1) RUBBER GASKETS
Rubber gaskets for use in joints of concrete culvert or storm sewer pipe and present material sections shall conform to the requirements specified in the Project Manual.

9-04.4 RUBBER GASKETS FOR CONCRETE PIPE AND PRECAST MANHOLES
Rubber gaskets for use in joints of concrete culvert or storm sewer pipe and present material sections shall conform to the requirements of the Project Manual.
9-0.4 CRACK SEALING—RUBBERIZED ASPHALT

Concrete pipe shall be cracked using a 4-inch wide cracked coupling band, held together with angles and bolts, a neoprene gasket between the pipe and the band, and be of the same material and corrugations as the pipe, and meet the requirements of Section 9-0.4.13.

9-0.5 ACCEPTANCE BY MANUFACTURER'S CERTIFICATION

Certain drainage materials may be accepted by the Engineer based on a manufacturer's certificate of compliance. Those materials are as follows:

- Metal drain and underdrain pipe
- PVC and corrugated polyethylene drain pipe and underdrain pipe
- Metal coupler and sanitary sewer pipe and pipe arch less than 30 inches diameter
- Metal coupler end sections
- Corrugated metal structural plate pipe, pipe arch, and under passes, and
- Ductile iron pipe

9-0.4.13 CORRUGATED ALUMINUM ALLOY DRAIN PIPE

Corrugated aluminum alloy drain pipe shall meet the requirements of ASTM M 196, without perforations.

9-0.4.13(a) COUPLING BANDS

Coupling bands for corrugated aluminum alloy drain pipe shall meet the requirements of coupling bands for Type I pipe of ASTM M 196, except that bands using projections (dimples) shall be provided. The bands shall be fabricated of the same material as the pipe. Acceptable coupling bands for aluminum corrugated pipe shall be made using a 3-piece, 24 inches wide corrugated coupling band, held together with angles and bolts, a neoprene gasket between the pipe and the band, and be of the same material and corrugations as the pipe, and meet the requirements of Section 9-0.4.13.

9-0.4.13(b) VACANT

9-0.4.13(c) POLYVINYL CHLORIDE (PVC) DRAIN PIPE

Polyvinyl Chloride (PVC) drain pipe and fittings shall meet the requirements of ASTM D 3034, with restricted gasket joint.

9-0.4.13(d) CORRUGATED POLYETHYLENE DRAINAGE TUNING DRAIN PIPE

Corrugated polyethylene drainage tuning drain pipe shall meet the requirements of ASTM M 229. The maximum size pipe shall be 8 inches in diameter.

9-0.4.2 SUBSURFACE DRAIN PIPE

Perforated concrete subsurface drain pipe shall meet the requirements of ASHRAE M 175, Type I, except the perforations shall extend 1/3 inch in diameter. Strength requirement shall be as shown in Table 1 of ASHRAE M 86.

9-0.4.3 VACANT

9-0.4.24 ZINC COATED (GALVANIZED) OR ALUMINUM COATED (ALUMINIZED) COUPLING IRON OR STEEL SUBSURFACE DRAIN PIPE

Perforated polyethylene drainage tubing substrate drain pipe shall meet the requirements of ASTM D 357, with a maximum size pipe shall be 8 inches in diameter.

9-0.5.2 PERFORATED PVC SUBSURFACE DRAIN PIPE

Perforated PVC subsurface drain pipe shall meet the requirements of ASTM D 278. The maximum size pipe shall be 6 inches in diameter.
SANITARY SEWER AND STORM DRAIN STRUCTURES, CULVERTS, AND CONDUITS

9-05

9-05.3/1/1A GENERAL
Plain concrete pipe shall meet the requirements of ASTM C 33 Class II.

9-05.3/1/1B END DESIGN
The end designs for plain concrete culvert pipe shall conform to the applicable requirements of ASABE M 190. All plain concrete culvert pipe and end sections shall comply with the applicable requirements of ASABE M 170 with regard to the provisions as listed in Table 2 of ASABE M 170. Class II Culvert Reinforcement in circular pipe, and WSDOT Standard Plan No. 7G.

9-05.4 STEEL CULVERT PIPE AND PIPE ARCH

9-05.4.1 GENERAL
Steel culvert pipe and pipe arch shall meet the requirements of ASABE M 36, Type I and Type II. Welded seam aluminum coated (aluminized) corrugated steel pipe and pipe arch with metalized coating applied inside and outside following welding is acceptable.

9-05.4.2 ELLIPTICAL FABRICATION
When draped pipes are specified, circular pipes shall be fabricated 5 percent out of round to form an elliptical section. The vertical or larger axis of the elliptical section shall be clearly marked before shipping.

9-05.4.3 VACANT

9-05.4.4 ASPHALT COATINGS AND PAVED INVERTS
Asphalt for asphalt coatings and paved inverts shall meet the requirements of ASTM M 190. Sections 4. The coatings for Sections 1, 2, 3, and 5 shall be specified in Section 7-02.2/3/C3A shall be uniform, inside and outside, and applied in accordance with the following requirements:

(a) The metal shall be free from loose, dirt, dust, moisture, or other deleterious contaminants. The process described below may be used for application.
(b) Before application:

The temperature of the asphalt at the time of pipe immersion shall be 60°F (plus or minus 5 degrees), and the end section shall conform to the following schedule:

<table>
<thead>
<tr>
<th>Thickness of Pipe</th>
<th>Minimum Immersion Time</th>
<th>Aluminum</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/8&quot;</td>
<td>275</td>
<td>0.5</td>
</tr>
<tr>
<td>1-1/8&quot;</td>
<td>325</td>
<td>3.0</td>
</tr>
<tr>
<td>1-1/2&quot;</td>
<td>375</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Pipe Preheating:
The asphalt shall have a temperature of 30 degrees F (plus or minus 5 degrees), and the pipe shall be brought to a temperature of 300 degrees F to 350 degrees F at the time of immersion.

Paved Inverts for Sections 1 and 2 as specified in Section 7-02.3/C1 shall consist of bituminous material applied in such a manner that a one or more smooth pavement will have been formed in the inverted filling the corrugations for at least 40 percent of the circumference. The pavement shall have a minimum thickness of 1/8-inch above the crest of the corrugations except where the upper edges intersect the corrugation. The pavements shall be applied following the coining with asphalt or fiber heading.

Treatment 5 shall be substituted for Treatment 2, and Treatment 6 for Treatment 4 at the option of the Contractor.

9-05.4.5 VACANT

9-05.4.6 SPUN ASPHALT LINING
Asphalt for spun linings on 100 percent peripheral shall conform to WSDOT Standard Plan No. 7F. Spun asphalt linings shall provide a smooth surface for the full interior of the pipe but completely filling the corrugations to a minimum thickness of 1/8-inch above the crest. The interior lining shall be applied by centrifugal or other accepted methods. The interior shall be free from sags or ruts, but slight residual corrugations due to cooling shrinkage of the lining will not be cause for rejection. At the three-sheet lap, an interior nonuniformity equal to the thickness of the sheet is allowable. The thickness of the lining shall be maintained to the ends of the pipe.

The thickness of the lining over the crest of the corrugation shall not vary by an amount in excess of 1/32 inch over the entire area of the spun lining.

In the case of helical corrugated pipe manufactured with a continuous helical seam, an inch uniformly over the back seam equal to the thickness of two spun sheets is allowable.

9-05.4.7 COUPLING BANDS
Coupling bands shall be single bands or corrugated bands as shown in the Drawings or WSDOT Standard Plan Nos. B11a through B14 and shall be furnished of the same material as the pipe and with the same metallic protective treatment as in the pipe. The corrugated bands shall conform to the pipe and shall meet all applicable requirements of ASABE M 36 except that coupling bands for all sizes of steel pipe arch with boom x 1-1/4-inch corrugations shall be 24 inches wide. Bands having projections in lieu of corrugations will not be allowed.

Steel bolts and nuts for coupling bands shall meet the requirements of ASTM A 307 and shall be galvanized in accordance with ASTM A 153.

Steel angles, when required for coupling bands, shall meet the requirements of ASABE M 36.

Asphalt for asphalt coatings or coupling bands shall be specified for coupling bands and asphalt for coupling bands.

Coupling bands shall be made by the same manufacturer as the steel pipe selected for use.

9-05.4.8/1 STEEL PIPE ARCH
Steel pipe arch shall meet the requirements for steel pipe and pipe arch of these Specifications except in the method of fabrication. Circular pipe shall be fabricated in two semicircles, the pipe arch shall be fabricated in two separate segments, the upper portion shall arch, and the finished section shall be furnished for including the connecting arcs.

Individual plates shall be a minimum of 2 feet in length extending from short ends that are required to complete the end section of the culvert.

When positive protection treatment is specified in the Drawings, the pipe arch shall be coated with one of the treatments as prescribed in the Contract.

9-05.4.9 STEEL END SECTIONS

9-05.4.9/1 GENERAL
The applicable provisions of ASABE M 36 shall apply to the construction of steel end sections, except that the end sections shall be furnished with the same material with the same metallic protective treatment as specified in the pipeline.

Asphalt coating shall not be used on steel end sections.

9-05.4.9/2 FABRICATION

9-05.4.9/3 GALVANIZED HARDWARE

9-05.4.9/3/1 PLATE EXTENSIONS

The plate extensions shall be furnished only when so designated in the Drawings. When required, the tie plate extensions shall be provided with hubs to match those in the lip of the starter and flange with 3/4-inch or larger galvanized nuts and bolts. The plate dimensions shall be the same material and thickness as the end section and shall be hot-dipped in the same material with the same metallic protective treatment at the end section.

9-05.5 ALUMINUM CULVERT PIPE

Aluminum culvert pipe shall conform to the applicable requirements of ASABE M 190.

9-05.5.1 ELLIPTICAL FABRICATION

9-05.5.2 MITERED ENDS

9-05.5.3 PROTECTIVE TREATMENT

When positive protection treatment is specified for aluminum pipe, it shall be Treatment 5 as shown in Section 7-02.3/C1.

9-05.5.4 ASPHALT COATINGS

Asphalt coatings for aluminum culvert pipe shall meet the requirements of ASTM A 307.

9-05.5.5 COUPLING BANDS

Coupling bands shall meet applicable requirements of ASABE M 36. Bands having projections in lieu of corrugations will not be allowed.

Steel bolts and nuts for coupling bands shall meet the requirements of ASTM A 307 and shall be galvanized in accordance with ASTM A 153.

9-05.5.6 ALUMINUM END SECTIONS

The applicable provisions of ASABE M 190 shall apply to the construction of end sections and plate extensions for aluminum pipe. In addition, they shall conform to the requirements of Section 9-05.4/1.
9-05.6 STRUCTURAL PLATE PIPE, PIPE ARCH, ARCH AND UNDERPASS

9-05.6.01 GENERAL

Structural plate pipe shall be full circle of the type, gage or thickness, and diameter specified.

9-05.6.02 FABRICATION

The plates at longitudinal and circumferential seams shall be butted with the bolt holes staggered in rows 2 inches apart, one being punched in the valley and one in the crest of each corrugation along both edges of each plate. Both holes on circumferential seams shall be spaced at approximately 12 inches intervals. No plate shall be closer to the edge of the plate than twice the diameter of the bolt.

9-05.6.03 ELLIPTICAL FABRICATION

Section 9-05.6.03 shall apply to structural plate pipes.

9-05.6.04 STRUCTURAL PLATE PIPE ARCH

Plates for structural plate pipe arches shall be formed so that the top shall be arc of no more than 70 degrees at any point and the bottom where the arches are no less than 50 degrees arc less than 10 degrees, and the top shall be parallel to the bottom by an arc having a radius of between 10 and 30 inches and of not more than 45 to 70 degrees at any point as specified in Section 9-05.6.01.

9-05.6.05 STRUCTURAL PLATE ARCH

Structural plate arches and their foundations shall be as specified in Section 9-05.6.01.

9-05.6.06 STRUCTURAL PLATE UNDERPASS

Structural plate underpasses shall be as provided in Section 9-05.6.01.

9-05.6.07 VACANT

9-05.6.08 PLATES

9-05.6.09A CORRUGATED STEEL PLATES

Galvanized corrugated steel plates for constructing structural plate pipe, pipe arches, arches, and underpasses, and nuts and bolts used in their assembly shall conform to the requirements of AASHTO M 167 except that the minimum width of the corrugated sheeting on the plates shall be 1.25 square foot per square foot of double exposed surface. If the average exposure as determined from the required samples is less than 3.65 ounces, or if any one specimen shows less than 2.75 ounces, the lot may be rejected. Nut and bolt sizes shall be galvanized in accordance with AASHTO M 222.

9-05.7 HYDROSTATIC PRESSURE ON PIPES IN STRAIGHT ALIGNMENT

Hydrostatic pressure tests shall be made in straight alignment so that the pressure is applied uniformly over the entire face of the pipe. The pressure shall be 2,000 pounds per square inch (psi) except that 4,500 psi shall be used on 48-inch diameter and larger pipes under differential load. The test section shall be filled with water to the required level and the water shall be considered as an integral part of the pipe system. The test section shall be closed and the water allowed to stand for a period of time.

9-05.7.01 PLAIN CONCRETE SEWER PIPE

Plain concrete sewer pipe shall meet the requirements of ASTM C 144, Class 3, unless otherwise called for on the drawings. Permeability test shall be conducted as follows:

The pipe selected for test shall be placed either end down on a soft rubber pad, at the option of the Engineer, and filled with water. The pipe shall be kept full of water for a period of 2 minutes. At the end of that period the water surface of the pipe shall be counted for leaks.

A leak is defined as a point of water, which, when wiped dry with a cloth, moisture will quickly reappear.

The Engineer may select a maximum of 2 percent in one test to be less than 5 pipes of each size.

9-05.7.02 Reinforced concrete pipe shall conform to ASTM Designation C 706, and shall be of the class noted on the drawings or in the Project Manual.

Pipe ends of reinforced concrete pipe may be bell and spigot, roundoff bell and spigot, or spigot and groove unless otherwise specified in the Project Manual. Acceptance shall be based on load bearing tests, material tests and inspection of the product at all stages of construction. Acceptance may be denied if any coupon load test bearing test is not performed when agreed upon by the manufacturer and the Engineer prior to installation.

Both bell and spigots shall be reinforced in pipe 30 inches or larger pipe, as specified in Section 9-05.7.01.

The identification of the minimum axis of elliptical reinforcement shall be in accordance with Section 9-05.7.01B.

9-05.7.03 CONCRETE SEWER PIPE JOINTS

All concrete pipe shall be joined with rubber gaskets. The joints shall be suitably reinforced. At the joint, the walls shall have the requirements of ASTM C 456. Gasket material shall be handled and stored in accordance with Section 9-05.4.02.

9-05.7.04 TESTING CONCRETE SEWER PIPE JOINTS

9-05.7.04A GENERAL

When a particular type of pipe joint design, material or joining method has not previously been tested and approved, the joint shall be made on one test length of the assembled sewer pipe to qualify the design, material or method of joining. The test shall be conducted in accordance with Section 9-05.7.04B. The size, cost, and metal shall be as shown in the Drawings or in the Specifications. Due to the nature of this test, the manufacturer of the pipe may require additional information or tests to be performed by the Contractor, at no additional charge to the Contractor.

The manufacturer of the sample pipe shall furnish to the Engineer one complete test assembly from normal full line production. The materials furnished comply in all respects with those Specifications. The Engineer may require additional information or tests to be performed by the Contractor, at no additional charge to the Contractor.

Unless otherwise specified, spiral rib sewer pipe shall be furnished with ribbons either by using a straight continuous helical sewn seam with a seam gasket or a continuous helical welded seam paralleling the rib. Pipe ends shall be cut even. Spiral rib sewer pipe shall be furnished with ribbons either by using a straight continuous helical sewn seam with a seam gasket or a continuous helical welded seam paralleling the rib.
9.05 SANITARY SEWER AND SEWER DRAIN STRUCTURES, CULVERTS, AND CONDUITS

9.05.11 ALUMINUM SEWER PIPE

9.05.11(1) GENERAL

Aluminum sewer pipe shall conform to the requirements of Section 9.05.5 for aluminum culvert pipe, except that the pipe shall be treated as specified in Section 7.02(30,31,3A), and the pipe shall be constructed of helically corrugated lock seam aluminum pipe. When galvanized lock seam lock seam aluminum pipe is installed, it is not required. Galvanized lock seam lock seam aluminum pipe shall be made by the manufacturer as the aluminum sewer pipe selected for installation.

9.05.11(2) BASIS FOR ACCEPTANCE

The basis for acceptance of aluminum sewer pipe shall be the same as specified in Section 9.05.5, except when helically corrugated lock seam aluminum pipe is called for. A qualification test, conducted by the Materials Laboratory, shall be required for manufacturer of manufactured with more than one specification shall be tested by random sampling of the total production for the duration of the contract. The test shall be conducted by the Materials Laboratory.

9.05.12 PVC SEWER PIPE

Polyvinyl chloride pipe shall conform to the requirements of ASTM D 3032 SC12 or ASTM D 718. All joints for PVC pipe shall conform to ASTM D 3212 using reinforced joint cement conforming to ASTM F 471. All fittings for PVC pipe pipe shall be injection molded or factory fabricated. Normal, all fittings shall be the same size as the pipe being connected, except that fittings using more or less material may be used subject to the approval of the Engineer. Fittings shall have sufficient strength to withstand handling and load stresses normally encountered.

9.05.13 DUCTILE IRON SEWER PIPE

Ductile iron pipe shall conform to ANSI A 251.21 or AWWA C 111, as approved by the Engineer, for loads as required by the Engineer. For loads as required by the Engineer. Ductile iron pipe shall be Class 50 or the class indicated on the Drawings or in the Project Manual. For ductile iron pipe shall be rigidly gasketed to the requirements of ANSI A 251.21 or AWWA C 111. All iron fittings may include ductile iron pipe. All iron fittings may include ductile iron pipe. All iron fittings may include ductile iron pipe. All iron fittings may be used with ductile iron pipe. All iron fittings may be used with ductile iron pipe.

9.05.14 VACANT

9.05.15 VACANT

9.05.16 VACANT

9.05.17 ALUMINUM SPIRAL RIB SEWER PIPE

9.05.17(1) GENERAL

Aluminum spiral rib sewer pipe shall be manufactured of corrugated aluminum and inspected in conformance with Section 9.05.5. The size, coating, and metal shall be as shown in the Drawings or in the Specifications. The manufacturer of spiral rib sewer pipe shall furnish to the Engineer a certificate of compliance stating that the materials furnished comply in all respects with these Specifications. The Engineer may require additional information or tests to be performed by the Contractor, at no expense to the Owner.

9.05.17(2) COUPLING BANDS

Section 9.05.17(2) apply to aluminum pipes, except that the bands shall be not more than 0.105 inches or less than 0.260 inches in thickness. Coupling bands shall be used by the manufacturer as the aluminum sewer pipe selected for installation.

9.05.17(3) BASIS FOR ACCEPTANCE

The basis for acceptance of spiral rib pipe shall be the same as specified in Section 9.05.5, except when helically corrugated lock seam aluminum pipe is called for. A qualification test, conducted by the Materials Laboratory, shall be required for manufacturer of manufactured with more than one specification shall be tested by random sampling of the total production for the duration of the contract. The test shall be conducted by the Materials Laboratory.

9.05.18 FILTER FABRIC

The geotextile shall be of woven or nonwoven construction and consist of long chain polymer fibers composed of polypropylene, polyester, polyethylene, polyvinylidene chloride, or polyamide. The fibers shall be oriented into a multidirectional staple network so as to retain their position relative to each other and allow the passage of water as specified. The fabric shall be free of any chemical treatment or coating which reduces the passage of water and shall be free of chemicals commonly found in textiles. The geotextile shall conform to the physical property requirements listed below.

<table>
<thead>
<tr>
<th>Physical Property</th>
<th>Test Method</th>
<th>Typical Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength, wt. lbs.</td>
<td>ASTM D 1900</td>
<td>(minimum)</td>
</tr>
<tr>
<td>Elongation, wt. %</td>
<td>ASTM D 1902</td>
<td>(minimum)</td>
</tr>
<tr>
<td>Coefficient of Water Permeability, units/sec</td>
<td>ASTM D 537</td>
<td>(minimum)</td>
</tr>
<tr>
<td>Pore Size Distribution</td>
<td>ASTM D 4283</td>
<td>(minimum)</td>
</tr>
</tbody>
</table>

9.05.19 FLOW CONTROL STRUCTURE

The Flow Control Structure shall be made from a standard class 8 material, designated as a reinforced concrete slotted grate, as specified in Section 7.02(30,31,3A), for this drainage system. The Flow Control Structure shall be made from a standard class 8 material, designated as a reinforced concrete slotted grate, as specified in Section 7.02(30,31,3A), for this drainage system.

9.05.20 FLOW CONTROL STRUCTURE

The Flow Control Structure shall be made from a standard class 8 material, designated as a reinforced concrete slotted grate, as specified in Section 7.02(30,31,3A), for this drainage system. The Flow Control Structure shall be made from a standard class 8 material, designated as a reinforced concrete slotted grate, as specified in Section 7.02(30,31,3A), for this drainage system.

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SANITARY SEWER AND STORM DRAIN STRUCTURES, CULVERTS, AND CONDUITS

Reinforcing Steel

9-06.15 WELDED SHEAR CONNECTORS
Welded steel shear plates shall be made from cold drawn bar stock conforming to the requirements of AASHTO M 141. Grades 1010 through 1014, inclusive, either semi-killed or killed deoxidized.

The material shall conform to the following mechanical properties:

- Tensile strength: 60,000 psi min.
- Yield strength: 36,000 psi min.
- Elongation: 20% min.
- Reduction of area: 20% min.
- Mechanical properties shall be determined in accordance with AASHTO Methods and Definitions D 754.

At the manufacturer's option, mechanical properties of the steel shall be determined by testing either the steel after cold finishing, or the full-diameter finished shaft.

9-06.16 VACANT

9-06.17 VACANT

9-06.18 METAL BRIDGE RAILING
Metal bridge railing shall conform to the type and material specifications set forth in the Drawings.

4. Section 9.06.18 of the Aluminum Association Standard Specifications for Aluminum Railings Posts Alloy A 354-T6 in hereinafter referred to as "AA Specifications" shall be the applicable material specification for aluminum. The manufacturer shall be responsible for the design and fabrication of all metal bridge railings. The metal bridge railings shall be designed and fabricated in accordance with the drawings specified herein.

9-06.19 BRIDGE DRAINS
Bridge drains shall be made of cast steel conforming to the requirements of AASHTO M 338. The name and location of the manufacturer shall be specified in the Drawings or in the Project Manual.

9-06.20 DOWNSPOUTS
Dowspouts shall be standard weight steel pipe, 4 inch or 6 inch diameter as shown in the Drawings.

9-06.21 VACANT

9-06.22 BOLTS, WASHERS AND OTHER HARDWARE
Ordinary machine bolts and flat head bolts shall be made from bar stock conforming to the requirements of AASHTO A 307, and shall be grade A. Dull bolts and domes may be used in both the finished and unfinished stages, provided they are of an adequate size and made of mild steel or malleable iron or may be cut from medium steel or wood with a hacksaw.

All bolts and other hardware which are to be galvanized and which require bending or shaping shall be hot forged to the received shape before galvanizing. Cold bending of such material will not be permitted because of the tendency toward embrittlement during the galvanizing process. Galvanizing shall be in accordance with AASHTO M 22E.

Split rings for the clamping of 4 inch inside diameter shall be made from hot rolled plate to an outside diameter of 0.750 inch plus or minus 0.010 inch and the section shall be beveled from the center portion toward the edges to a thickness of 0.140 inch plus or minus 0.010 inch. It shall be cut through in one place in its circumference to form a tongue and slot. Split ring connectors shall be galvanized in accordance with AASHTO M 22.

Split-groove Castor connectors shall be manufactured according to ASTM A 4 for malleable iron castings. They shall consist of 4 rows of opposing grooves forming a 4-19\2 inch square grid with 15 teeth which are hold to place by bolts which are diamond shaped in cross-section.

Nails shall be round wire wire standard bar nails. Spikes shall be wire spires or bolt spires, as specified in the Drawings. Bolts, dowels, washers, and other hardware, including nails, shall be black or galvanized as specified in the Drawings, but not as specified shall be galvanized when used in treated steel structures.

9-07 REINFORCING STEEL

9-07.1 GENERAL

9-07.1.1 ACCEPTANCE BY MANUFACTURERS CERTIFICATION

Reinforcing steel may be accepted by the Engineer based on the manufacturer's Certificate of Compliance.

9-07.1.2 BENDING
Steel reinforcing bars shall be cut and bent by careful and competent workmen. All bending shall be done by hand, template, or other fabrications which shall not vary appreciably from the shape and dimension shown in the Drawings.

Hacks and bends of steel reinforcing bars shall be bent to the following inside diameters of forming rings and otherwise as shown in the Drawings:

Bar Size

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>Bar Type and Ties</th>
<th>All Other Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8&quot;</td>
<td>27/64&quot;</td>
<td>6 bar diameters</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>27/64&quot;</td>
<td>6 bar diameters</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>27/64&quot;</td>
<td>6 bar diameters</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>27/64&quot;</td>
<td>6 bar diameters</td>
</tr>
<tr>
<td>5/8&quot;</td>
<td>27/64&quot;</td>
<td>6 bar diameters</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>27/64&quot;</td>
<td>6 bar diameters</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>27/64&quot;</td>
<td>8 bar diameters</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>27/64&quot;</td>
<td>10 bar diameters</td>
</tr>
</tbody>
</table>
9-09 REINFORCING STEEL

The supplementary requirements of AASHTO M 31 for bend tests shall apply to size No. 14 and No. 18 steel as well as bond hooks or hooks.

9-07.1(b) LENGTHS

Net lengths of bent bars shown in the "LENGTH" column of the bar list in the Drawings are rounded to the nearest inch. Net length is the length of bar after all bend deductions are subtracted from the gross length.

The following bend deductions for 90 degrees bend have been subtracted from the gross length:

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>4′</th>
<th>5′</th>
<th>6′</th>
<th>7′</th>
<th>8′</th>
<th>9′</th>
<th>10′</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 4</td>
<td>5/16</td>
<td>7/32</td>
<td>5/32</td>
<td>3/32</td>
<td>1/8</td>
<td>5/32</td>
<td>7/32</td>
</tr>
<tr>
<td>No. 5</td>
<td>7/32</td>
<td>1/8</td>
<td>5/32</td>
<td>3/32</td>
<td>1/8</td>
<td>5/32</td>
<td>7/32</td>
</tr>
<tr>
<td>No. 6</td>
<td>9/32</td>
<td>5/32</td>
<td>3/32</td>
<td>1/8</td>
<td>5/32</td>
<td>7/32</td>
<td>7/32</td>
</tr>
<tr>
<td>No. 7</td>
<td>1/8</td>
<td>5/32</td>
<td>3/32</td>
<td>1/8</td>
<td>5/32</td>
<td>7/32</td>
<td>7/32</td>
</tr>
<tr>
<td>No. 8</td>
<td>7/32</td>
<td>5/32</td>
<td>3/32</td>
<td>1/8</td>
<td>5/32</td>
<td>7/32</td>
<td>7/32</td>
</tr>
<tr>
<td>No. 9</td>
<td>9/32</td>
<td>5/32</td>
<td>3/32</td>
<td>1/8</td>
<td>5/32</td>
<td>7/32</td>
<td>7/32</td>
</tr>
<tr>
<td>No. 15</td>
<td>21/32</td>
<td>17/32</td>
<td>13/32</td>
<td>9/32</td>
<td>5/32</td>
<td>3/32</td>
<td>1/8</td>
</tr>
</tbody>
</table>
| For bends other than 90 degrees, direct proportion of these deductions will be used. The bend deductions listed will apply except where bending radii are shown in the Drawings.

For standard hooks on the ends of bars, the following hook lengths, in addition to the set out at detailed dimension, have been provided:

- Length Added for One Hook
  - 180° Hook: 90° Hook
- Bar Size | All Bars and Ties | Other Bars
- No. 3    | 3′ | 3′ |
- No. 4    | 5′ | 5′ |
- No. 5    | 7′ | 7′ |
- No. 6    | 9′ | 9′ |
- No. 8    | 11′ | 11′ |
- No. 10   | 13′ | 13′ |
- No. 12   | 15′ | 15′ |

9-07.1(c) INSPECTION

The provisions of Section 603.10 shall apply to the inspection of rolling and fabricating reinforcing steel.

9-07.2 DEFORMED STEEL BARS

Unless otherwise specified in the Project Manual or on the Drawings, reinforcing bars for the particular use specified shall be deformed steel bars of the size specified in the Conformity Documents meeting the requirements of ASTM Designation A 615 or A 405.

Deformed steel bars, reinforcing bars in the Drawings and Specifications by numbers for example, #4, #5, #6, etc.

Reinforcing bars shall be free from loose mill scale, dirt, grease, rust, other defects affecting the strength of bond with concrete. Steel coated with rust may be used if the oxidation are not deep or loose coated. Size numbers shall be taken to represent the diameter of the bar in 1/8 inch units, except where standard gauge wire sizes are indicated on the Drawings.

9-07.3 EPOXY-COATED STEEL REINFORCING BARS

Epoxy-coated steel bars shall be coated according to AASHTO M 286 with the additional following modifications:

(a) The list of steel reinforcing bars acceptable for epoxy coating shall include ASTM A 996.
(b) The Contractor shall furnish a written certification that properly identifies the material, the number of each batch of coating material used, quantity represented, date of manufacture, name and address of manufacturer, and a statement that the coated steel meets the requirements of AASHTO M 286.
(c) The Contractor shall supply to the Engineer a representative sample of eight sources of the coating material from each batch. The sample shall be packaged in an airtight container and identified by batch number.
(d) Prior to coating the bars, the Contractor shall submit to the Engineer for review, the coating material manufacturer's recommendations on the proper use and application requirements for the coating material.
(e) A certification stating that all bars have been coated in accordance with the coating material manufacturer's recommendations and those specifications shall be furnished with each shipment. This certification shall include for each bar the preheat temperature, cure times, thickness checks, holidays detected, and test results. Two copies of these certifications shall be furnished to the Engineer.
(f) The Contractor shall give advance notice to the Engineer of the coating schedule in the coating plant so that any inspection may be provided. The Engineer may inspect the coated bars at the coating plant for approval.
(g) The painting material, compatible with the coating material and inert to concrete, shall be supplied to the purchaser.

9-07.3(a) BLANK STEEL BARS

Where plain steel bars are specified, they shall conform to the chemical and physical properties of ASTM A 615, Grade 60, unless specifically noted otherwise. Plain steel bars are identified in the Drawings and Specifications by brackets around an icon; for example, 3/8″ diameter, 1/2′ diameter, 5/8″ diameter, etc.

9-07.4 DOWEL BARS (FOR CEMENT CONCRETE PAVEMENT)

Dowel bars shall be plain steel bars of the dimensions shown in the Standard Plans. They shall conform to AASHTO M 136. Dowel bars shall be epoxy encapsulated.

9-07.5 TIE BARS (FOR CEMENT CONCRETE PAVEMENT)

Tie bars shall conform to the requirements of the Standards Specifications for Deformed Billet/Bars Bars for Concrete Reinforcement, ASTM Designation A 615, Grade 60 for strength bars and Grade 40 for bent bars.

9-07.6 BARS (FOR CEMENT CONCRETE SPECIFICATIONS)

Tie bars shall be epoxy encapsulated.

9-08 PAINTS

9-08.1 RAW MATERIALS

The acceptance of particular lots of raw materials shall be in no way obligate the Engineer to accept lots of finished paint that do not conform to the requirements of these Specifications. Where not specifically detailed, the raw materials shall meet the requirements of the applicable Federal Specification in effect at the time of manufacture. Products not covered by State or Federal Specifications shall be of top quality, meeting prevailing commercial standards. Raw materials for paints shall conform to the requirements of the Specifications listed below:

- Acrylic, alkyd, or chlorinated rubber base.
- Alkyd resin, Federal TR 212, Type 1 or Type 2.
- Aluminum paste, ASTM D 63, Type 2, Class B. Paints made with the paste shall be smooth and highly lustre.
- Bituminous asphalt shall have no deleterious effect on the drying time of the finished paint. It shall effectively prevent skinning when added in the amounts specified in each formula and tested in accordance with Federal Test Std. No. 341A, Method 351.
- Acrylic, petroleum, mineral oil, and mineral spirits.

SECTION 9-08 PAINTS

9-08.2 PAINT FORMULATIONS

9-08.2.1 PAINT FORMULATIONS A-46-GENERAL

All paints shall be made from materials meeting the requirements specified in Section 9-08.1. The paint shall be made in accordance with the following formulas and shall meet the requirements set forth above as well as the special requirements set forth for each formula. The formulas are stated in terms of dry pigment. Each formula shall contain the specified raw materials which shall be proportioned to give the compositions in percentages by weight or parts by weight, as shown in the formulas that follow.
PAINTS

(a) Formula A-3.7—Red Lead Sealing Paste:
Red Lead (dry pigment) 85.3%
Raw Linseed Oil 8.5%
Non-drying Aluminum Paste 2.9%
Liquid Driers 0.1%
Weighing in units of lbs. (minimum) 7.0 lbs.
Drying time-top for dry to recoat 34 hours
This material should be ground to a smooth, uniform
paste of putty-like consistence. Additional linseed oil
may be added at the time of use to reduce the paste
workability consistence for quick or sparse brush. This material
hardens in storage and should be used within 15 days of
the date of manufacturing.

(b) Formula A-4.0—Phosphoric Acid Red Lead Primer:
The primer shall meet the requirements of Federal Specifications
TT-F-606, Type IV, Paint, Red Lead Base, Ready Mixed. The velocity of the finished paint shall be
80.50 K.U. at 70 degrees F and the Sag Index shall be 75.

(c) Formula A-5.61—Vinyl Primers:
The primer shall meet the requirements of Federal Specifications
ML-1-P28258 or MIL-P-51665, Primer, Primers, Formulations (Formula 1178 for Methyl). Vinyl
Wash Primer shall be mixed by adding 1
volume of acid component (silicone) to 4 volumes of resin component (base solution) slowly and with constant
stirring. The material shall be used within 6 hours of mixing. The wash primer shall be sprayed applied to
all surfaces at a coverage rate of 250 to 300 square feet
per gallon to dry film thickness of 0.3 to 0.9 mils. Within
5 minutes after application, minimal spread is to be
allowed. Add component above the required amount
shall not be used for thinning. A drying of 1 hour is
required before painting.

(b) Butyl Primer shall meet Federal Specification
TT-B-846B, Butyl Alcohol Normal.

(b) Trisepoxy (50 percent) shall conform to ASTM D

(d) Formula A-6.60—Zinc Dust Oxide Primers:
The primer shall meet the requirements of Federal Specifications
TT-F-641 Primer—Paint, Zinc Dust Oxide Type
7—Shop Coat for Steel (Basic Lead Silicate Chrome):
The primer shall generally conform to Federal Specification
TT-F-641, Type II. The characteristics of the dry paint shall be as follows:

Viscosity (minimum) 3000 K.U.
Weight per gallon (minimum) 24.5 pounds

(b) Formula A-9.73—Galvanizing Repair Paste, High
Zinc Dusted Paint:
The galvanizing repair paint shall meet the requirements of Federal Specification
ML-1-P2305S (Prime Paint, High Zinc Dusted Paste, Galvanizing Repair).

(b) Formula A-10.62—Virk Red Lead Primer:
The primer shall meet the requirements of Federal Specification
ML-P-2831 PRIMER, VIRK-RED LEAD
(for brush or spray).

(b) Formula B-4.6.3—Phosphoric First Field Coat for Steel:
The phosphoric first field coat for steel shall meet the
requirements of Federal Specification TT-F606, Type IV—
Phosphoric Primers—Ready Mixed—except that 0.4
percent of the red lead content shall be replaced
with lampblack to give a resultant brown color. The viscosity of the finished paint shall be 80.50 K.U. at 70 degrees F
and the Sag Index shall be 75.

(b) Formula B-7.70—First Field Coat for Steel (Basic
Lead Silicate Chrome):
This primer shall primarily conform to Federal
Specification TT-F-641, Type IV. It shall:

(a) Formulas C.10.63—Vinyl Finish Coat:
The vinyl finish coat shall conform to the following
specifications:

(Pigment 12 Percent Minimum by Weight) — A combination of titanium dioxide and colored pigments or a combination of colored pigments such
that the resultant paint when dry matches the color sample
available at the Project Engineer's office.

(b) Vehicle 08 Percent by Weight —

Varnish Type (I) 9.1 parts
Varnish Type III(II) 9.1 parts
Tinted Primers 3.4 parts
Methyl Isoxoyl Ketone 3.5 parts

(b) Vehicles

Varnish Type I 100.0

(b) Varnish Type III shall be hydroxy containing vinyl
chloroacetaldehyde copolymer. It shall contain 95.5 to
98.5 percent by weight vinyl chloride, 2.3 to 5.5
percent vinyl acetate and 5.3 to 7.0 percent vinyl
alcohol. It shall produce results in the specified
formulations equal to the Bakelite Corporation
Vinylite Type E-131.

(b) Varnish Type III shall be a vinyl chloroacetaldehyde
co-polymer of medium average molecular weight and shall contain 65 to 80 percent vinyl chloro and 12 to
15 percent vinyl acetate by weight. It shall produce in the
specified formulations results equal to Bakelite
Corporation Vinylite resin VYH-11.

(b) Butyl Primer shall be ground to the Vinyl Finish
Paint vehicle to yield a smooth well ground paint, Black
Bakelite Vinyl Tint Paste, satisfactory for finishing either the Vinyl-Red Lead Primer or Vinyl Finish
Paint.

(b) The Vinyl Finish Paint and Vinyl Tinting Paste shall be
ground to a fineness of not less than 250 square
microns when tested in accordance with Federal Test Method Std.
ND-140, Hopper No. 141.

(b) Vinyl Thinner shall be composed of the following materials:

Toluene 90 percent by volume
Methyl Isoxoyl Ketone 10 percent by volume

(b) The paints shall require blushing with from 20 to 35 percent by volume of Vinyl Thinner to

(b) Materials

Aluminum paste Type 2 Class B 2.0 pounds
Varnish Type 83-6 1.0 gallons

(b) Aluminum paste shall be mixed on the job site, and only enough for one day shall be mixed at a time. The

(b) The paint shall be incorporated by careful mixing and

(b) Test Requirements: Prior to mixing.

(b) The material shall meet the requirements of Federal
Specification TT-E-329 Black Ename1, Synthetic Semi Gloss.
9-08 Viscosity at 20°degrees F Consistency: The paint shall not thicken after manufacture to an extent sufficient to impair its brushing qualities.
Test Requirements: Prior to shipment.
9-08.4 DryING TIME AND QUANTITY OF DRIER
The paint shall dry within the length of time stated in each formula but shall not contain sufficient quantities of drier to cause the paint to dry to a nonuniform or necrotic film. The drier shall be controlled to vary the quantity of drier, given in the formulas sufficiently to accomplish the above results.
9-08.45 WORKING PROPERTIES
The paint shall contain no caked material that cannot be broken up readily by stirring. When applied to a clean vertical surface, the paint shall dry without running, streaking, or sagging.
9-08.46 STORAGE PROPERTIES
Paints manufactured under these specifications shall show no skin over the surface after 48 hours in a partially filled container, when tested as outlined in Federal Test Method Standard No. 141. A slight amount of skin or gel formation where the surface of the paint meets the side of the container may be disregarded. Variable percentages of anti-shrinking agents are shown in those formulas set forth above that are susceptible to undesirable skin formation. The manufacturer shall be allowed to vary the amount of anti-shrinking agent given in the formulas provided the above results are accomplished and provided the paint does not dry to a nonuniform or necrotic film.
9-08.47 FINENESS OF GRINDING
The paint shall be ground so that all particles of pigment will be dispersed and be coated with vehicle, and the residue on a 325 sieve will not exceed 1 percent by weight of the pigment.
9-08.48 STANDARD COLORS
When the paint is required to match a standard color, the manufacturer may obtain a sample of the required color without cost upon application to the Materials Laboratory.
9-08.49 CONTAINERS
Each container shall be filled with paint and sealed airtight. Each container shall be weighed or measured to ensure that the actual weight or measured quantity of the vehicle shall then be mixed thoroughly, if necessary, to form a paint free from skins, lumps, and foreign materials.
9-08.4(3) VISCOSITY ADJUSTMENT
The weight per gallon of the paint in any lot shall not be less than that stated in the formula. A "g" as used in this formula shall mean the weight and viscosity measured at 100°F of the paint measured in accordance with the requirements set forth in Section 9-08.5.7.
9-08.6(3) WEIGHT VARIATIONS
The weight per gallon of the paint in any lot shall not be less than that stated in the formula. Any variation in the weight per gallon of the paint shall be between the quantity at paint ground at one time by any one mill.
9-08.7 FIELD SAMPLES
Because of the volatility of the solvents used in the paint, the upper limit viscosity shall be walled on all paint samples taken in the field.
9-09.3 PRESERVATIVE TREATMENT
9-09.3(11) GENERAL REQUIREMENTS
9-09.3(11) SEASONING BEFORE TREATMENT
Timber, lumber, or felling may be air-seasoned or kiln-dried, before treatment, until the moisture remaining in the wood will not prevent the injection and proper distribution of the specified amount of preservative. For air seasoning, the materials shall be stored as follows:
Lumber shall be segregated according to size and each layer in the stack shall be segregated by at least 1 inch strips with an air space of 1 inch or more between each two pieces of lumber in any layer; for caps, stringers, poles, and larger timbers, at least 2 inch strips shall be used to separate the layers. Allow at least 3 feet shall be left between rows of stacks, and the materials shall be at least 12 inches off the ground on concrete or treated timber sill. Filling shall be carried in like manner, placing as nearly as practicable only one length in a stack, using at least 2-inch strips or sagings of equal size between each layer, and reversing all filling in every other layer in order to keep the stack level. The space under and between the rows of stacks shall be kept free at all times of rotting wood, weeds, or rubbish. The yard shall be so drained that no water will enter under the stacks or in its immediate vicinity.
9-09.3(13) PLACING IN TREATING CylINDERS
Each cylinder charge shall consist of pieces approximately equal in size and moisture and upwood content into which approximately equal quantities of preservative fluid can be injected. Pieces shall be selected to ensure contact of steam and preservatives with all surfaces.
Timber and lumber shall be framed, bored, incised, or chambered, where possible, before treatment.
9-09.3(14) INCISING
In order to secure a more uniform penetration, sawed timber and lumber measuring 1 1/2 inches in thickness and 4 inches or over in width shall be incised by a machine having power driven rollers whose incisions are 1 inch in length and continuous of predetermined pattern. Timber or lumber 3 inches or over in the least dimension shall be incised on all four sides. Timber or lumber less than 3 inches in thickness shall be incised on the widest side only. The shape of the teeth shall conform to the pattern so designed that the points are sharp and the edges wedge-shaped so that upon entering and leaving the wood, a spreading of the fibers is accomplished.
9-09.3(15) PLANT EQUIPMENT
Treating plants shall be equipped with thermostats and gauges necessary to indicate and record accurately the conditions at all stages of treatment and to such extent as may be maintained in condition satisfactory to the purchaser. The appliance and chemicals shall be ready for making the analyses and tests required by the purchaser shall also be provided by the operators and be in good condition at all times.
9-09.3(22) CROSEOTE TREATMENT
9-09.3(23) CROSEOTE OIL
Croseote for both pressure treatment and surface treatment consists of the standard requirements of the Standard Specifications for Croseote, ASTM D 159.
### TIMBER AND LUMBER

#### 9-09

**9-09.232B OIL SEASONING FOR DOUGLAS FIR**

Green Douglas fir timber or pilings shall be seasoned by heating in oil under a vacuum until the moisture remaining in the wood will not prevent the injection and proper distribution of the specified amount of preservative.

The material shall be heated in creosote under a vacuum at temperatures not less than 160 degrees F and not more than 220 degrees F for lumber, nor 220 degrees F for pilings.

A minimum vacuum of 30 inches shall be maintained during heating. The seasoning period shall be maintained until condensation pointing off from the timber is at the rate of approximately 1/10 of a pound per cubic foot of timber per hour.

**9-09.232C PENETRATION AND RETENTION**

The range of temperature, pressure, and time duration shall be controlled to result in a maximum penetration by the quantity of preservative injected. The vacuum requirements stipulated are in inches of mercury at sea level, and necessary corrections shall be made for altitude.

After treatment by the specified process, the material shall meet the minimum requirements, for both penetration and retention, set forth in the following table:

<table>
<thead>
<tr>
<th>Material</th>
<th>Temperature of Wood</th>
<th>Process Type</th>
<th>Penetration in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote Cell</td>
<td>3-4 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 1</td>
<td>5 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 2</td>
<td>6 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 3</td>
<td>7 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 4</td>
<td>8 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 5</td>
<td>9 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 6</td>
<td>10 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 7</td>
<td>11 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 8</td>
<td>12 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 9</td>
<td>13 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 10</td>
<td>14 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 11</td>
<td>15 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 12</td>
<td>16 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 13</td>
<td>17 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 14</td>
<td>18 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 15</td>
<td>19 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 16</td>
<td>20 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 17</td>
<td>21 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 18</td>
<td>22 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 19</td>
<td>23 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 20</td>
<td>24 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 21</td>
<td>25 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 22</td>
<td>26 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 23</td>
<td>27 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 24</td>
<td>28 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 25</td>
<td>29 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 26</td>
<td>30 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 27</td>
<td>31 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 28</td>
<td>32 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 29</td>
<td>33 min.</td>
</tr>
<tr>
<td>Creosote</td>
<td>350-375 F</td>
<td>Creosote 30</td>
<td>34 min.</td>
</tr>
</tbody>
</table>

**Note:** For single pole applications, the grade for Western Lumber (C1) is expanded to allow No. 1 for batters. For multiple pole applications, the grade for Western Lumber (C1) is expanded to allow No. 1 for batters.

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**9-09.232D HEATING IN OIL**

Air seasoned or kiln dried Douglas fir shall be heated in oil prior to the pressure treatment. The preservative shall be introduced to the timber at a temperature of 160 degrees F to 180 degrees F, and the temperature shall be gradually raised to 200 degrees F and held at that temperature for a period of from 3 to 5 hours or a sufficient length of time to obtain an even temperature throughout the material.

**9-09.232E FULL-CELL PROCESS**

Following the heating period, in the case of air seasoned or kiln dried material, and the seasoning under vacuum period in the case of material that is air seasoned, the cylinder shall be filled with creosote and the pressure applied so required to a maximum limit of 175 psi and maintained, taking into consideration the quantity of creosote absorbed during the heating with oil and the specified absorption of creosote that has been obtained.

Temperature of the creosote during the pressure period shall be held between 160 degrees F and 200 degrees F. After pressure is completed, the cylinder shall be emptied of creosote and a vacuum of at least 20 inches promptly created and maintained for a sufficient period of time to free the material from dripping creosote.

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**9-09.232F EMPTY-CELL PROCESS**

Following the heating period, in the case of air seasoned or kiln dried material, and the seasoning under vacuum period in the case of material that is air seasoned, the material shall be subjected to an air pressure of sufficient intensity and duration which, in the judgment of the operator, is sufficient to accomplish the final retention of creosote specified. The pressure shall then be introduced, the air pressure being maintained constant until the cylinder is completely filled.

Creosote shall then be removed from the measuring tank into the wood in a quantity sufficient, in the opinion of the operator, to leave the required retention at the completion of the process herein described. Maximum pressure shall be maintained in no case more than 20 psi. The temperature of the creosote during the pressure period shall be held between 160 degrees F and 200 degrees F.

After pressure is completed, the cylinder shall be quickly emptied of creosote, and a vacuum of at least 20 inches created and maintained for each period of time as may be required to remove dripping creosote from the material.

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**9-09.233 PENTACHLORPHENOL TREATMENT**

**9-09.233A PENTACHLORPHENOL**

Pentachlorophenol shall conform to the requirements of AASHTO M 135. Solvents used in pentachlorphenol solutions shall be petroleum spirits complying with the specifications:

(a) Heavy petroleum solvent oils shall meet the requirements of AWWA 79 Type A.

(b) The preservation solvent oils in the treatment shall consist of not less than 67/10 percent, not more than 5-1/2 percent by weight of pentachlorophenol dissolved in the proper petroleum solvent.

**9-09.233B TREATMENT**

Pentachlorophenol pressure treatment shall be in accordance with the applicable portions of AASHTO M 133. The minimum net retention of the dry wood shall be 0.50 pound per cubic foot of wood, except as noted elsewhere in these Specifications. Treatment shall be by the empty cell process.

**9-09.233C PENETRATION**

Penetration shall be per Section 9-09.32C.

**9-09.234 WATER-BORNE PRESERVATIVES**

Water-borne preservatives shall conform to the applicable portions of AASHTO M 132.

The treatment process and the penetration and retention of the sets shall comply with the applicable portions of AASHTO M 132, except as noted elsewhere in these Specifications or in the Project Manual.

Penetration shall be per Section 9-09.32C.
MATERIALS, CATCH BASINS AND INLETS

SECTION 9-11 WATERPROOFING

9-11.1 ASPHALT FOR WATERPROOFING
Asphalt for waterproofing shall conform to the requirements of ASTM D 332, Type 4. The material used as primer shall conform to the requirements of AASHO M 116, Primer for Use with Asphalt in Densifying and Waterproofing. Acceptance shall be as provided in Section 402.4(2).

9-11.2 WATERPROOFING FABRIC
Waterproofing fabric shall be a saturated cotton fabric meeting the requirements of AATCC 117, Woven Cotton Fabrics Saturated with Bituminous Substances for Use in Waterproofing.

9-11.3 PORTLAND CEMENT MORTAR
Portland cement and sand for the mortar protection course shall conform to the following requirements:

Portland Cement Section 9-01
Sand Section 9-03

SECTION 9-12 MASONRY, CATCH BASINS AND INLETS

9-12.1 REINFORCED CONCRETE
Reinforced concrete shall consist of portland cement, mineral aggregates and water, in which steel has been embedded in such manner that the steel and concrete act together.

9-12.2 CEMENT
Portland cement shall conform to the requirements for the Specifications for Portland Cement (ASTM C 150, any type, unless otherwise limited in the Project Manual, or by the Engineer).

9-12.3 STEEL
Reinforcement shall consist of wire conforming to ASTM A 615, or ASTM A 401, or bars of Grade 60 steel conforming to ASTM A 615, or bars of Grade 40 steel conforming to ASTM A 302.

9-12.4 AGGREGATES
Aggregate shall conform to ASTM C 33, except that the requirement for gradation shall not apply to precast items.

9-12.5 STEPS
Reinforced concrete shall be cast in place.

9-12.6 CONCRETE BRICK
Concrete brick shall conform to the Specifications for Concrete Brick (ASTM C 23, Grade A).

9-12.7 CLAY BRICK
Clay brick shall conform to ASTM C 23, Grade NA unless otherwise provided in the Project Manual.

9-12.8 METAL CASTINGS
Metal castings shall be manufactured from cast iron ASTM A 68. Cast steel shall be manufactured from ASTM A 36.

9-12.9 MANHOLE RING AND COVERS
Manhole rings and covers shall conform to the Standard Plans.

9-12.10 ALUMINUM STEPS
Aluminum steps shall be forged of 6063-T6 alloy having a minimum tensile strength of 36,000 psi. The cubic inch shall be not less than 3/4 inch wide by 3/4 inch thick with two non-skiing gross not to exceed 0.75 inch long and shall have a non-skiing gross not to exceed 0.75 inch long and shall have a non-skiing gross not to exceed 0.75 inch long and shall
9-12.8.2 METAL FRAME AND FRAME AND SOLID METAL COVER FOR CATCH BASINS OR INLETS

The frame and grate and solid metal cover shall conform to Standard Plan No. 202 through 262. The frame may be made of cast iron, ASTM A 48 Class 30, or ductile iron, ASTM A 536, Grade 80-55-06, at the manufacturer's option. The grate and cover shall be made of ductile iron only. Other applicable provisions of Section 9-12.8.1(a) shall apply, except (d) for identification marking. Catch Basins, Type 2AD and 2AB and Inlets, Section Type 2AD and 250B shall be furnished with a vauled grate as indicated on the Drawings. 9-12.8.2(a) CAST METAL INLETS

The casings for cast metal inlets shall be cast steel or ductile iron as shown in Standard Plans Nos. 5600 or Section 9-14.14 and 3051. Alteration plans are acceptable. A copy of the drawings shall conform to fabricator's Shop Drawings approved prior to award of contract.

SECTION 9-13 RIPRAP AND SLOPE PROTECTION

9-13.1 GENERAL

Concrete riprap shall consist of broken stone, concrete in saks, or concrete slabs.

9-13.2 LOOSE RIP

9-13.2(1) GENERAL

The stone for loose riprap shall be hard, sound, and durable. It shall be free from segregation, seams, cracks, and other defects tending to destroy its resistance to weather.

Spalls are defined as broken rock in sizes ranging from 3-inch to 12-inch cubic units. Loose riprap shall be free of rock fines, soil, or other extraneous material.

9-13.2(2) HEAVY LOOSE RIPRAP

Heavy loose riprap shall meet the following requirements for grading:

<table>
<thead>
<tr>
<th>Minimum Size</th>
<th>Maximum Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 to 90%</td>
<td>1 ton (1/2 cubic yard)</td>
</tr>
<tr>
<td>70 to 90%</td>
<td>300 lbs. (2 cu. ft.)</td>
</tr>
<tr>
<td>100%</td>
<td>50 lbs. (pitch)</td>
</tr>
</tbody>
</table>

9-13.2(3) LIGHT LOOSE RIPRAP

Light loose riprap shall meet the following requirements for grading:

<table>
<thead>
<tr>
<th>Size Range</th>
<th>Maximum Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>20% to 90%</td>
<td>300 lbs. or 1 ton</td>
</tr>
<tr>
<td>30% to 90%</td>
<td>50 lbs. (pitch)</td>
</tr>
<tr>
<td>100%</td>
<td>50 lbs. (pitch)</td>
</tr>
</tbody>
</table>

9-13.3 HAND PLACED RIPRAP

The stone shall be as nearly rectangular as possible, 50 percent shall have a volume of not less than 1 cubic foot. No stone shall be used which is less than fiance size, which does not extend through the wall.

The stone shall be hard, sound, and durable. It shall be free from seams, cracks, and other defects tending to destroy its resistance to weather.

9-13.4 SACK RIPRAP

Sack riprap shall consist of concrete placed in sacks made of at least 10 ounce burlap and having a capacity of approximately 23 cubic feet. Each sack shall be filled with approximately 1 cubic foot of concrete having a consistency in conformance with Sections 9-14.10 and 9-14.11.

For sack riprap exposed to fresh water, the concrete shall be Class C and for sack riprap exposed to salt water, the concrete shall be Class B as specified in Section 9-14.2. The cement and fine and coarse aggregates shall conform to the requirements for cement and fine and coarse aggregate of Sections 9-14.2 and 9-14.3, respectively.

9-13.5 CONCRETE SLAB RIPRAP

Concrete slab riprap shall consist of concrete placed in slabs 6 inches thick, unless otherwise shown in the Drawings or directed by the Engineer.

For riprap exposed to fresh water, the concrete shall be Class C, and for riprap exposed to salt water, the concrete shall be Class B as specified in Section 9-14.2. The cement and fine and coarse aggregates shall conform to the requirements for cement and fine and coarse aggregate of Sections 9-14.2 and 9-14.3, respectively.

9-13.6 CONCRETE SLOPE PROTECTION

9-13.6(1) GENERAL

Concrete slope protection shall consist of reinforced portland cement concrete poured or pneumatically placed upon the slope with a restrained joint pattern or with asphalt concrete masonry units placed upon the slope closely adjoining each other.

9-13.6(2) SEMI-OPEN CONCRETE MASONRY UNITS SLOPE PROTECTION

Precast cement concrete blocks shall conform to the requirements of ASTM C 90 for hollow block and C 94 for solid block. Grade M 11, except that strength shall be calculated on wet concrete area.

9-13.6(3) POURED PORTLAND CEMENT CONCRETE SLOPE PROTECTION

Concrete concrete blocks shall consist of reinforced concrete placed in conformance with Section 9-14.2.

9-13.6(4) PNEUMATICALLY PLACED PORTLAND CEMENT CONCRETE SLIP PROTECTION

Concrete the material shall be portland cement as specified in Section 9-14.

Aggregates: This material shall meet the requirements for fine aggregate as specified in Section 9-14.1. The content of the fine aggregate at the time of use shall be between 1 percent and 4 percent by weight.

Reinforcement: Wire mesh reinforcement shall conform to the provisions of Section 9-14.4.

Water: Water shall conform to the provisions of Section 9-14.7.

SECTION 9-9 EROSION CONTROL AND ROADSIDE PLANTING

9-9.14 SOIL

9-9.14(1) TOPSOIL TYPE A

The topsoil shall be friable soil from the A horizon as determined by the United States Agriculture Soil Conservation Service Soil Survey. Topsoil shall be free from: materials toxic to plant growth; noxious weeds, thistles, roots, sod debris, and other debris. One hundred percent of the topsoil shall pass through a 1 inch screen. Maximum electrical conductivity shall be 0.2 millimhos and the maximum exchangeable sodium percentage shall be 10 percent.

Topsoil Type A shall consist of a sandy clay loam, sandy loam, loam, clay loam, or alluvial soil. These soil textural classes shall be determined by the United States
9-14.1(2) TOPSOIL TYPE B

Topsoil Type B shall be native topsoil taken from within the project limits either from the area where roadway excavation is to be performed or from stripings from borrow pit, quarry pit, or from other designated sources. The general limits of the material to be utilized for topsoil will be indicated in the Drawings or specified in the Project Manual. The Engineer will make the final determination of the areas where the most suitable material exists within these general limits. The Contractor shall reserve this material for the specified use. Materials for topsoil Type B shall not be taken from a depth greater than 1 foot from the existing ground unless otherwise designated by the Engineer.

In the production of topsoil Type B, all vegetative matter, except large brush and trees over 4 feet in height, shall become a part of the topsoil. Prior to removing, the Contractor shall mow or otherwise reduce the height of the native vegetation such as sagebrush, snowberry, etc., to be a height not exceeding 1 foot. Native weeds, as designated by authorized State and County officials, shall not be incorporated into the topsoil, but shall be controlled and disposed of as designated elsewhere or as approved by the Engineer. The Contractor shall separate and dispose of all such undesirable material to be taken from the designated areas and placed at locations which will not interfere with the construction of the project as approved by the Engineer. Areas beyond the slope benches shall be designated as fire-hazard areas in the above operations.

Topsoil Type B will not be considered as selected materials as defined in Section 2.14.1(2). The conditions of said section shall not apply.

9-14.1(3) TOPSOIL TYPE C

Topsoil Type C shall be native topsoil meeting the requirements of Topsoil Type B but obtained from a source provided by the Contractor outside of the project site.

9-14.1(4) PLANTING SOIL TYPE D

Planting soil shall consist of approximately two-thirds soil and one-third organic material by volume thoroughly mixed.

The ingredients to be used in mixing planting soil shall meet the following requirements:

(a) Sand shall be sandy loam or loamy sand consisting largely of sand, but with enough clay and organic matter to give it a small amount of stability. Individual sand grains can be seen and felt readily. Grains appearing in the hand when dry, it shall fall apart when the pressure is released; on agitating when moist, it shall form a clod but only hold its shape when the pressure is released, but shall withstand careful handling without breaking.

(b)(a) Topsoil shall be Neither tillage nor rainfall shall cause the soil to become waterlogged.

(c) Topsoil shall be friable and close packed, and shall readily crumble when struck with a hammer.
Plants delivered shall have legible labels attached to each individual plant, specifying its name, supplier, and other necessary information. Each bundle, bale, or container containing one or more plants shall be accompanied by a necessary detailed information as to its botanical name, size, age, caliper or other data required to identify it consistent with Specifications. When delivered as a bundle, bale, box, container, etc., containing more than one plant, information on the label shall show the quantity together with the other required information. Exception: All trees, whether furnished singly or baled, shall be individually tagged with names, size or caliper, etc., needed as above shown. Contractor may refer to State of Washington Department of Agriculture, Orders 1229 and 1230, Nursery Stock Standards, regarding labeling of plant material. Plant material with illegible or missing tags shall be rejected by the Engineer. All plants that are damaged or trademark shall be assigned an individual tag on each plant.

14.6(d) INSPECTION

The Contractor shall, as soon as practical, inform the Engineer as to the source of plant materials for the project. Approval of plant material for a project shall not be considered as final acceptance. The Contractor shall notify the Engineer not less than 48 hours in advance of delivery of plants from the nursery to assure adequate time for inspection before planting.

All trees will be inspected by the Seattle Engineering Department Arborist or his representative at the project site prior to planting. The Contractor shall plant only that plant material approved by the Arborist or his representative.

Root condition of plants furnished in containers shall be determined by removal of the plant from the container. Plants not meeting the requirements herein specified shall be immediately removed from the project and replaced by the Contractor.

Plant material delivered, inspected and approved for planting shall be planted by the Contractor. Plants not meeting the requirements shall be immediately removed from the project at the direction of the Engineer.

14.6(e) TEMPORARY STORAGE

Plants stored under temporary conditions shall be the responsibility of the Contractor.

Plants stored on the project shall be protected at all times from extreme weather conditions. Plants stored with sawdust, soil, or other approved material shall be kept moist at all times.

Plants material delivered and accepted shall be planted immediately. Plants that cannot be planted within 1 day after arrival shall be "heated" in accordance with accepted horticultural practices as follows:

(1) Bare root plants shall be placed in trenches with roots covered with moist earth, sawdust or other suitable material. All bare root material must have the bundle broken and placed in the trenches separately.

(1) Balled and burlapped plants shall have the root ball protected with moist earth, sawdust or other acceptable material.
9.14.11 CEDAR EDGING
Edging edging material shall be 2-inch x 4-inch cedar, concrete, gravel or tumbled with tight joints.

9.14.12 BOLLARDS
9.14.12(1) WOOD BOLLARDS
Bollards shall be nominal 8-inch x 8-inch, 60-day stack dry, select Douglas Fir. Bollards shall be pressure treated (closed cylinder method) Penetrometer after cutting and preshrinking. Tops and 4-inch sides of bollards (above the notch) shall be painted with 2 coats of white marine enamel as manufactured by Inter-Lac or approved equal per manufacturer's recommendations.
All metal parts (bolts, nuts, washers, etc.) shall be hot-galvanized.

9.14.12(2) CONCRETE BOLLARDS
Concrete for bollards shall be Class C 2/3 or 4 concrete. Bollards shall be reinforced with four No. 6 deformed reinforcing steel bars longitudinally, with No. 8 gauge wire ties 1/4 inch thick bar surface of the concrete. All forms are removed, concrete shall be placed to form a smooth dense face. Any surface irregularities shall be within tolerances. The final 4-inch sides of bollards (above the notch) shall be coated with a primer. After the initial set but before the final coating, the excess mortar shall be refilled with mortar and poured to a minimum of 1/2 inch.

9.14.12(3) PADLOCKS FOR REMOVABLE BOLLARDS
The padlock shall be manufactured by Best Lock Company, Lock number 255073 with bronze body, 2-inch stainless steel shackle, and equipped with construction core or approved equal.

9.14.13 BENCHES
Bench seats shall be of the type indicated on the Drawings as specified in the Project Manual.

9.14.14 TREE GRATES
Tree grates shall be 2-piece ductile iron conforme to ASTM A251 or A396. 3/4 inch thick and 48 inches in diameter. Grates shall have centered-breakout center rings that allow easy removal for tree watering. The center ring shall be expanded from 9 inches to 16 inches to 22 inches.

9.15.1 PIPE, TUBING AND FITTINGS
9.15.1(1) GENERAL
Pipe shall be galvanized iron, PVC, or polyethylene, as specified in the Technical Specifications of the Project Manual.

9.15.1(2) GALVANIZED PIPE AND FITTINGS
Pipe shall be standard weight, hot-dipped galvanized iron or steel, as specified by the Engineer, to the requirements of ASTM Designation A 120.

9.15.1(3) POLYVINYL CHLORIDE PIPE AND FITTINGS
PVC pipe shall be Schedule 40 and conform to all requirements of ASTM D 1780. All joints of the control valve shall be Schedule 40 and conform to all requirements of ASTM D 2991, SDR 21.

Fittings shall be of the solvent weld type except where valves, elbows, etc., require threaded transition fittings. Fittings shall conform to the requirements of ASTM D 1696.
PVC pipe and fittings shall be non-toxic, free from taste and odor, and self-extinguishing.

Pipe shall be homogeneous throughout and free of defects cracks, holes, foreign materials, wrinkles, dents and other objectionable materials.
PVC pipe shall be continuously and permanently marked with the following information: manufacturer's name, kind of pipe, National Sanitation Foundation (NSF) approval and schedule number.

9.15.1(4) POLYETHYLENE PIPE
Polyethylene pipe shall be Class 80, SDR 16, medium density polyethylene, and meet the requirements of ASTM D 2998, conforming to U.S. Commercial Standard CS-258, and the National Sanitation Foundation (NSF) approved.

9.15.2 CONTROL TUBING
Control tubing shall be copper refrigerant tubing meeting the current requirements of ASTM Designation B 280 in the size specified on the Drawings. Tubing and fittings shall be capable of withstandng a 300 psi internal operating pressure, and shall be of the size indicated on the Drawings.

9.15.3 AUTOMATIC CONTROLLERS
Automatic controllers shall be installed on a concrete base. The automatic controller shall be electrically wired for automatic opening and closing control valves for predetermined periods of time and mounted so that all manual adjustments will be conveniently located for use by the operator. Controllers shall be of the self-powered type. The control block water shall be from 16-inch gauge aluminum alloy 6063-T6 or 16-inch gauge steel metal. Each block shall be ready for dry application of the unit and mounted and hard dry before shipped.

A pedistal or skirting may be placed around the conduit leading to the metal housing shown in the Drawings. It shall be of the material and finish for approval.

A control block water shall be furnished with the following operating features:
(a) Each controller station shall be adjustable for running open or closed for a period of time or minutes to five or as long as one hour.
(b) Adjustments shall be provided whereby any number of days may be divided and whereby any one or more positions on the controller can be skipped. When the adjustments are made, they shall continue automatically without manpower until the operator desires to make new adjustments.
(c) Controllers shall allow any position to be operated manually both on or off whenever desired.
(d) Controllers shall provide for resetting the start of the irrigation cycle at any time and advancing from one position to another with the control block water.
(e) Controllers shall contain an on-off switch and fuse assembly.
Included on the valve to operate the valve without the removal of electrical current. A manual shut-off valve with a handwheel for wrench operation is required for manual actuation. The Contractor shall ensure the valve is operable. Once the manual adjustment is set, the valve shall operate automatically in the selected direction. The water flow shall be completely stopped when the control valve is closed either manually or automatically. Additionally, automatic and manual controllers need not be of the same manufacture.

9-15.7(3) AUTOMATIC CONTROL VALVES WITH PRESSURE REGULATOR

The automatic control valve with pressure regulator shall be similar to the automatic control valve and shall also reduce the inlet pressure to a constant lower pressure regardless of supply fluctuations. The regulator shall be fully adjustable.

9-15.8 QUICK COUPLING EQUIPMENT

Quick coupler valves shall have a service rating not less than 125 psi for railroad tank car. The body of the valves shall be of cast-steel serrated brass alloy No. C 44990 conforming to ASTM B 596. The base of the valves shall have standard flange pipe threads. The design of the valve shall be such that it will open only upon inserting a coupler key and will close as the coupler is removed from the valve. Leaking of water between the coupler and valve body when operation will not be accepted. The valve body receiving the coupler shall be designed with double wiper seals to allow smooth operation in opening and closing of the valve with a minimum of effort. Saws may be notched at the base to hold the coupler firmly in the open position. Couplers shall be of the same material as the valve body with stainless steel double guide pads to fit the worn seal. Couplers shall be of one-piece construction with stainless steel side handles attached. All couplers shall have standard and upset pipe threads at the top. Couplers shall be furnished with all quick coupler valves unless otherwise specified.

9-15.9 DRAIN VALVES

The Contractor shall install 3/4 inch male automatic ball check valve at the low point in the system. The drain valve shall be installed in a pocket containing a minimum of 1/2 cubic yard of coarse gravel or crushed rock (1/2 inch to 3 inches size).

9-15.10 ROSE BIBS

Rose bibs shall be constructed of bronze or brass, angle thread to accommodate a 3/4 inch hose connection, and shall be key operated. Designs shall be such as to prevent operation by wrench or pliers.

9-15.11 BACKFLOW PREVENTION DEVICES

9-15.11.1(1) ATMOSPHERIC VACUUM BREAKERS

Aluminum vacuum breakers shall be of a type included in the Washington State Department of Social and Health Services listing of "Acceptable Atmospheric (Non-Pressure) Type Vacuum Breaker," or other types with IAPMO approval. They shall be installed downstream of the last shall valve and have a minimum of 6 inches above the highest outlet or overflow level of the irrigation system and located so that adequate room is available for maintenance and testing.

9-15.11.1(2) PRESSURE VACUUM BREAKERS

All copper breakers shall be of a type included in the Washington State Department of Social and Health Services list of "Acceptable Copper Type Vacuum Breakers," or other types with IAPMO or USIC approval. They shall be installed a minimum of 12 inches above the highest outlet or overflow level of the irrigation system.

9-16 FENCE AND GARDUARD

9-16.1 FLOW CONTROL VALVES

The body materials shall be plastic or metal. Internal parts shall be of the same construction as body material. The lines, nozzle sizes, and larger flow control valves shall have a minimum pressure assumption range of 2 to 30 psi. The smaller flow control valves shall have a minimum pressure assumption range of 3 to 50 psi. Flow shall be controlled in 5 percent of design volumes.

9-16.2 AIR RELIEF VALVE

The air relief valve shall automatically relieve air and break a vacuum in the serviced pipe. Body materials shall be installed at least in high points.

9-16.7 ELECTRICAL WIRE

Wire from controller to valves shall be #14 UF direct buried (130°F), or #6 for the hot side, white for neutral (solid copper). The assembly wires, where required, shall be any third color (except green). UF and UL designations shall be clearly marked on the jacket of all wires.

9-16.10 DETECTABLE MARKING TAPE

Detectable marking tape shall consist of inorganic polyethylene plastic that is impervious to all known acids, alkalis, chemical reagents, and solvents likely to be encountered in the soil, with a metallic filler core to provide the most positive detection and pipeline locating. The tape shall be color coded and shall be imprinted continuously over its entire length in permanent black ink. The messages shall convey the type of line buried below and shall also have the word "Caution" prominently shown. Color coding of the tape shall be as follows:

- Utility
  - Tape Color
  - Water
  - Green
  - Sewer
  - Blue
  - Electrical
  - Yellow
  - Gas
  - Red
  - Telephone-CATV
  - Orange

Tape lengths shall be 250 feet and shall be manufactured by the manufacturer for the depth of installation.

9-16.15 SLEEVE

Pipe elbows shall be PVC Schedule 40. Sleeves shall be as recommended by the manufacturer for the depth of installation.

9-16.17 CONDUIT

All conduit shall be as recommended by the manufacturer for the depth of installation.

SECTION 9.6 FENCE AND GARDUARD

9-16.1 CHAIN LINK FENCE AND GATES

All materials used in the construction of chain link fences and gates shall be new, iron or steel material shall be galvanized unless specified otherwise. Importantly, galvanizing material or metal cladding which some serious galvanizers of galvanizing occur shall be specified.

The base material for the manufacture of steel pipes used for posts, braces, top rails, and gates shall be of a type conforming to the requirements of ASTM Designation A 120, except the weight reductions of the bar shall be as specified below:

For a fence material of number II columns shall meet the requirements of ASTM Designation A 663.
9-16  FENCE AND GUARDRAIL

9-16.17) CHAIN LINK FENCE FABRIC
Chain link fabric shall consist of 11 gauge wire (.020 inch diameter) for Type A, 14, 6 and 6 1/4 inch, and 9 gauge (.014 inch diameter) for Type B or 3 1/4. The fabric wire may be one of the following materials provided that only one type shall be selected for use in any one contract:
- Galvanized steel wire conforming to ASTM A 263-B.
- Galvanized shall be Class I performed by the hot-dip process.
- Class II aluminum coated steel wire conforming to ASTM A 49.
- Class III aluminum wire conforming to 6061-7074 Alloy.
The wire shall be woven into approximately 2-inch diamond mesh.

9-16.18) BANDS AND STRETCHER RAMS
Fabric bands shall be 1/8 inch by 1 inch nominal and stretcher bars 3/8 inch by 3/4 inch nominal. Nominal shall be construed to be the area of the cross-section of the shape obtained by multiplying the specified width by thickness. A variation of plus or minus five percent from this theoretical area shall be construed as "nominal" size. Bands shall be hot-dip galvanized to meet the requirements of ASTM F 630.

9-16.19) TIE WIRE
The wire shall be 9 gauge aluminum wire complying with the requirements of ASTM B 211 or 9 gauge galvanized wire meeting the requirements of AASHO M 379. Galvanizing shall be Class I. Hog rings shall meet the requirements of AASHO M 279. Galvanizing shall be Class I.

9-16.11) CHAIN LINK GATES
Gate frames shall be constructed of cold rolled or less than 1/16 inch round cold-drawn pipe galvanized with nominal weight of 2.77 pounds per linear foot. The finish of the gate frame shall be with a minimum order of polishes with a mild steel or brass or zinc plated steel fitting designed for the purpose, or they may be painted. Welding shall conform to the requirements of Section 603.6320.5. All woods shall be ground smooth and painted with a high zinc dust content paint meeting the requirements of MIL-F-35305. The paint shall be applied in one or more coats to meet the thickness of 0.005 inches minimum.

Cross tubing shall be 3/8 inch galvanized steel adjustable rods.

Chain link fence fabric for filling the gate frame shall meet the 4000 pound test specified for chain link fencing type of the fabric being furnished. Each gate shall be furnished complete with necessary hinges, latch, and drop bar locking device designed for the type of gate used on the project. Gates shall have positive type latching devices with provisions for padding.

Gate frames constructed of steel sections, other than pipe, that are designated with a number as to form a gate of equal or better rigidity may be used provided they are approved by the Department.

9-16.11) MISCELLANEOUS
All concrete shall be Class C as specified in Section 602.

9-16.2) WIRE FENCE AND GATES

9-16.2(1) GENERAL
All materials used in the construction of the wire fence shall be new. Iron or steel material shall be galvanized. 314

9-16.2(2) STEEL FENCE POSTS AND BRACES
Steel fence posts and braces shall be of good commercial quality iron or steel material as approved by the Engineer prior to construction. Posts shall be not less than 7 feet in length.

Line posts may be channel, T, U, Y, or other approved shapes manufactured solely for use as fence posts. One type of line post shall be used throughout the project. Line posts shall be inspected, sorted, or properly adapted for attaching either wire or mesh in a manner that will not damage the galvanizing of posts, wire, or mesh during the fastening. Line posts shall have a minimum weight of 1.35 pounds per linear foot and shall be provided with a tapered steel anchor plate attached securely having a minimum weight of 0.47 pounds and having a surface area of 20 square inches plus or minus 3 square inches.

End, corner, gate, and pull posts shall meet the specification for line posts except that they shall have a minimum weight of 3.13 pounds per foot for line post and anchor plates and special studs, angles, or adaptors for the attachment of wires will not be required.

Braces shall have a minimum weight of 3.1 pounds per linear foot.

All posts, braces, anchor plates, and hardware not covered by ASTM F 630 shall be galvanized in accordance with the requirements of ASTM A 153, Type II.

A tolerance of minus 5 percent on the weight of individual posts, brace, or anchor plates will be permitted.

9-16.2(3) WOOD FENCE POSTS AND BRACES
Douglas fir, Western red cedar, hemlock, or larch shall be used in the construction of wood fence posts and braces. The material shall be of good quality and approved by the Engineer prior to use. Pleter cross shall not be used for round posts. Wood fence posts shall be sufficient in weight to remain in the outer periphery to obtain the specified penetration of fence. The ends of the posts shall be cut to the correct length before pressure treatment.

Pressure treated orunken chamfered post should be used.

9-16.2(4) BRACE WIRE
Brace wire shall be 9 gauge galvanized wire meeting the requirements of ASTM A 153, Type II for general Class 2.

9-16.2(5) STAPLES AND WIRE CLAMPS
The staples used to attach the wire fencing to wood posts shall be galvanized 9 gauge, 1 1/2 inches long meeting the requirements of AASHO M 279, Galvanizing Class 1.

The wire clamps used to attach the wire fencing to steel posts shall be galvanized 11 gauge wire meeting the requirements of AASHO M 279, Galvanizing Class 1.

9-16.2(6) BARRED WIRE
Barred wire shall conform to the requirements of AASHO M 280, and shall consist of two strands of 12 gauge galvanized wire, twisted with four point 14 gauge barbs with the barbs spaced an average of 3 inches apart. Galvanizing shall be Class 2 or 3.

9-16.2(7) WIRE MESH
Wire mesh conform to the requirements of AASHO M 279, and shall consist of smooth horizontal wire with vertical spaces spaced 6 inches apart. The top and bottom wires shall be 10 gauge, and the intermediate wires and vertical bars shall be 12 1/2 gauge. The mesh shall have a total width of 26 inches (Design No. 27044-12-1/2). Galvanizing shall be Class 2. The zinc-coated wire as represented by the test specimens shall be capable of being wrapped in a close helix at a rate not exceeding 15 turns/minute around a cylindrical steel mandrel having a diameter the same as the specimen being tested, without cracking or failing the zinc coating to such an extent that any zinc can be removed by wrapping with the bare fingers.

9-16.2(8) VERTICAL CINCH STAYS
Vertical cinch stays shall be 9/16 gauge galvanized wire meeting the requirements of AASHO M 279, except that the minimum weight of zinc coating shall be 0.23 ounces per square foot of unwelded wire surface.

9-16.2(9) STAIR GATES
Gate frames shall be constructed of galvanized standard weight pipe with a nominal diameter of not less than 1 inch. The pipe shall conform to the requirements of ASTM A 130. Wire gates shall be not less than 48 inches in height and shall be designed so that the pin holes called for in the plans or specified by the client in the contract, spaced at 1 1/2 points in the gate. All gates shall be provided with a pair of gates with the upper diagonal truss from side to corner to corner.

The gate frame shall be provided with wire mesh conforming to the requirements specified in Section 9-16.2(7), exclusive of the post which is to be complete with necessary hinges and latch designed for use with the type of gate posts used in the project. The hinges shall be so designed as to be securely attached to the gate post and to enable the gate to be swung backward.

Double gates shall be hinged in the same manner as single gate posts and shall be provided with an approved drop bar locking device.

9-16.16) MISCELLANEOUS
Bolts, nuts, and hinges used in the construction of gates and fences shall be galvanized in accordance with AASHO M 220.

All concrete shall be Class C as specified in Section 602.

9-16.3) BEAM GUARDRAIL

9-16.3(1) RAIL ELEMENT
The W-beam rail and terminal sections shall consist of 12 gauge steel formed to a 5 inch wide and 3 inch deep. Guardrail Type 10 (above beam) and the transition sections shall consist of 10 gauge steel. The rail elements and terminal sections shall be formed from open hearth, electric furnace, or basic oxygen steel. The physical properties of the steel shall conform to the following minimum requirements:

Ultimate tensile strength 70,000 psi
Elongation in 2 inches 12%

The rail splices shall have a minimum total ultimate strength of 80,000 pounds per square inch.

The 6-inch channel rails and splice plates shall be in conformance with AASHO M 163. All fabrication shall be complete before galvanizing.

The holes in the plate shall be to facilitate erection and to permit expansion and contraction. The edges of the rail shall be rolled or rounded as they will not sharp edges. Where the rail is a curve, the plates at the splice shall make contact through the area of splice. When the radius of curvature is less than 150 feet, the rail shall be shaped in the shop.

9-16.3(2) POSTS AND BLOCKS
Posts and blocks may be of crooked treated timber, pressure-treated phenol formaldehyde treated timber, waterborne chromated copper azalea (CCA), ammoniacal copper azalea (ACA), ammoniacal copper azine (ACAZ), treated timber or galvanized steel except only treated posts and blocks may be used for weathering steel beam guardrail. Except for anchor assemblies, all posts for any one project shall be of the same type. Posts and blocks shall be of the size and length shown on the Plans No. 3-1 and No.3-1-A and meet the requirements of these Specifications.

All timber posts and blocks shall be treated to the grade specified in Section 9-903.2, except plate launder No. 1 grade may be used. The blocks used with the guardrail. The timber posts and blocks shall be fabricated as specified in the Standard Plans before being treated. Timber posts and blocks shall be treated with the specified post cure to a maximum red of 0.50 in the treated state, as indicated by the bottom of the post when inserted into the ground for a distance of 0.50 inches minimum.

9-16.3(3) GALVANIZING
Beam rail elements and terminal sections shall be galvanized in accordance with AASHO M 148. Class 6, Type 2, except that the rail shall be galvanized after fabrication, with indications to include forming, cutting, shearing, punching,
9-16 FENCE AND GUARDRAIL

The Inspector shall have the authority to reject materials or workmanship which do not fulfill the requirements of these Specifications. In case of disputes or disagreements, the Contractor or his designee shall be appealed to the Engineer, whose decision will be final.

The Inspector shall accept a mill test report certifying that the steel used in fabricating the rail elements meets the requirements of the specifications. The State reserves the right, however, to require the Contractor to furnish samples of the steel proposed for use and to determine to its satisfaction that the steel meets the specification requirements. Steel rail elements, fittings, terminal section hardware, and bolts may be accepted by the Engineer based on the Manufacturer's Certification of Compliance.

9-16.4 WIRE MESH SLOPE PROTECTION

9-16.4.1 GENERAL

All metal material used in the construction of wire mesh slope protection shall be new and galvanized, imperfectly galvanized material or material upon which serious of omission of galvanizing occurs will not be acceptable.

9-16.4.2 WIRE MESH

The galvanized wire mesh shall conform to No. 9 page 0.148 inch (1.18 mm) diameter commercial quality acid treated steel wire, 3/2 (2.5/2 in 1/2 inch) diamond mesh which shall conform to the requirements of ASTM M 156. Galvanized wire mesh shall conform to the requirements for ASTM A 392 except the weight of wire coating shall be 0.60 ounce per square feet minimum, for uncoated wire surface. Galvanizing shall be done before weaving.

The wire mesh fabric shall have knotted selvages.

9-16.4.3 WIRE ROPE

Wire rope shall be 1/2 inch diameter zinc coated steel structural wire rope conforming to the requirements of ASTM A 479, Class B.

9-16.4.4 HARDWARE

All rings shall be drop-forged steel, heat treated after forging. Lightweight wire rope fittings weighing approximately 0.5 pounds per hundred shall be used with the 1/2 inch diameter wire rope and 0.6 pounds per hundred for 1 inch diameter drop-forged steel wire mesh. All rings, thimbles, wire nuts, and U-bolts shall be galvanized in accordance with ASTM A 392, Class C, except castings shall be Class A, and forgings shall be Class B.

9-16.5 HOG RINGS

Hog rings and tie wire shall be manufactured of 9 gauge, 6 inch long, in accordance with the requirements for hog rings as shown in Section 9-12.2.

9-16.6 GREENT

When required, gear for anchors shall consist of one part Portland cement and three parts of sand. The Portland cement and sand shall conform to the requirements of Section 9-4.3.2.

9-16.4.4 ANCHOR RODS

Anchor rods shall be of good quality steel. The eye may be drop-forged or drawn with a full repulsion weld and shall develop a 150 pound minimum with the rod. The anchor rod shall be galvanized in accordance with ASTM A 153.

9-16.5 VACANT

9-16 FENCE AND GUARDRAIL

9-16.6.1 GENERAL

All material used in the construction of the fence shall be new, free from moisture or aluminum coated as specified. Imperfectly galvanized or aluminum coated, or materials of any condition of galvanizing or aluminum coating will not be acceptable.

9-16.6.2 GLASS SCREEN PANELS

Glass screen fabric shall consist of diamond woven wire mesh. The wire mesh be 0.164 inch diameter aluminum alloy complying with the Aluminum Association requirements for alloy 6061-T6 or, if it may be 0.16 inch diameter (0.08) iron or steel wire which shall meet all of the requirements of ASTM A 235 galvanized or A 481 for aluminum coated, except that galvanizing of Type 2 glass screen fabric shall be less than 0.5 ounce per square feet and shall be done before weaving. Aluminum screens shall be A 201.

Type 1 glass screen mesh size shall be approximately 1 inch diameter. Type 2 glass screen mesh shall be a minimum of 3/16 inch vertical and 5/32 inch horizontal. The design shall permit the glass to be held in a vertical position as shown in the Standard Plan without distortion of the slats.

9-16.6.3 POSTS

Line posts for Type 1 glass screen shall be 1.5 inch by 1.875 inches hot-dip galvanized steel H columns with a minimum of 2.8 pounds per linear feet. Line posts for Type 2 glass screen shall be 1.5 inches by 2.25 inches hot-dip galvanized steel H column with a minimum weight of 4.0 pounds per linear feet, or 2.0 inch inside diameter hot-dip galvanized steel pipe with a nominal weight of 3.0 pounds per linear foot provided only one type shall be used in any one project.

End, corner, brace, and pull posts shall be 2.4 inches inside diameter with cold rolled steel pipe with nominal weight of 3.5 pounds per feet. Intermediate pull posts (braced line posts) shall be 2.0 inches inside diameter hot-dip galvanized steel pipe with cold rolled steel pipe with nominal weight of 2.0 pounds per linear feet. The base material for the manufacture of steel pipes used for the foundation of the requirements of ASTM A 252, except the weight tolerance on tubular posts shall be as applied to pipe material for the same size of steel H columns shall meet the requirements of ASTM A 250.

Posts provided for glass panels will have an acceptance tolerance on the weight per linear foot, as specified, equal to plus or minus 10% for tubular and H-section posts. This tolerance will apply to each individual post.

All posts and cap shall be hot-dip galvanized. They shall have a minimum average of 1.0 ounces zinc coating per square foot. Each individual post, in the case of hot-dip galvanized, this area is defined as the total area inside and outside a sample for computing the average weight of coating. For each inch post it shall be a 1/4 inch piece cut from each cut each galvanized member.

9-16.6.4 TENSION WIRE

Top and bottom tension wire shall be 7 gauge coil spring steel wire of good commercial quality and shall have a disc coating averaging 0.008 ounces per square feet of surface area.

9-16.6.5 CABLE

The tension cables shall be 1/4 inch diameter aluminum coated or hot-dip galvanized, 7 wire stainless steel cable conforming to the requirements of ASTM A 476 for aluminum coated or A 475 for galvanized, High-Strength Grade. Galvanizing shall be Class A.

9-16.6.6 CABLE AND TENSION WIRE

ATTACHMENTS

All tension wire and cable attachments shall be hot-dip galvanized steel conforming to the requirements of ASTM A 252 unless otherwise specified. Eye bolts shall have either a shoulder or a back-up on the eye end and be provided with an eye nut where needed or standard butt and lock washer and be 3/4 inch diameter for tension cable and 2/8 inch diameter for tension wire and of sufficient length to allow for the type of posts used. Where the eye bolt is to be installed through a pipe section, tee lead washers and one sided washer shall also be provided. Turnbuckles shall be of the shackles end type, 1/2 inch diameter with standard shank of 6 inch and provided with 3/8 inch diameter pin. Thimbles shall be light weight wire rope thimbles for use with 1/4 inch diameter cable. Wire rope clips shall have a U-bolt diameter of 3/16 inch for use with 1/4 inch diameter cable. Anchor shackles shall be 3/8 inch diameter with a minimum distance between eyes of 11/16 inch and a pin diameter of 5/16 inch. Stamping shall be 0.02 inch diameter galvanized iron wire.

9-16.6.7 SLATS

9-16.6.7(A) WOOD SLATS

Wood slats shall be 3/8 inch by 2 1/2 inch by the height designation of the fence. Material shall be finished and treated color redwood and shall be free from knots, cracks, and other imperfections. A dimensional tolerance of plus or minus 1/16 inch in width or thickness is allowed provided that the minimum space between slats does not exceed 3/4 inch.

9-16.6.7(B) PLASTIC SLATS

Plastic slats shall be 3/8 inch by 2 1/2 inch by the height designation of the fence. They shall be manufactured from continuous filament polyester fiber reinforced polymer, designed to retard ultraviolet penetration. The material shall have a minimum wall thickness of 0.013 inch and shall be designed for minimum wind and snow loads. The material shall remain flexible without distortion and without becoming brittle through a temperature range from -40F to +100F. Tensile strength shall be at least 3600 psi and the melt index shall not exceed 25.

Plastic slats shall be retained in place by means of U-shaped retention members at the bottom and top of the fence. Retention members shall be of the same material as the slats.

The color for plastic slats shall be selected by the Engineer from samples submitted by the Contractor or supplier.

9-16.6.8 FITTINGS

Fittings shall be meltable cast iron or pressed steel and galvanized in accordance with the requirements of ASTM A 522.

Fittings for any particular fence shall be those furnished by the manufacturer of the fence.

9-16.6.9 FABRIC BANDS AND STRETCHER BARS

Fabric bands shall be 3/8 inch by 1 inch nominal and stretcher bars 2 1/2 inch by 3/4 inch nominal. Nominal shall be constructed to be the area of the cross-section of the shape obtained by multiplying the specified width by thickness. A variation of minus 5% percent from this theoretical area shall be constructed as "trimmed" size. Eye bolts shall be hot-dip galvanized and meet the requirements of ASTM A 660.
9-16.6 POSTS

Fence posts for position A shall be 2-inch inside diameter hot-dip galvanized shear plate, with a nominal weight of 0.35 pounds per linear foot. Fence posts and bases for position B and C shall be 3/4-inch inside diameter hot-dip galvanized steel pipe with a nominal weight of 0.11 pounds per linear foot. The posts shall have a hot-dip galvanized steel post cap securely riveted to the top so as to be capped with 1/4-inch steel weldable nails to prevent the fence from being cut over the top of the post. All cutting, welding, and drilling shall be completed before the post is galvanized.

9-16.7 CABLE

Cable shall be 3/8-inch diameter, hot-dip galvanized, 7 strand, high strength grade, steel cable conforming to the requirements of ASTM A 475. Galvanizing shall be Class A.

9-16.8 WEATHERING STEEL BEAM GUARDRAIL

9-16.8(1) RAIL AND HARDWARE

Steel for rail elements and terminal sections shall conform to ASTM A 606 and A 607. Bolt, nuts, and washers for installation of the weathering steel shall be manufactured from steel conforming to ASTM A 324 and shall not be galvanized. If required, flat washers and flat washers shall be manufactured from ASTM A 242. In addition, all steel for the guarded elements shall conform to the chemical composition limits (percent by weight):

<table>
<thead>
<tr>
<th>Element</th>
<th>Max.</th>
<th>Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cr</td>
<td>0.25</td>
<td>0.15</td>
</tr>
<tr>
<td>Ni</td>
<td>0.20</td>
<td>0.05</td>
</tr>
<tr>
<td>Cu</td>
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<td>0.08</td>
</tr>
<tr>
<td>Ni</td>
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<td>0.03</td>
</tr>
</tbody>
</table>

Metallic and non-metallic coatings of gray castings ASTM A 105 and shall be hot-dip galvanized after fabrication.

9-16.7(5) HOG RING FASTENERS

Hog ring fasteners shall be 9-gauge steel wire with galvanized coatings, conforming to ASTM A 231, Class B.

9-16.7(6) SANDWRAP ANCHORAGE ASSEMBLIES

Spring anchorages shall be constructed at both ends of each length of such protection fence and at intermediate points if the fence exceeds 1,000 feet in length. The anchorage shall consist of anchor, anchor rod, anchor spring, spring anchor, bolt, brick, and base plate. The anchor shall be manufactured of 3/4-inch metal and must be hot-dip galvanized after fabrication and welding. The spring anchor shall be a 30-inch long spring anchor, and the base plate shall be welded to the anchor rod and to the spring anchor, and shall be hot-dip galvanized after fabrication to either a zinc coating of 0.7 oz or 0.5 oz.

9-16.7(6) ANCHORS

Anchor rods shall be either manufactured as specified in Section 1-9.3(1) or they may be fabricated from steel conforming to ASTM A 424 with the exception that all Type I anchors shall be manufactured of hot-dip galvanized cable and fittings as specified in Section 9-16.3(3).

9-17 GUIDE POSTS

9-17.1 POSTS

Guide posts shall be fabricated from steel meeting the requirements of ASTMB 183, or from aluminum meeting the requirements of ASTM B 221. Al 6063-T5. Posts fabricated from steel having less than the required minimum elongation specified in ASTM B 183 shall be accepted provided the elongation exceeds 10 percent in 8 inches and the posts are capable of being bent to a 60-degree angle around a 4-inch mandrel and then straightened without fracture. After fabrication, U or flange steel posts shall be galvanized in accordance with the requirements of ASTM B 183.

Flexible guide posts shall conform to applicable details of WSDOT Standard Plan No. 13 and the Project Manual. Flexible guide posts may be accepted by the Engineer on the basis of a Manufacturer's Certificate of Compliance.

9-17.2 ALUMINUM PLATE

9-17.2(1) SHEET ALUMINUM STOCK

General: The plates shall be fabricated of aluminum alloy conforming to ASTM B 209, grade 0055-78, or 0056-78 0.035 inch thick. The physical dimensions including drilled or punched holes shall be according to WSDOT Standard Plan No. 24, item 43. One side of the aluminum for prismatic reflector guide posts plate shall be coated with a baked enamel coating. Enamel coating shall not be required for fully reflectorized plates.

Treatment: The sheet shall be degreased and etched for 3 minutes by immersion in a 1 percent dilute phosphoric acid solution (the "Molyb" 1200 application, or equivalent). The process shall be in strict compliance with the specifications of the manufacturer. The metal shall be handled by device or clean gloves between all cleaning and etching operations and the application of paint priming or reflective sheeting.

Ensured: The enamel shall meet the requirements of Federal Specification TT-E-650, Enamel, Allied, Semi-gloss, Class 8, BAK. The dimensions and appearance of the plate shall conform to the enclosed sample with the enamel. The color of the enamel for Type A guide posts shall be White and for Type B guide plates shall be Interstate Yellow (Federal Standard 165, Color No. 1524E).

9-17.3 REFOCTORIZATION

Refoctorization shall be applied to all posts shall, at the Contractor's option, be either reflective sheeting applied to an aluminum plate or reflective sheeting applied according to WSDOT Standard Plan No. 14, or in the case of flexible guide posts, reflective sheeting shall be applied to the face of the post unless otherwise specified in the Project Manual. The reflective sheeting shall meet the requirements of Section 9-14.8(4).

Prismatic reflectors shall consist of glass or plastic reflecting elements and shall be resistant to shock and vibration and shall be mounted so as to be in strict compliance with the requirements of Federal Standard M-2164.

The reflective elements shall be attached to the reflector sheeting in such a manner as to preclude the entrance of water, vapor, or other foreign material between the reflective element and the backing. Prismatic reflectors shall have the following minimum coefficient of reflection when tested in units of candle power per foot-candle per square foot:

<table>
<thead>
<tr>
<th>Angle</th>
<th>Observation Angle</th>
<th>White (Color No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2°</td>
<td>1/4°</td>
<td>1/2°</td>
</tr>
<tr>
<td>1°</td>
<td>1°</td>
<td>1°</td>
</tr>
<tr>
<td>2°</td>
<td>2°</td>
<td>2°</td>
</tr>
<tr>
<td>5°</td>
<td>5°</td>
<td>5°</td>
</tr>
<tr>
<td>10°</td>
<td>10°</td>
<td>10°</td>
</tr>
<tr>
<td>20°</td>
<td>20°</td>
<td>20°</td>
</tr>
<tr>
<td>30°</td>
<td>30°</td>
<td>30°</td>
</tr>
<tr>
<td>60°</td>
<td>60°</td>
<td>60°</td>
</tr>
</tbody>
</table>
The basis of acceptance of reflective elements will be on Materials Laboratory (Ml) or certified test reports from the manufacturer, at the option of the Engineer. If reflective elements are the basis of test reports, the Contractor shall provide the Engineer, prior to acceptance, with copies of certified test reports signed by a responsible representative of the manufacturer. The certified test reports shall be the sole basis of acceptance of the manufacturer. The certified test reports shall contain the following information:

(a) Description of the type and quantity of items covered by the test report.

(b) Project for which the material is intended, or name and address of the Contractor to whom the material was delivered, or other suitable description enabling the Engineer to identify positively that the test report covers the material delivered to the particular project.

(c) The test report shall show evidence of calibration values at 1/2 degrees and 1/6 degrees observation o's present in units of candle-power per foot-candle per square foot, at entrance angles of 9 degrees, 10 degrees, and 20 degrees.

(d) Minimum coefficient of reflection values for reflective sheathing at 0.2 degree, 0.3 degree, and 2.0 degrees observation expressed as average candlepower per foot-candle per square foot at entrance angles of 40 degrees and minus 4 degrees for both wet and dry conditions, 55 degrees gloss rating, long removal after aging, and quality after accelerated weathering.

(e) Certified quality of application of reflective sheeting to the aluminum plate.

It is expressly understood that the furnishing of certified test reports will not relieve the Contractor from the obligation to replace material found to be defective for any reason after delivery to the project, nor will certified test reports prevent the Engineer from sampling material when it arrives on the premises and submitting it to such additional laboratory tests as he may deem appropriate or significant.

9-17.4 HARDWARE

Hardware or fittings shall be aluminum blind rivets.
applied readily by brush or spray to the masonry at atmospheric temperature down to minus 20 degrees F. The average absorption of three test specimens treated with the waterproofing material tested, when tested in accordance with the methods used in the Materials Laboratory, shall not exceed 2 percent after being partially immersed in water for 72 hours immediately after curing.

The average moisture vapor transmission (breathability) of three test specimens, when tested in accordance with the methods used in the Materials Laboratory, shall be not less than 50 percent at seven days.

The water-repellent compound shall be approved by the Materials Laboratory before it is used.

9-18.5 SODIUM METASILICATE

Sodium metasilicate shall comply with ASTM D 537.

SECTION 9-19 PRESTRESSED CONCRETE GIRDERS

9-19.1 AGGREGATES AND PROPORTIONING

The concrete for prestressed girders shall have the minimum compressive strengths as specified in the Drawings. Aggregates used in the mix shall conform to the requirements of Section 9-20.1 except that the manufacturer may retain the grading of the coarse aggregate employed in the concrete mix design is qualified with the modified gradation.

The Contractor shall submit for approval a proposed mix design for each design strength to be used. Included shall be evidence satisfactory to the Engineer that the proposed mix will meet design requirements. Approval of the mix design will not prejudice any requirements for the concrete as placed in the girders.

Water used in mixing the concrete shall conform to the requirements of Section 9-07.1.

Cement shall be Type II or Type III conforming to the requirements of Section 9-06. Any chemical admixtures that are used shall conform to the provisions of Section 9-37.1.

The total chloride ion (Cl⁻) content of the mixed concrete, expressed as a percent by weight of cement, shall not exceed 0.06 percent for precast concrete.

9-19.2 REINFORCEMENT

Reinforcement shall meet the requirements of Section 9-07.1.

9-21 PLASTIC TRAFFIC BUTTONS AND LANE MARKERS

9-21.1 PLASTIC TRAFFIC BUTTONS AND LANE MARKERS Type 1

9-21.1(11) GENERAL

Plastic Traffic Buttons and Lane Marker Type 1 shall be essentially in the form of a single-based segmented, composed of thermosetting resins and pigments, and of uniform composition throughout. The color shall be yellow or white to correspond to the delineation line color.

9-21.1(2) PHYSICAL AND CHEMICAL PROPERTIES

The exposed surface shall be free of chips, cracks, mold marks, and other irregularities which interfere with appearance or application. The bottom surface may have molded patterns but shall not show general convexity or concavity in excess of 1/8 inch. The molding process shall be such that coarse aggregate particles on the curved surface are covered by not less than 1/16 inch of pigmented material.

The plastic traffic buttons and lane marker Type 1 shall meet the following requirements:

<table>
<thead>
<tr>
<th>LANE MARKER / TRAFFIC BUTTON (Description)</th>
<th>LANE MARKER / TRAFFIC BUTTON (Description)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>Diameter</td>
</tr>
<tr>
<td>3.75&quot; to 4.125&quot;/ 4 x 17&quot; x 1/4&quot;</td>
<td>4 x 10&quot; x 1/4&quot;</td>
</tr>
<tr>
<td>Weight (pounds)</td>
<td>Weight (pounds)</td>
</tr>
<tr>
<td>0.1254 min.</td>
<td>0.1254 min.</td>
</tr>
<tr>
<td>State Reflector</td>
<td>State Reflector</td>
</tr>
<tr>
<td>306 min.</td>
<td>306 min.</td>
</tr>
<tr>
<td>Impact Resistance (inches - pounds)</td>
<td>Impact Resistance (inches - pounds)</td>
</tr>
<tr>
<td>15 inches - pounds</td>
<td>15 inches - pounds</td>
</tr>
<tr>
<td>Porosity of Foam</td>
<td>Porosity of Foam</td>
</tr>
<tr>
<td>0.02 max.</td>
<td>0.02 max.</td>
</tr>
<tr>
<td>Colorants (inches)</td>
<td>Colorants (inches)</td>
</tr>
<tr>
<td>0.125 Max.</td>
<td>0.125 Max.</td>
</tr>
<tr>
<td>Titanium Dioxide (in lbs)</td>
<td>Titanium Dioxide (in lbs)</td>
</tr>
<tr>
<td>21 lbs.</td>
<td>21 lbs.</td>
</tr>
<tr>
<td>Reuse Content</td>
<td>Reuse Content</td>
</tr>
<tr>
<td>10 lbs.</td>
<td>10 lbs.</td>
</tr>
</tbody>
</table>
| Plastic traffic buttons should be Guideable Traffic Detectors Model 410 or approved equal.

9-21.1(3) TEST METHODS

Test methods shall be as follows:

(a) Reflectance: Reflectance will be measured with a photovolt Reflectance Meter or its equivalent by comparing the buttons to a 70 percent reflectivity standard.

(b) Impact Resistance: Impact resistance will be measured by allowing a 1 pound steel ball to fall 15 inches (five feet) onto the lane marker, supported by but not bonded to a steel base plate.

(c) Titanium Dioxide Content: The titanium dioxide content will be determined by ashing representative portions of the lane marker, treating the ash with a boiling (NH₄)₂SO₄-H₂SO₄ solution, filtering, and measuring the absorption of the filtrate at about 410 millimicrons. Calibration will be with known samples using ASTM Designation D 421.

(d) Resin Content: Resin content will be determined by ashing and igniting representative portions of the marker.

Additional information on the test methods is available from the Materials Laboratory of the Seattle Engineering Department.

9-21.2 LANE MARKER TYPE 2

The markers shall consist of an acrylic plastic sheet filled with a tightly adherent potting compound. The shell shall contain prismatic reflective faces as shown in Standard Plan No. 700 to reflect incident light from opposite directions.

9-21.2(3) STRENGTH REQUIREMENTS

Markers shall support a load of 2,000 pounds as applied in the following manner:

(a) A marker shall be centered over the open end of a vertically positioned hollow metal cylinder. The cylinder shall be 1 inch high with an internal diameter of 3 inches and wall thickness of 1/4 inch. The load shall be slowly applied to the top of the marker through a 1-inch diameter by 1-inch high spherical plug centered on the top of the marker.

(b) Failure shall constitute either a breakage or significant deformation of the marker at any load of less than 2,000 pounds.

SECTION 9-22 MONUMENT FRAMES AND COVERS

9-22.1 GENERAL

Monument castings shall be cast iron as indicated on the (Standard Plans).

Castings shall conform to the requirements of ASTM Designation A 45. Class 30 and shall be free of porosity, shrink cavities, cold shuts or cracks, or any surface defects which would impair serviceability. Repair of defects by welding, or the use of "smoothing-on" or similar material, will not be permitted. The manufacturer shall certify that the product conforms to the requirements of those specifications.

A"

9-22.2 MONUMENT FRAMES AND COVERS

9-22.2.1 GENERAL

Monument castings shall be test cast iron as indicated on the (Standard Plans).

Any chemical admixtures that are used shall conform to the provisions of Section 9-37.1.

The total chloride ion (Cl⁻) content of the mixed concrete, expressed as a percent by weight of cement, shall not exceed 0.06 percent for precast concrete.

9-23 CONCRETE CURING MATERIALS AND ADMIIXTURES

9-23.1 SHEET MATERIALS FOR CURING CONCRETE

Sheet materials for curing concrete shall meet the requirements of ANSI M 37. Sheet Materials for Curing Concrete, except that only white reflective type shall be used.
CONCRETE CURING MATERIALS AND ADJUVANTS

9-23.2 CHLORINATED RUBBER TYPE CURING COMPOUNDS

Composition:

<table>
<thead>
<tr>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>White</td>
<td>White</td>
</tr>
<tr>
<td>Pigmented</td>
<td>Pigmented</td>
<td>Heavy laden</td>
</tr>
</tbody>
</table>

Vehicle Ingredients

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Lbs/100 Gal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorinated Paraffin, MIL-C-429, Type II (708 C)</td>
<td>67.9</td>
</tr>
<tr>
<td>Chlorinated Paraffin, MIL-C-429, Type I (608 C)</td>
<td>67.9</td>
</tr>
<tr>
<td>Chlorinated Rubber (Type I)</td>
<td>170.3</td>
</tr>
<tr>
<td>Ethylene Glycol Monobutyl Ether</td>
<td>272.8</td>
</tr>
<tr>
<td>Naphthalene, T.T./300</td>
<td>272.8</td>
</tr>
<tr>
<td>Arsenic Burn (Type I)</td>
<td>2.1</td>
</tr>
<tr>
<td>Benzoic Acid</td>
<td>5.4</td>
</tr>
</tbody>
</table>

Pigment Ingredients

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Lbs/100 Gal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium Dioxide, ASTM D 476, Type III</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note 1. Chlorine percent: 45.68

Vacciny 20% in Tohono, Certificates at 25°C: 8-14

Specific Gravity: 1.265 to 1.268

Index of Refraction: 1.500 to 1.506

Note 2. A substrate blend may be substituted for the solvents in the formulation provided:

(a) The solvent blend shall have a flash point of 7°F above open and minimum.

(b) The finished curing compound shall conform to the requirements in this Section for "characteristics of finished material" and shall contain 18% by weight of a phenolic resin with a paddle.

Note 3. Liquid, color, and free max. (Gardens), vacuity 110-150 poises at 25°C, resistivity.

At the discretion of the manufacturer, an anti-setting agent other than the specified naphthalene may be used to ensure compatibility in order to maintain the pigment in the package. The total amount of anti-setting agent used shall not exceed 60 pounds per 100 gallons of the concrete curing material. There shall be no cracking or settling of the pigment in the package that cannot be repaired by using a paddle.

Characteristics of Finished Material

<table>
<thead>
<tr>
<th>Type</th>
<th>7.9 min.</th>
<th>21.5 min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight, by weight percent</td>
<td>65.0%</td>
<td>49.5%</td>
</tr>
<tr>
<td>Flammability, grams of fuel</td>
<td>5.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Viscosity at 77°F, KU</td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td>Drying time, hours on concrete</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>85%</td>
<td>91.0%</td>
<td></td>
</tr>
</tbody>
</table>

4.5 min. | 10.2 min. |

Drying Time, hours on concrete

4.5 min. | 4.4 min. |

Dry through, hours at 77°F

2.0 max. | 2.0 max. |

Weather resistance, grams per hour at 72 hours (Type I)

2.50 max. | 2.50 max. |

Length of Cure

| 14 Curves | Match Std. | Match Std. | Match Std. |

Note 4. May be affected by use of a solvent blend.

Note 5. Test Method WSDOT 407

Packaging: The compound shall be packaged in new 5 gallon steel containers or clean 5 gallon drums with renewable head to prevent thermal starting.

Test: Testing will be performed prior to use by applicable methods from ASTM, Federal Test Method Std. No. 141, or WSDOT Testing Procedures.

CONCRETE CURING MATERIALS AMONG STERAD AND ADJUVANTS

9-23.3 TRANSPARENT CURING COMPOUND

The compound, at the time of application, shall be a liquid that is free from suspended matter and sufficiently low in viscosity to result in uniform coating when applied by spraying.

The compound shall be sufficiently transparent and free from permanent color to result in no pronounced change in color from that of the natural concrete at the conclusion of the curing period. The compound shall contain a dye of color strength sufficient to render the film distinctly visible on the concrete for at least 4 hours after application.

The loss of moisture shall not exceed 2 grams per square inch when subjected to the Test for Moisture Retaining Effectiveness of Concrete Curing Compounds. Details of the test method are available from the Materials Laboratory.

9-23.4 VACANT

9-23.5 BURLAP CLOTH

Burlap cloth shall meet the requirements of AASHTO M 182, Class 4.

9-23.6 AIR-ENTRAINING AND CHEMICAL ADJUVANTS

Air-entraining admixtures shall be made to meet the requirements of AASHTO M 184.

Chemical admixtures for concrete shall conform to the requirements of AASHTO M 184, Type A, B, or D. Chemical admixtures containing more than 1 pound chloride ion (Cl⁻) by weight shall not be used.

Acceptance for air entraining or chemical admixture shall be made to the Materials Laboratory before use.

9-23.7 AIR-ENTRAINING AND CHEMICAL ADJUVANTS FOR FIBER-ENHANCED PRESTRESSED CONCRETE

Air entraining admixtures shall meet the requirements of AASHTO M 104.

Chemical admixtures shall conform to the requirements of AASHTO M 104, Type A, B, D, or F. Approval of specific admixture products shall be made as a part of the annual approval of precast fabrication laboratory. Chloride ion content of chemical admixtures shall not exceed one pound per weight.

Acceptance will be on the basis of the Manufacturer's Certification of Compliance.

If required by the Engineer, the air entraining or chemical admixture shall be sampled and tested by the Materials Laboratory before use.

9-23.8 WHITE PIGMENTED CURING COMPOUND

Resin base curing compound shall conform to the requirements of AASHTO M 104 for Type 2, Class B, white pigmented curing compound, except that the water content of the liquid membrane-forming compound, when tested as specified in WSDOT Test Method 402, shall restrict the loss of water to not more than 2.50 grams in 72 hours.

9-23.9 CONCRETE MIXES INCORPORATING FLY ASH

Concrete mixers incorporating fly ash may be utilized for all concrete mix designs as far as guidelines are noted in the Project Manual. Mix proportions will be subject to approval by the Engineer and shall be in compliance with the following conditions.

(a) Fly ash may be used to replace up to 20 percent of portland cement at the rate of 1 1/4 pounds fly ash per each pound of portland cement used. Where a specific cement content is not provided, fly ash content shall not exceed 25% of the total cementitious materials. Cementitious material shall be the sum of portland cement and fly ash.

(b) Cement replacement in concrete mixes specifying a cement content shall be subject to strength confirmation testing and approval of the proposed mix by the Engineer for the following classes of concrete:

Concrete Class C
Concrete Class B when used in bridges, culverts, and retaining walls
Concrete Class A

For classes of concrete, the Contractor shall design the concrete mix to meet an average 28 day compressive strength of 1,534 times the minimum ultimate compressive strength shown in Section 6.02.3(2) for concrete Plains with a coefficient of variation of 20 percent.

For concrete Plains with a coefficient of variation other than 20 percent, the required average strength shall be:

fₚ = fₚ(1.28 + 0.025)c

where:

fₚ = required average 28 day compressive strength
fₚ = minimum ultimate compressive strength after 28 days
C = coefficient of variation (CV) expressed as a decimal

The required average 28 day compressive strength will be determined from five 2 inch diameter cylinders tested in accordance with WSDOT test methods 801 and 811.

A CV of 20 percent will be permitted unless the concrete supplier can justify a lower value.

To establish a CV for a concrete Plant, a minimum of 30 sets of two cylinder compressive tests will be required. The cylinders will be 6X6X12 inch test specimens and will be maintained in an indoor environment with average temperature and humidity. The test results for each of the two cylinders will be used with the equation to calculate the CV for each test. The equipment used for the production concrete must be the same as will be used for the production concrete and must be of the same mix design ratio as that of the project.

The concrete mix design shall be approved by the Engineer and verified by the Materials Laboratory upon completion of all testing.

The concrete mix design shall be approved by the Engineer and verified by the Materials Laboratory upon completion of all testing.

(f) Cement replacement may be used without strength confirmation testing of the proposed mix for concrete Class C, Class D, and Class IX for applications not within the scope of this Section 9-23.

(1) Making calculations relative to cement factor or allowable water content with WSDOT test methods 801 and 811, the total cementitious materials shall be considered to be the weight of portland cement plus the weight of fly ash added.

(g) Air content of concrete containing fly ash shall be on the same basis as for comparable class of concrete without fly ash.

As an alternative to the use of fly ash and cement as separate components, a blended hydraulic cement may be used. Concrete made with blended hydraulic cement shall
SECTION 9-24  PLASTIC WATERSTOP

9-24.1  MATERIAL

The waterstops shall be fabricated from a plastic compound, the basic resin of which shall be polyvinyl chloride. The compound shall contain any additional resins, plasticizers, inhibitors, or other material such that when the material is compounded, it shall meet the performance requirements given in this specification. Single-pass waterstop material of the same composition generated from the fabricator's waterstop production may be used. No reclaimed polyvinyl chloride shall be used.

All waterstops shall be molded or extruded in such a manner that any cross section will be dense, homogeneous, and free from porosity and other imperfections. The waterstop shall be symmetrical in shape, nominally 4 inches in width, by 2/3 inch thick, and a minimum of four ribs on the face of both. The bulb thickness and diameter shall be as noted in the plans.

9-24.1.1  TESTS OF MATERIAL

The waterstops shall meet all of the physical and other test requirements of this material as defined in the Corps of Engineers Specifications for Polymer Chloride Water Stop CEDC-07C, except that the tear resistance of the material shall be not less than 100 pounds per inch. The Contractor shall furnish such sample material as required by the Engineer for the purpose of making tests.

SECTION 9-25  WATER

9-25.1  WATER FOR CONCRETE

Water for use in cement or mortar concrete shall be reasonably clear and free from oil. It shall not contain chlorides calculated as sodium chloride in excess of 2,500 parts per million, nor sulfates calculated as sodium sulfate in excess of 1,000 parts per million. It shall not contain any impurités in amounts sufficient to cause unrelated or marked change in time of setting in the concrete with which it is mixed, nor a reduction in mortar strength of more than 5 percent compared toug the results obtained with distilled water.

The property enumerated above shall be determined in accordance with ASTM C 183 unless otherwise stated.

9-25.2  WATER FOR IRRIGATION

Water for irrigation shall not contain dissolved or suspended matter which will be harmful to the plant material on which it is to be used.

SECTION 9-26  EPOXY RESINS

9-26.1  GENERAL

These Specifications cover 2-component epoxy resin systems for bonding plastic concrete or mortar to metal or hardened concrete, or for bonding hardened concrete or other materials to hardened concrete. Epoxy resin used for patching external concrete shall have a concrete-gray color. The epoxy resin systems shall be furnished in the type, grade, and class as specified according to the following systems.

Type I: For use in bonding hardened concrete to other materials in hardened concrete. Type II: For use in bonding freshly mixed concrete to hardened concrete. Type III: For use in bonding resistant materials to hardened concrete and as a binder in epoxy mortars or epoxy concrete.

9-26.1.1  TYPES

Three grades of systems are defined according to their flow characteristics and are distinguished by the viscosity and consistency requirements in Section 9-26.1.1. Grade 1: Low viscosity. Grade 2: Medium viscosity. Grade 3: High viscosity.

9-26.1.1.1  PHYSICAL REQUIREMENTS OF EPOXY RESIN SYSTEMS

All testing shall be in accordance with ASTM C 863 unless otherwise stated.

TYPE I II III
Viscosity, Poise (P): 202.0 302.0 602.0 1002.0
Grade 2, min.: 202.0 302.0 602.0 1002.0
cons. 1002.0 1002.0 1002.0 1002.0
Consistency, in mm: Grade 1, max. 1/416.0 1/416.0 1/416.0
Grade 3, max. 30 30 30
Get time, Minutes, min.: 30 30 30
Bond strength, psi, hardened concrete: Type I 1,200 1,200 1,200
Type II 600 600 600
Type III 600 600 600
Bond strength, psi, plastic concrete to hardened concrete: Type I 1,200 1,200 1,200
Type II 600 600 600
Type III 600 600 600
Volatile content, cured system: Type I 3 3 3
Type III 1.5 1.5 1.5

SECTION 9-27  EPOXY RESINS

9-26.1.2  AGGREGATE

 Aggregate for epoxy mortar or concrete shall be clean, surface dry aggregates with a maximum particle size equal to or physical properties of the epoxy resin system, and shall be of a quality and gradation suitable for Portland cement concrete or mortar. Sand meeting the requirements of Section 9-10.1.2) will be satisfactory.

9-26.1.3  SAMPLING

A representative sample of each component (one pint of each) shall be taken either from a well-blended bulk lot prior to packaging or by withdrawing that same lot from no less than 5 percent of the components comprising the lot or shipment. Instead of the forgoing, packaged materials may be sampled by a random selection of containers of each component from each lot.

9-26.1.4  REDUCTION

Except as noted otherwise, the entire lot of both components may be rejected if samples submitted for test fail to meet any requirements of this specification.

9-26.1.5  PACKAGING AND MARKING

The components of the epoxy resin system furnished under these specifications shall be supplied in separate containers which are nonreactive with the materials contained.

9-26.1.6  BULK BAGGING

Containers shall be identified as "Component A contains Epoxy Resin and Component B contains Curing Agent" and shall show the type, grade, class, and mixing directions as defined by the above specifications. Each container shall be marked with the name of the manufacturer, the lot or batch number, the date of packing, and the quantity contained in pounds and gallons.

9-26.1.6.1  MARKING

Containers shall be so marked on the package in accordance with the Federal Hazardous Products Labeling Act and State of Washington, Department of Labor and Industries Regulations for Shipment of Hazardous Products.

9-26.1.6.2  CERTIFICATION

If requested by the Engineer, the manufacturer of the epoxy resin system shall certify that components A and B meet the requirements set forth before a sample will be accepted for testing by the Owner. Such certification shall consist of signed copies of the manufacturer's test report or a statement of the manufacturer, accompanied by a copy of the test results, that the components A and B have been sampled and tested. Such certification shall indicate the date of testing and shall be signed by an authorized agent of the manufacturer or manufacturer.

9-26.1.7  ACCEPTANCE

Acceptance of a batch lot or shipment of the material for use on the project shall be based on the result of laboratory tests of samples, as specified in Section 9-10.1.3) representing the particular batch or shipment of materials supplied. Tests will be performed at the Materials Laboratory. A period of 10 days should be allowed for testing, following receipt of samples in the laboratory.

9-26.2  ADHESIVE FOR LANE MARKERS

9-26.2.1  DESCRIPTION

The adhesive shall be furnished as two components, each packaged separately. The components shall be as follows:

<table>
<thead>
<tr>
<th>Package</th>
<th>Parts by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Epoxy Resin</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
</tr>
<tr>
<td>B</td>
<td>Tannin Dioxide</td>
</tr>
<tr>
<td></td>
<td>7.2</td>
</tr>
<tr>
<td></td>
<td>Resin Grade Asbestos</td>
</tr>
<tr>
<td></td>
<td>5.00</td>
</tr>
<tr>
<td></td>
<td>Tar</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9-26.2.2  RAW MATERIALS

Raw materials for the adhesive shall meet the following specifications:

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Resin—Viscosity, 5, points at 25 degrees C.; insoluble equivalent 175-250; color (Gardner) 5 maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Product from coal tar and lignite. Acetone insoluble more than 1.00</td>
</tr>
<tr>
<td></td>
<td>Hydrogen peroxide.</td>
</tr>
</tbody>
</table>

9-26.2.3  MARKING

Containers shall be identified as "Component A contains Epoxy Resin and Component B contains Curing Agent" and shall show the type, grade, class, and mixing directions as defined by the above specifications. Each container shall be marked with the name of the manufacturer, the lot or batch number, the date of packing, and the quantity contained in pounds and gallons.

9-26.2.4  MARKING

Containers shall be so marked on the package in accordance with the Federal Hazardous Products Labeling Act and State of Washington, Department of Labor and Industries Regulations for Shipment of Hazardous Products.

9-26.2.5  CERTIFICATION

If requested by the Engineer, the manufacturer of the epoxy resin system shall certify that components A and B meet the requirements set forth before a sample will be accepted for testing by the Owner. Such certification shall consist of signed copies of the manufacturer's test report or a statement of the manufacturer, accompanied by a copy of the test results, that the components A and B have been sampled and tested. Such certification shall indicate the date of testing and shall be signed by an authorized agent of the manufacturer or manufacturer.

9-26.2.6  ACCEPTANCE

Acceptance of a batch lot or shipment of the material for use on the project shall be based on the result of laboratory tests of samples, as specified in Section 9-10.1.3) representing the particular batch or shipment of materials supplied. Tests will be performed at the Materials Laboratory. A period of 10 days should be allowed for testing, following receipt of samples in the laboratory.
9-26.2(3) PHYSICAL REQUIREMENTS OF MIXED ADHESIVE

Mixed adhesive shall be a blend of 1 part of component A and 1 part of component B, as specified in Section 9-26.2(1), and shall meet the following properties:

- Gel time (100 gms Batch) = 520 minutes
- Tensile strength / Surface Adhesion:
  - Elms between steel blocks cured 24 hours at 70°F
  - Tested at 70°F: 1,000 psi (Min.)
  - Shore D Hardness:
    - Tested at 70°F: 70-90 (Cured 24 hours at 70°F)
    - Tested at 130°F: (Min.) 30

9-26.2(4) ACCEPTANCE

Adhesive for lane markers may be accepted by the Engineer based on the Manufacturer's Certificate of Compliance. The manufacturer shall certify that each batch of adhesive conforms to these specifications. The lot or batch number shall appear on the certificate, on all samples, and on all lots of adhesive delivered. A one piece sample of the A and B components shall be sent to the Materials Laboratory by the supplier not less than 10 days before using.

SECTION 9-27 CHIRRING

9-27.1 PLAIN METAL CHIRRING

9-27.1(1) GENERAL

Plain metal shall be galvanized metal members and fittings which are designed, formed and patterned to be field-assembled into a continuous closed faced wall of connected bins. The designs, shapes, and patterns of the various members and their assembly shall be in accordance with the details shown in WSDOT Standard Plan No. 155-0 and 155-1.

9-27.1(2) BASE METAL AND SLOPER COATING

The galvanized sheet and fabricating the several members shall conform to the requirements of the current edition of the Metal Course Plan, AASHTO M 236. Bolts, nuts and miscellaneous hardware shall be galvanized to conform with the requirements of AASHTO M 236.

9-27.1(3) GAGE

The various members of the wall shall be of the same gage designated in WSDOT Standard Plan No. 155-0 and 155-1 for the type of metal chirring to be constructed.

9-27.1(4) FABRICATION

All members shall be so fabricated that members of the same nominal size and gage shall be fully interchangeable.

No drilling, punching, or driving to correct defects in members shall be permitted. Any members having holes improperly punched shall be replaced.

9-27.2 VACANT

9-27.3 GABION CHIRRING

9-27.3(1) WIRE

Wire used in the construction of the gabion baskets may either be hot-dipped drawn steel. Gabions shall meet the requirements of ASTM A53, Grade Numbers 1020 or 1026. Steel wire fabric shall meet the requirements of AASHTO M 312.

Wires shall be galvanized in accordance with ASTM A641 with a Class 3 Coating and Medium Temper. For gabion baskets, wire used in the body of the mesh shall not be thinner than 11 gauge, wire used in hose shall be 10 gauge and hose and hose with 9 gauge. For PVC coated gabion baskets are specified, wire used in the body of the mesh shall not be less than 12 gauge, hose wire shall 11 and hose with 10 gauge.

Displacement shall be made of the same mesh and gage and shall be coated as the same as the body of the basket.

9-27.3(2) CLIP FASTENING

Clip fasteners may be the locking spring steel type, clamping type or other type that provides a positive lock and continues to the following specifications. For gabion baskets, either galvanized steel or stainless steel clip may be used. The clip shall be capable of holding a load of 600 pounds within the opening when tested in tension along the longest side of the clip. The hardness of the steel shall be such that the clips can be moved 1/4 inch without permanent deformation. Galvanizing on the steel clip shall have a minimum of 0.006 ounces per square foot. The stainless steel clip shall 10 gauge 431 stainless steel.

For PVC coated baskets, clips shall 10 gauge 431 stainless steel.

9-27.3(3) STONE

Stone for filling gabions shall have a Deformation Factor of at least 30. The stone shall be dense enough to pass the unit weight test described in Section 64-306. Stone shall meet the following requirements for gradation:

- Paving #8 square stone > 100%
- Paving #8 square stone > 75% - 100%
- Fracture: 0 - 12%
- Fracture: 75%

All percentages are by weight.

9-27.3(4) MESH OPENINGS

Openings of the mesh shall be approximately 4 inches in the lengthwise direction and 4 inches in the crosswise direction.

9-27.3(5) NONRAVELING CONSTRUCTION

The wire mesh shall be fabricated to be nonraveling. This is defined as the ability to resist pulling apart at any of the connections forming the mesh when a single strand in a section of mesh is cut.

SECTION 9-28 SIGNING MATERIALS AND FABRICATION

9-28.1 SIGNS

9-28.1(1) GENERAL

Signs shall be mounted on wood utility poles (other than City Light) and signs installed overhead shall be High Density Overhead plywood. Other signs shall be either High Density Plywood or sheet aluminum.

9-28.1(1-A) SIGN FACE SHEETING

Reflective sheathing shall consist of spherical lens elements either embedded within a transparent plastic or affixed to a synthetic resin and encapsulated by a transparent plastic. The sheathing shall have a flat, smooth, outer surface, be weather resistant, and have a precoated adhesive backing with a protective liner.

The sheeting shall have the following minimum brightness values expressed as average candle power per square foot of material. Measurements shall be made in accordance with standard test procedures for reflectors in Federal Specification LS-330.

(a) With Embedded Lens Elements:
- Color: Silver White (41)
- Silver-White (2)
- Yellow

- Die: Avg. 0.2% 0.15% 0.2% 0.15% 0.2% 0.05% 0.15%
- Inc. Avg. 70.0 60.0 40.0 30.0 5.0 25.0 15.0
- Die: 14.5 8.5 4.0 3.0 9.5 6.0 11.5
- Inc. 7.5 4.0 2.0 0.0 9.0 4.5 1.0
- Die: 0.0 0.0 0.5 0.0 0.0 0.5 0.0
- Inc. 0.0 0.0 0.0 0.0 0.0 0.0 0.0

(b) With Encapsulated Lens Elements:
- Color: Silver White (41)
- Silver-White (2)
- Yellow

- Die: Avg. 0.2% 0.15% 0.2% 0.15% 0.2%
- Inc. Avg. 250.0 150.0 100.0 62.0 2.5 15.0
- Die: 4.0 3.0 1.0 0.5 0.5 0.5
- Inc. 12.0 14.0 2.0 8.0 0.5 0.5
- Die: 0.0 0.0 0.0 0.0 0.0 0.0
- Inc. 0.0 0.0 0.0 0.0 0.0 0.0

- The brightness of the reflective sheeting, totally wet by rain, shall be less than not less than 90 percent of the above values. Wet performance measurements shall be conducted in accordance with the Standard Rainfall Test specified in Federal Specification LS-301.

- The diffuse dye color of the reflective sheeting shall be visually evaluated by comparison with the applicable Highway Color Tolerance Chart. Color comparisons shall be made under normal daylight or a standard daylight having a color temperature of 6500 degrees Kelvin. Color reflectance shall be measured at 0 degrees and viewed at 45 degrees.

The sheathing surface shall be smooth and facilitate cleaning and wet performance and exhibit 150 degrees reflectance and at least 100 degrees ASTM D 525. The sheathing surface shall be readily processed and compatible with opaque paint and shall not be affected by normal handling, cutting, and application. The sheathing shall permit cutting and color processing at temperatures of 90-120 degrees F and 5000 pounds per square inch.

The sheathing surface shall be resistant to abrasion such that it may be cleaned with gasoline, VM&P Naphtha, mineral spirits, terpentine, methanol, or xylene.

9-28.1(11) GENERAL

Sheet aluminum signs shall be constructed of alloy 6061-T6. After the sheathing has been fabricated, the sheathing shall be degreased and etched by immersion for a minimum of 5 minutes in a 6 ounce per gallon caustic rich solution at 120 degrees F. Immersed, in order, by a water rinse, descaling, water rinse, hot water rinse, and drying. The etching process shall produce a dull aluminum finish on both sides of the panel which will last the life of the sign. The treated panel surface shall be compatible with the sign face sheeting to be applied. Reflective coated aluminum signs shall be comprised of panels 4 feet by 10 feet in size. The Contractor shall use the welder panels possible. Parts necessary for assembly shall be constructed of aluminum. Sheet aluminum thickness shall be 0.080 inch.

Metal shall be handled by device or clean canvas gloves given the etching and operating phases of the application of sign face sheeting.
9-28.17 LETTERS, ARROWS, AND SYMBOLS

Letters, arrows, and symbols shall be of the type, size, and color specified on the Drawing Schedule 40 galvanized pipe. The symbol "Standard Highway Signs" by United States Department of Transportation

9-28.18 HARDWARE

Bolts, nuts, and washers shall be of the same material for each attachment. All hardware necessary for assembly shall be constructed of the materials listed below.

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolts</td>
<td>ASTM B 309 2024-T4 Aluminum</td>
</tr>
<tr>
<td>Washers</td>
<td>ASTM B 339 2024-T4 Aluminum</td>
</tr>
<tr>
<td>Nuts</td>
<td>ASTM B 339 2024-T4 Aluminum</td>
</tr>
<tr>
<td>Locknuts</td>
<td>ASTM B 311 2024-T4 Aluminum</td>
</tr>
<tr>
<td>Rivets</td>
<td>ASTM B 339 2024-T4 Aluminum</td>
</tr>
<tr>
<td>Post Clips</td>
<td>ASTM B 179 2024-T6 Aluminum</td>
</tr>
<tr>
<td>Angle &amp; Bar</td>
<td>ASTM B 209 2024-T6 Aluminum</td>
</tr>
<tr>
<td>Strap &amp; Mounting Bracket</td>
<td>ASTM A 276 Stainless Steel</td>
</tr>
</tbody>
</table>

9-28.19 SHEETING APPLICATION

Plywood sign faces shall be glued with beech thinner, beech resin, or another recommended by the sheeting manufacturer. The surface shall be sanded with light sandpaper or steel wool and wiped with clean cloths. Single signs shall be coated with a recommended solution by the sheeting manufacturer.

9-28.20 SHEETING BACKING

All sheeting shall be applied with a vacuum applicator recommended by the sheeting manufacturer, or by a method recommended by the manufacturer.

9-28.21 POSTS

Wood sign posts shall be Standard Grade Western Cedar. The top of each sign post shall be chamfered at approximately 45 degrees. STOP and YIELD sign posts shall be painted with 2 coats of rust inhibiting primer and painted with 2 coats of flat black acrylic primer and white paint. These shall be followed by primer, white paint, and a topcoat of flat black acrylic primer and white paint. The sign shall be equipped with a topcoat of flat black acrylic primer and white paint.

9-28.22 DIRECT BURIAL METER POST

Direct burial meter post shall be fabricated from standard black 2 inch inside diameter pipe or standard Schedule 40 galvanized pipe. The top of each sign post shall be painted with 2 coats of rust inhibiting primer and painted with 2 coats of aluminum, yellow or green paint. This shall be followed by primer, white paint, and a topcoat of flat black acrylic primer and white paint.

9-28.23 TEST METHODS

The properties enumerated in these specifications shall be determined in accordance with the following methods:

(a) Viscosity - Federal test method standard 141A, Method 4140.10
(b) Weight per gallon - Federal test method standard 141A, Method 4140.10
(c) Contrast ratio - Federal test method standard 141A, Method 4121.12 procedure "B", method "F".
(d) Daylight reflectance - Federal test method standard 141A, Method 4121.12 using standards as prescribed in Par. 15.32.
(e) Non-volatile content - Federal test method standard 141A, Method 4140.10
(f) Pigment content - Federal test method standard 141A, Method 4140.10
(g) Dispersion - Federal test method standard 141A, Method 4111.1

9-28.26 PHYSICAL PROPERTIES OF THE MOUNTING

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity</td>
<td>70 to 75 degrees F - 70-75° C</td>
</tr>
<tr>
<td>Weight per gallon</td>
<td>9.00 lbs/gal</td>
</tr>
<tr>
<td>Weight per gallon</td>
<td>9.10 lbs/gal</td>
</tr>
<tr>
<td>Weight per gallon</td>
<td>9.20 lbs/gal</td>
</tr>
<tr>
<td>Weight per gallon</td>
<td>9.30 lbs/gal</td>
</tr>
<tr>
<td>Weight per gallon</td>
<td>9.40 lbs/gal</td>
</tr>
</tbody>
</table>

9-28.27 COMPOSITIONAL REQUIREMENTS

(a) Pigment Composition: Pigments shall be of the same type, color and size specified on the Drawing Schedule 40 galvanized pipe. The symbol "Standard Highway Signs" by United States Department of Transportation.

9-28.29 PAVING MATERIALS & FABRICATION

9-29.1 MATERIALS FOR PAVEMENT MARKING shall be placed or plastic material as specified on the Drawings or in the Project Manual.

9-29.2 PAINT

9-29.21 GENERAL

Paint shall conform to specifications for no heat, instant dry pavement marking. White sand shall comply with specifications for E-16 sand.

9-29.22 PHYSICAL PROPERTIES OF THE COATING

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity</td>
<td>70 to 75 degrees F - 70-75° C</td>
</tr>
<tr>
<td>Weight per gallon</td>
<td>9.10 lbs/gal</td>
</tr>
<tr>
<td>Weight per gallon</td>
<td>9.20 lbs/gal</td>
</tr>
<tr>
<td>Weight per gallon</td>
<td>9.30 lbs/gal</td>
</tr>
<tr>
<td>Weight per gallon</td>
<td>9.40 lbs/gal</td>
</tr>
</tbody>
</table>

9-29.30 COMPOSITIONAL REQUIREMENTS

(a) Pigment Composition: Pigments shall be of the same type, color and size specified on the Drawing Schedule 40 galvanized pipe. The symbol "Standard Highway Signs" by United States Department of Transportation.
9-29

Pavement Marking

9-29.4 Pressure Sensitive Tape

Pressure-sensitive tape shall be a 4 inch wide, pressure-sensitive, reflective/white tape of the type approved by the Engineer.

The following pressure-sensitive tape has been approved as a Type A pavement marking tape:

(a) 3M Scotch name brand pavement marking tape, coated with pressure-sensitive adhesive, manufactured by 3M Company, 3M Center, St. Paul, Minnesota 55101.

Surface preparation and application shall be in accordance with all the manufacturer's specifications.

SECTION 9-30 Water Distribution Materials

9-30.0 General

All materials for water distribution and transmission shall be new. Except that materials used for temporary water mains and temporary service connections shall be either new or previously used only on temporary potable water supplies, and shall be subject to Seattle Water Department inspection and approved prior to installation.

Prior to ordering any pipe to be used in a potable water supply, the Contractor shall submit the material source, in accordance with Section 9-61.6 and obtain the Engineer's approval.

9-30.1 Pipe

9-30.1(1) Ductile Iron Pipe

(a) Ductile iron pipe shall be centrifugally cast in 15-foot lengths conforming to AWWA C150 and shall have a concrete-mortar lining conforming to AWWA C901. Ductile iron pipe shall be joined using restrained joints shall be Standard Thickness Class 50. All other ductile iron pipe shall be Standard Thickness Class 80 or the thickness class as shown on the Drawings and/or Project Manual.

(b) Non-restrained joints shall be rubber gasket, push-on type, or mechanical joint conforming to AWWA C110.

(c) Tension joints shall be as specified in Section 9-30.0(8).

(d) All pipe shall be in accordance with Section 9-30.0(10).

(e) Pipe with threaded flanges shall not be used.

9-30.1(2) Concrete Cylinder Pipe

Concrete cylinder pipe shall be modified, prestressed concrete cylinder pipe with steel cylinder core. The pipe shall conform to AWWA C305, and shall be designed for the minimum pressure as specified on the Drawings or Project Manual. The pipe manufacturer shall provide design calculations, load test layout, and details of special fittings. Special and fittings shall be such as to conform with the same hydraulic test required for straight sections. Tension joints shall be provided where necessary.

Hollow to flange fitting length shall be in accordance with AWWA C110 or AWWA C115. Tension flanges and pipe shall conform to AWWA C115. The exterior flange lap overlapping the pipe barrel shall be sealed with a butyl rubber seal.

Leaves shall have a diameter of at least 12 inches and 15 inches minimum length for pipe greater than 12 inches diameter. Factory finish shall be the standard of the manufacturer.

9-30.2 Special Fittings

9-30.2(1) Ductile Iron Pipe

(a) Fittings for tile pipe shall be ductile iron conforming to AWWA C110 or AWWA C115. Threaded flanges and pipe shall conform to AWWA C115. The exterior flange lap overlapping the pipe barrel shall be sealed with a butyl rubber seal.

(b) All pipe shall be in accordance with Section 9-30.0(10).
9-30.2.4(11) BUTTERFLY VALVES

Threaded butterfly valves shall conform to ANSI B-16.1, Class 150. The ends of the butterfly type, if flanged ends are required they shall be sized and drilled in conformance with ANSI B-16.1, Class 150. Valves shall be suitable for direct burial installation.

Regardless of what is indicated on the drawings, valve ends may be mechanical or push on joint. Where re-entrant joints are called out, valve ends shall be flanged with flanged by re-entrant joint adapters per Section 9-30.2(11).

Valves shall be mounted on the water main or pipeline such that the operating nut is accessible from directly above.

Operator shall be manual, fully enclosed, and suitable for buried service. It shall open and close when viewed from above, and shall be equipped with a standard AWSB 2 inches square operating nut.

Operating handles and lever handles shall be equipped with external indicators, visible from above, which show the position of the valve disc.

The minimum number of turns from fully open to fully closed shall be as follows:

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Turns</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 inches to 8 inches</td>
<td>16 turns</td>
</tr>
<tr>
<td>10 inches to 12 inches</td>
<td>20 turns</td>
</tr>
<tr>
<td>14 inches to 18 inches</td>
<td>30 turns</td>
</tr>
<tr>
<td>20 inches to 24 inches</td>
<td>44 turns</td>
</tr>
<tr>
<td>28 inches to 36 inches</td>
<td>60 turns</td>
</tr>
<tr>
<td>42 inches to 48 inches</td>
<td>72 turns</td>
</tr>
<tr>
<td>47 inches to 54 inches</td>
<td>84 turns</td>
</tr>
<tr>
<td>60 inches</td>
<td>100 turns</td>
</tr>
</tbody>
</table>

An affidavit of compliance stating that the valves furnished fully comply with AWSB C904 and the modifications to this Section shall be submitted by the manufacturer.

The valve bodies shall be cast iron mounted with approved hardware. Valve stems shall be bronze or other approved non corrosive material and there shall be no non-ferrous materials in the valve. Contact surfaces shall be machined and finished in the best workmanlike manner; and all mating surfaces shall be easily removable.

The butterfly valves shall be manufactured by Henry Pratt Company, 3201 S. 40th St., Omaha, Nebraska, 68105, or its authorized agent.

9-30.2.6(10) PLASTIC FOAM

Plastic foam used as water main construction for meter boxes, valve chambers, valve boxes, pipe protection and various underground installations shall meet the Federal Spec. FPC-17528 Type I Class II.

9-30.3(13) PORTLAND CEMENT CONCRETE

Portland Cement Concrete for pipe support saddles and concrete for thrust blocks shall be Class I(1-1/2).

9-30.3(14) POLYETHYLENE ENCASEMENT

Polyethylene liner for encasement of ductile iron pipe and fittings shall conform to Section 9-30.3.

9-30.2.3(1) GENERAL - MANUFACTURE AND MARKINGS

The valves shall be a standard pattern of a manufacturer whose products are approved by the Seattle Water Department and shall have the name or mark of the manufacturer; year valve casting was made, size, and working pressure plainly cast in raised letters on the valve body.

9-30.2.3(2) VALVES

9-30.2.3(3) TAPING SLEEVE AND VALVE ASSEMBLY

Taping sleeves for use on pipes, not having special coatings or protective construction shall be made of steel equal in size to the pipe and painted rustproof. Prior to taping, sleeves shall be painted with a primer. A suitable primer and tape shall be approved by the Department.

9-30.2.5(11) TWO-INCH BLOW OFF ASSEMBLY

Twistlock blow off assembly shall be as indicated on the drawings.

9-30.2.5(12) PLASTIC FOAM

Plastic foam used as water main construction for meter boxes, valve chambers, valve boxes, pipe protection and various underground installations shall meet the Federal Spec. FPC-17528 Type I Class II.

9-30.3(13) PORTLAND CEMENT CONCRETE

Portland Cement Concrete for pipe support saddles and concrete for thrust blocks shall be Class I(1-1/2).

9-30.3(14) POLYETHYLENE ENCASEMENT

Polyethylene liner for encasement of ductile iron pipe and fittings shall conform to Section 9-30.3.
9-30.3(1.2) MORTAR FOR PLASTER-COATING
Mortar for plaster-coating masonry units shall be composed according to either of the two alternate mixtures detailed below:

- **Parts by volume**
  - Mortar: cement: sand
  - Wet mix: 1:1:6
  - Dry mix: 1:1:4

9-30.3(1.2) WATER PRESSURE TESTING VALVES
(a) Water Pressure Regulating Valves, 3-inch through 12-inch Sizes:
- Valve shall be forged steel, Class 125 ASA drilling, when tested to a pressure of 150 psi, to have a single seat, globe valve. It shall be spring loaded and hydraulically operated. Seat shall be replaceable. The diaphragm shall be fully guided and top and bottom. All necessary repairs shall be possible without removing valve from the line. Packing glands are not permitted. Disc shall be synthetic rubber valve and have a rectangular cross section. The stem shall be guided by a bearing in the valve cover and an integral bearing in the valve seat. There shall be no piston operating the main valve.
- Discs may be designed to maintain a constant downstream pressure regardless of varying inlet pressure. They shall be handling, clean water.
- No control pilots or nonlinear equipment is to be furnished. Valves shall be CSA Valve No. 9 or approved equal.

(b) Water Pressure Regulating Valves, 2-inch Sizes:
- Valve shall be Mueller No. H-910 2-inch Water Pressure Regulating Valves or approved equal.

9-30.3(1.15) POLYTHYLENE ENCASEMENT, MULTI-LAYERED POLYETHYLENE TAPE COATING, AND SPECIAL TAPE COATING FOR VALVES
Polyethylene encapsulation, multi-layered polyethylene tape coating and special tape coating shall be per Sections 9-30.3, 9-30.3(10) and 9-30.3(10A) respectively.

9-30.4 VACANT

9-30.5 HYDRAULICS
9-30.5(1) GENERAL
Fire hydrants shall conform to AWWA C602 and shall be of standard manufacture and of a pattern approved by the Seattle Water Department. The name or mark of the manufacturer, size of the valve opening and the size of the casing shall be plainly cast in raised letters on the hydrant barrel to be visible after the hydrant is installed.

Hydrants of the following manufacturer and pattern have been approved for use by the City of Seattle:

(a)浙州 States
(b) Ohio Model 910 (form)
(c) Mueller "Cantex" Model 4-432
(d) Ameron-Durand Model 9-428
(e) Kennedy "Guardian"

9-30.5(2) END CONNECTIONS
The end connection shall be 4 inches, standard flange, Class 125 drilled conforming to ANSI B 16.5.

9-30.5(3) HYDRANT DIMENSIONS
The dimensions and details of hydrant and nozzles shall be as follows:

- Hydrant connection pipe size inside diameter: 6 inches.
- Standard, minimum inside diameter: 7 inches.
- Flange: 3 1/2 feet.
- Valve opening, minimum diameter: 5 inches.
- Size of auxiliary gate valve: 6 inches.
- Hose nozzles, number and size: 2; 3 1/2 inch.
- Thread (National Board of Fire Underwriters): 7/16 per inch.
- Total length of threaded male nipple: 1 inch.
- Sizing nozzle, number and size: 35.

Hydrants shall be furnished with one streamer nozzle with size and threads conforming to dimensions as identified in the latest City of Seattle Standard Plans for Fire Hydrants.

Drain Valve: Drain valve shall be automatic with outlet tapped or plumbed to 3/4-inch female iron pipe threads.

Sidewalk flange (ring) to center of pumpere nozzle: 14 inches or more.

Face: Pumper port toward the street.

All nozzles shall be fitted with cast iron threaded caps with operating nut of the same design and proportions as the hydrant stem nut. Caps shall be clearly marked to fit the corresponding nozzles and shall be fitted with suitable neoprene gaskets for positive water tightness under test pressures.

9-30.5(4) OPERATING NUTS
The operating nuts on hydrant stems and nozzle caps shall be as follows:

- **Pattern of nut**
  - Tapered pentagonal
  - Height: 1/16 inch
  - Size of pentagon: 5/8 inch at bottom of nut
  - 1 1/4 inch at top of nut (measured from point to flat)

9-30.5(5) HYDRANT RESTRAINT
Shackled rods shall be 3/4-inch diameter with threaded ends, and shall meet ASTM A 56 "All-thread" rod is not acceptable. If a tie bolt restraint system is used, they shall be "CORTEN Steel Star National Products Super Star Tie Bolt SST" or approved equal. If a mechanical joint gland-will-bulb restraint system is used, it shall conform dimensionally as shown on the hydrant detail, and shall be ductile iron conforming to ASTM A-536, Grade 50/60. Coating for shackling rods shall be in accordance with Section 9-30.15.

9-30.5(6) SIDEWALK FLANGE CONSTRUCTION
Hydrants shall be provided with a sidewalk flange and be equipped with breakaway devices at the sidewalk flange which will allow the hydrant barrel to separate at this point with a minimum breakage of hydrant parts in case of damage. There shall also be provided at this point a safety stem coupling on the operating stem that will shatter at the time of impact. Unless otherwise specified, all hydrants shall be equipped with forging stem seals.

9-30.5(7) VACANT

9-30.5(8) HYDRANT FACTORY HYDROSTATIC TEST
All hydrants shall be tested by the manufacturer, as required by AWWA C602. The Contractor shall furnish to the Owner an affidavit of compliance from the manufacturer for all tests.

9-30.5(9) HYDRANT CONNECTION PIPE
Pipe connections from the hydrant to the water main shall be 6-inch Ductile Iron Pipe, Class 52, in accordance with Section 9-30.11.

9-30.5(10) HYDRANT VERTICAL EXTENSIONS
Hydrant barrel extensions shall have a 7-inch minimum inside diameter and shall be cast iron or ductile iron and shall conform to the AWWA, Standards for such coaters. The extensions of the connecting flanges for the extensions shall match the flanges of the fixtures on the hydrant.

Hydrant vertical extensions shall also include the necessary hydrant operating and extension, complete with safety stem couplings.

Extensions with threaded flanges shall be ductile iron and shall conform to AWWA C115. The exterior flange lip overlapping the barre pipe shall be welded with a buttmetallic mastic.

9-30.5(11) HYDRANT BLEEDER
When approved by SWS, the hydrant bleeder assembly, as shown on the hydrant detail, shall be constructed of 3/4-inch polyethylene or polyethylene tubing of 3/4-inch copper tubing Type K, conforming to Sections 9-30.4(1A), 9-30.6(6B), or 9-30.6(6C), as approved.

9-30.5(12) POLYTHYLENE ENCASEMENT, MULTI-LAYERED POLYETHYLENE TAPE COATING, AND SPECIAL TAPE COATING FOR HYDRANTS AND CONNECTIONS
Refer to Section 9-30.3(10).

9-30.6 SERVICE CONNECTIONS AND SERVICE PIPES OR TUBING

9-30.6(1) GENERAL
These standards shall be used unless modified by the Drawings and or the Project Manual. Service piping standards shall also be used, as modified on the Drawings for 2 inches blow off assembly, hydrant bleeder assembly.
9-30

WATER DISTRIBUTION MATERIALS

9-30.7 BEDDING, FOUNDATION MATERIAL AND GRAVEL
When the mineral aggregate is specified by a "Type" designation, it shall conform to the requirements shown in the Table as Section 9-30.7.

9-30.8 PLASTIC FILM WRAP
Plastic film wrap for polyethylene encasement shall be 8 mil polyethylene conforming to AWWA C150.

9-30.9 VACANT

9-30.10 LOCATING WIRE
Locating wire for use with PVC pipe shall be 14 gauge solid copper with neoprene coating. Connections and splices shall be made with Penn Wire split Bolt Wire Connectors, catalog No. 349, or approved equals.

9-30.11 ELECTROLYSIS PROTECTION
9-30.11.1 ZINC REFERENCE ELECTRODES
The electrode material shall be high purity zinc with a minimum content of 99.999% zinc (AWWA B4107-75 Type B or equivalent). The disc electrode shall have a minimum surface area of 50 sq. in. (322 sq. cm.). The active material shall be sealed around mild steel core.

9-30.11.2 Zinc plate shall be included in a lead cable consisting of a single conductor No. 12 AWG stranded copper type THW with 400 volt yellow insulation or equivalent.

9-30.11.3 The cable shall be attached to the mild steel with a copper electrical connection clasp.

9-30.11.4 The cable shall be thoroughly covered with 2 half-lapped layers of electrical tape, or epoxy cap.

9-30.11.5 WATER METER BOX

9-30.11.6A GENERAL
The water meter box and lid shall conform to Section 9-30.60.

9-30.11.6B TEST BOX
(a) The 4 1/2 inch (112mm) deep test box shall provide a single piece enclosure 8 inches (203mm) x 6 inches (152mm) x 15 inches (381mm) with a lid. The test box shall be Stabil No. 200 or approved equal.

(b) The lid shall be manufactured from sheet steel and shall contain a one-piece closed cell neoprene gasket. The lid shall be secured by half dozen screws.

(c) The test box shall comply with the NEMA Type 12 standard for an oil, dust and drip-proof enclosure. The wire entrance shall be sealed with an epoxy seal kit.

(d) The test box shall include a 1/4 inch (6mm) thick phenolic back panel with a terminal block assembly (Bacharach N200 or equivalent) containing 16 terminal slots to accommodate No. 12 AWG wire. Each terminal shall be specifically identified by imprinted phenolic name plates which indicate the origin of the stranded wire.

(e) Each wire shall include at least 18 inches slack to allow adjustment to two box out of the unit box during testing.

(f) Each wire shall be specifically identified by marking tape.

Approximately 1.5 lb. of 0.04 cu. ft. of crushed rock or pea gravel shall be provided to create a permeable bed 6 inches (15cm) deep inside each water meter box.

9-30.11.7 NORMAL FLOW LIMITS
Size

<table>
<thead>
<tr>
<th>Flow Limit</th>
<th>No. 2</th>
<th>No. 3</th>
<th>No. 4</th>
<th>No. 6</th>
<th>No. 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 inch</td>
<td>5-100 GPM</td>
<td>10-50 GPM</td>
<td>15-60 GPM</td>
<td>30-180 GPM</td>
<td>50-250 GPM</td>
</tr>
<tr>
<td>1 1/4 inch</td>
<td>10-200 GPM</td>
<td>15-100 GPM</td>
<td>20-150 GPM</td>
<td>40-250 GPM</td>
<td>60-350 GPM</td>
</tr>
<tr>
<td>1 1/2 inch</td>
<td>20-400 GPM</td>
<td>30-200 GPM</td>
<td>40-300 GPM</td>
<td>80-400 GPM</td>
<td>120-550 GPM</td>
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<tr>
<td>2 inch</td>
<td>40-800 GPM</td>
<td>50-400 GPM</td>
<td>60-600 GPM</td>
<td>120-750 GPM</td>
<td></td>
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</tbody>
</table>

Note: Normal flow rate is determined by the manufacturer of the meter. The flow rate is then multiplied by the size of the pipe to determine the maximum flow rate.

9-30.12 INTERCHANGEABLE PARTS
All parts of turbine meters of the same size, make and model shall be interchangeable.

9-30.13 GUARANTEE
All turbine meters shall be guaranteed for 1 year after installation. The guarantee shall be in addition to any material, workmanship, or construction warranties provided by the manufacturer.

9-30.14 TEST REPORT
All turbine meters purchased under this specification shall be accompanied by a test report issued by the manufacturer.

9-30.15 COATING FOR ALL BOLTS AND SHACKLE RODS
All bolts and shackle rods, unless otherwise designated by the Engineer, shall be coated with 2 coats of asphalt varnish per ASTM D1970 or equivalent.

On corrosion protection waterlines, all shackle rods, concrete blocking and anchor rods, and all the clamp shall be factory applied protective coating with fusion bonded epoxy in accordance with ASTM A 774. All pipe threading and assembly, the threaded ends, nuts, and washers shall be coated with a liquid epoxy patch kit in accordance with ASTM A 774 and manufacturer's recommendation.
LUMINAIRES

9.31.11(1) GENERAL

Luminaires shall be "cobalt blue" style and shall consist of a luminous housing, lamp, ballast, and photovoltaic cell. Luminaires shall be in accordance with Material Standard 5093.2, except as modified herein.

Luminaires shall have attached to the housing, an ANSI approved decal (2 inches square) which will be readily visible from the ground, indicating lamp type or color code (i.e., blue for Mercury Vapor, gold for High Pressure Sodium, red for Metal Halide), and lamp voltage by numerical code, (i.e., 74 for 70 Watt).

9.31.11(2) LAMPS

Lamps shall be used for operation in any position shall be used (unless noted otherwise on the Drawings). High pressure sodium lamps shall meet the following minimum ratings:

<table>
<thead>
<tr>
<th>MINIMUM</th>
<th>INITIAL</th>
<th>LUMEN</th>
<th>WATTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIFE (HOURS)</td>
<td>OUTPUT</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>100</td>
<td>24,000</td>
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<tr>
<td>350</td>
<td>24,000</td>
<td>5,000</td>
<td></td>
</tr>
</tbody>
</table>

9.31.11(4) BALLAST

The ballast shall be designed to properly operate the type of lamp at the specified operating voltage. The ballast shall be designed to start lamps at temperatures as low as 20 degrees Fahrenheit. Ballasts shall be the regulator type, high power factor. Ballasts shall be capable of operation with plus or minus 10 percent input voltage variations. All ballasts shall be multi-line to allow field adjustment of voltage.

Ballast core limitations shall be of high quality electrical steel welded together to minimize noise and assure trouble free operation over the life of the luminaire.

Ballast cells shall be precision wound on formed insulation bobbins and terminals shall be of a push on type connection.

Components to provide the high starting voltage required by the high pressure sodium lamp shall be mounted on a printed circuit board which shall be easily accessible without disassembling the complete luminaire so that the ballast can be repaired or replaced.

The ballast shall be capable of starting and operating high pressure sodium lamps from a nominal 90,000 watt power factor within the limits specified by the lamp manufacturer. The ballast, including starting aid, must provide itself against normal lamp failure modes. The ballast shall be capable of operating with the lamp in an open or short circuit condition for 6 months without significant loss of ballast life.

For nominal line voltage and nominal lamp voltage, the ballast design center shall not vary more than 5 percent from rated lamp watts.

At any lamp voltage, from nominal through load, lamp shall be provided with normal lamp operating voltage, not exceeding 18 percent plus or minus 10 percent line voltage variation.

For 100 volts line voltage, the ballast shall be rated at 55 volts. For 200 volts line voltage, the ballast shall be rated at 110 volts.

Each ballast shall have a name plate attached permanently to the ballast housing.

All ballasts shall be multi-line.

9.31.11(5) PHOTOVOLTAIC CELLS

Photovoltaic cells shall be used with all luminaires and shall be of a type approved by Underwriters Laboratories. Material Standard 5093.2, Photovoltaic cells shall be NEMA-type plastic or NEMA-type glass. In addition, photovoltaic cells shall be tested by the Underwriters Laboratories to ensure that the photovoltaic cells will be protected against damage by the voltage indicated on the Drawings. The unit shall consist of a high efficiency, single junction, silicon solar cell. The photovoltaic cells shall be approximately 20 inches square and shall be mounted such that the dimensions of the rectangular shall be adequately spaced so that there shall be internal reflecting prism and exterior reflecting prisms. The photovoltaic cells shall be of a single-junction, silicon solar cell.
ILLUMINATION AND ELECTRICAL MATERIALS

9-31.4 MINERAL INSULATED (MI) CABLE
Conductors shall be solid copper, 600 volt, of the size noted on the Drawings. The Contractor may choose cable with 2 or more conductors. All the conductors serving a device shall be in the same sheath. This shall not prevent normal practices such as the power conductors to a switch being in one sheath and the load conductors being in a second sheath.

The sheath shall be copper, and unless noted otherwise on the Drawings or in the Project Manual, shall be covered with a factory provided polyethylene jacket. The sheath shall be considered the grounding conductor.

The sheath shall be terminated at junction boxes or conduits as shown on the Drawings, using glands and nuts provided by the cable manufacturer. The glands shall be sized for the cable used and UL Listed.

The conductors exposed beyond the end of the sheath shall be covered by insulation provided with the gland. The normal length of the insulation is 10 inches. Power circuits shall be color coded in accordance with Section 9-31.5.

The sheath shall be sealed against moisture at the glands with seal provided by the cable manufacturer. The seal shall be suitable for prolonged submersion in water.

9-31.5 WIRE SPICES
This standard applies to wires other than MI cable made in above grade or below grade installations except where breaker boxes and equipment are located directly to the terminal board. All conductors shall be U.L. or equivalent, labeled approved for the purpose.

(a) Above Grade Installations (including connections in pole hand holes)
(1) Copper to Copper Connector - The connector shall be a high strength brass alloy of the split bolt type specified in Material Standard M2688.
(2) Copper to Aluminum Connector - The connector shall be of the one or two bolt type labeled CO/ALR and include an approved spacer bar.
(3) Non-reversible connector may be approved if the sheath of the connector is of Material Standard M2686.

(b) Below Grade Installations (including structures)
(1) Below grade splices shall be made in a 2 piece rigid body transparent moisture proof spliced enclosures. The body shall be wetted to ensure coating of the conductors and even distribution of the encapsulant. The body and encapsulant shall be composed of material rated for the line to be carried in cold. The encapsulant shall be a remoldable (gel like), transparent type. Non-reversible encapsulant may be approved if each splice is approved by the Engineer prior to installation.

9-31.6 FUSES AND FUSE HOLDERS
The fuse holder shall consist of a fuse, a two-section standoff body and two insulating boots, all rated at 600 volts. The fuse shall be of the washer and washer type. Fuses rated at 20 amperes and less shall be 1/2 inch by 1/2 inch in a 10 amp rated boot. Fuses rated 30 to 60 amperes shall be 3/4 inch by 1-1/2 inch in a 60 amp rated boot.

The standoff body shall be made of waterproof molded plastic, in two sections, the line-side section and the load-side section. Their purpose is to provide a visible means of disconnect for circuit repair or maintenance. The fuse shall be held in the load-side section only. Each section shall be totally enclosed at the wire entrance end and the sections shall be joined by a threaded, grooved joint. The standoff body shall be designed to confine any electric arc, should the standoff be closed on a live circuit.

Fuse holder terminals shall be compression type, rated for the actual wire utilized. Only one wire shall be installed in any terminal.

Where the fuse is in the base of a metal pole, it shall have a breakaway receptacle used as a mechanical weak link to physically interrupt the circuit under impact in addition to the requirements for the standoff holder.

Insulating boots shall be used to waterproof the wire connections. The type of insulating boot shall be a single conductor boot for the line-side.

The fuse shall be a current limiting type with a high speed opening and an interrupting rating of 100,000 rms symmetrical amperes. The fuse shall be rated at 25 seconds at 100 percent load, but not great enough to result in a safety loss during overcurrent conditions.

The fuse shall be designed so that the carrying capacity or opening time is little affected by the temperature and will operate with low watt loss to reduce heating.

Individual luminaires having rated load at 10 amperes for 400 watt luminaires at 120 volts shall be rated at 15 amperes.

Fusible outlets shall be fused at 15 amperes.

9-31.7 GROUND RODS AND CLAMPS
Ground rods shall be fabricated from cold-finished carbon steel rod in accordance with ASTM Designation A 538 or as applies to Grade 50. Galvanized ground rods shall not be used.

The covering of the steel core shall be a sheath of a compatible copper type steel at least 1/2 inch in a minimum thickness of 0.010 inches. The rods shall have threaded ends at each end for joining together. The junior rod shall be 10 feet in length and 3/8 inch diameter. Rods shall conform to Material Standard M2685.

Couplings for sectional rods shall be made of high-strength, corrosion-resistant steel, internally threaded to fit standard rods.

Driving studs shall be made of high-strength, hardened steel of SAE 1045 or equal quality.

Ground rods shall meet the requirement of Material Standard M2685.

TRAFFIC SIGNALS SYSTEM

9-32.11 FUSED SWITCH
9-32.11.1 GENERAL
Fused switch shall be rated heavy duty with dead front construction. All fuses will be rated at 150 percent of the current limiting type with 300,000 A.I.C. rating.

Fused switch shall be Furrier Cat. No. 794G2322 for 100 amp, 240 volt, single phase with 5/8", or equal, mounted in NEMA I enclosures or shall be Furrier Cat. No. 79644223 to 200 amp, 60 volt, three phase with 5/8", or equal, mounted in NEMA I enclosure. Switches for other voltages shall be similar to the above. The enclosure shall prevent opening cover unless the switch is "OFF". Operation shall be "Quick-Make, Quick-Break" type. Knob cuts and mounting holes shall be provided in the enclosures. Door latch shall permit踏枚ing door in closed position.

9-32.11.2 SWITCHBOARD MATING

Matting shall be non-rubber with a diamond plate surface design and cloth impression back. Design shall conform to MIL SPEC MIL-M-15452B Type III dated December 7, 1977 as amended.

Switchboard mating shall have a minimum diaphragm strength of 30,000 watts.

9-32.11.3 ELECTRIC PANELS AND BREAKERS
Panes shall be dead front construction. All factory wiring shall be copper. Circuit breakers shall conform to Federal Specifications W-C-578B. All 100 amp fuse breakers shall be Class 125 for single pole breakers, and shall be Class 225 for multiple pole breakers 225 amperes fuse breakers shall be Class 125.

Circuit breakers shall be of the rating shown on the Drawings or as called for in the Project Manual. Circuit breakers shall be of the unenclosed molded case blown type with end cables. Entries shall be suitable for surface mounting in the cabinet on a back or bracket.

Circuit breakers will be labeled to indicate the circuit controlled.

Overcurrent protection and relay equipment, as called for on the Drawings or in the Project Manual, shall be installed according to the best practice of the manufacturer, with materials and installation meeting all applicable requirements of the National Electric Code (NEC) and the Seattle Electrical Code.

Contactors shall be "lighting" type specifically rated for tagung, fluorescent and mercury lamp loads, electrically held.

9-31.9 SWITCHES AND RECIPROCATORS

(a) Single gang switches shall be 30 amp, 120 volt, AC type, grounded, specification grade, conforming to Federal Specification W-C-576B and shall be U.L. listed. Switches shall be Hubbell 2G single pole, or approved equal.

All double pole switches, 125 volt, AC, GFCIHospital Grade receptacles, to be UL listed "Hospital Grade" under UL No. 460. Receptacles shall be Hubbell GF-G60, or approved equal.

Cover plates for switches and receptacles shall be stainless steel.

Device boxes shall be standard surface mount hot-dip ground type steel boxes at least 1/2 inch deep, single or ganged to size to accommodate devices shown. All boxes shall be equipped with gasketed plates, except for length.

9-31.10 PULL CORD
Pull cord shall be 1/4 inch polypropylene in accordance with Material Standard M2773.

SECTION 9-32 TRAFFIC SIGNALS SYSTEM
9-32.11 CONTROLLER ASSEMBLY

9-32.11.1 GENERAL
The controller assembly shall consist of the controller, associated equipment and specified auxiliary equipment all in the specified cabinet, as indicated in the Controller Assembly Table and other Exhibits as found in the appendix of the Project Manual, and on the Drawings.

Controllers shall be pre-wired or listed or as indicated on the Controller Assembly Table.

The controller assembly at each location shall be capable of controlling traffic flow in consonance with the respective Initial Controller Timming Exhibit and the Phase Diagram or Signal Sequence Diagram, or both, for each intersection as specified in the Controller Assembly Table.

The controller shall be micro-processor based, modularly constructed and shall be completely enclosed in a sheet metal case, with a protective finish, which shall serve as a mounting frame. No active or passive electronic components, other than the power supply, shall be attached to a part of the case.
Controller inputs and outputs shall be made at the front panel through a NEMA type (MEL-C-3485) connector. The connector shall be metal and plastic.

 Associated components shall be grouped in plug-in printed circuit assemblies. Printed circuits shall be grouped into multi-circuit assemblies. Each assembly shall be a separate part and shall be clearly marked. Circuit boards shall be connectable and systematically arranged so that they may be removed without unsoldering or handling individual components.

 Each logic circuit shall be installed as required to provide special functions (e.g., pre-eject, special seating, etc.) and shall be capable of being interfaced to the external logic specifications as detailed in the Drawings and/or the Controller Assembly Table. External logic shall use digital methods and solid state construction. Logic units shall be modularly constructed, escape from the metal case, and all inputs and outputs shall be through NEMA Type (MEL-C-34432) connector. The connector shall be metal or plastic.

 Automatic changes in time clocks or interconnect from flashing to normal operation shall be made at the beginning of the major street green interval. Automatic changes from normal to flashing shall be made at the end of the major street red interval. The change from normal to flashing shall be made by any manual switch in the street circuit or by the controller. The "EMERGENCY FLASH" switch shall be made at the beginning of the major street green interval.

 The controller shall power up in the major street yellow. All accessory programming equipment shall be provided with each controller to change the timing of the controller. All timing shall be set with push buttons from the front panel.

 All timing shall be set in decimal numbers. It shall be possible to change the timing without removing any part of the controller and without using any special tools and to change timing without placing the intersection into the flashing mode. All timing functions except offsets shall be in seconds and all percentages. It shall be possible to program any interval to zero timing to allow that interval to be skipped.

 All illuminated displays and manual input timing shall be easily visible in bright sunlight. Any volatile power memories such as random access memories (RAM) which contain input timing not stored in non-volatile memory shall be battery-supported for non-volatility for a period of not less than 5 days. The battery shall be a rechargeable type with automatic charging circuitry or lithium battery that shall be self-contained and need not be accumulating timing for a period of time. The controller model shall be provided with an internal or external unit to program all programmable read-only memories used in each type of controller, unless one unit is capable of programming all models provided.

 To prevent the conflict moment from tripping during relamping of a green or yellow in a single phase to phase loop, the three wires wound 1000 ohm resistor on the yellow and green outputs shall be wired to neutral to be wired into the cabinet for tripping off the line circuits.

 The following exhibits included herein shall apply to the controller:

 Exhibit Title
 A Controller Assembly Table
 B Police Panel

 TRAFFIC SIGNALS SYSTEM

 9.3-32.12C 120 VAC INTERCONNECTION INTERFACES

 Pre-produced circuit systems shall be wired to operate on a standard 120 VAC 3-cycle, 3-position interconnection system:

 Circuit Function
 1 120 Vac Common
 2 Cycle 1 (200 Vac)
 3 Cycle 2 (200 Vac)
 4 Cycle 3 (200 Vac)
 5 Offset 1 (5 percent cycle at green)
 6 Offset 2 (5 percent cycle at green)
 7 Offset 3 (5 percent cycle at green)

 9.3-32.12D MASTER CONTROLLER OPTION

 It shall be possible to program the controller to function as a master controller. In this mode the controller shall output a logic ground switch signal providing a grounded output for five percent of cycle in effect for each cycle length selected. The controller shall be terminated as a master controller if specified.

 9.3-32.13A NEMA STANDARDS

 The controller shall conform to NEMA Standards TD-1.1938 and shall provide all functions (except that remote density can be provided, but not be required) which are provided for the standard. Controller modules which are modified and are not interchangeable with the same module in a NEMA standard controller shall be marked in a permanent manner, as a non-NEMA standard module. All overlap functions shall be programmable.

 9.3-32.11B MANUAL INPUTS

 The following manual inputs shall be provided:

 (a) Minimum Green
 (b) Walk
 (c) Park
 (d) Yellow Grn
 (e) Minimum Recall
 (f) Exit Grn
 (g) Max 1
 (h) Max 2
 (i) Pedestrian Recall
 (j) Auto/Manual

 9.3-32.10C VISUAL OUTPUTS

 The following visual outputs shall be available by observing switch locations or illuninated displays on the front panel:

 (a) Per Phase:
 (i) Phase on
 (ii) Phase off
 (iii) Pedestrian activation
 (iv) Pedestrian activation
 (v) Undertest actuation
 (vi) Undertest actuation
 (vii) Undertest actuation
 (viii) Undertest actuation
 (ix) Undertest actuation
 (x) Undertest actuation
 (xi) Undertest actuation
 (xii) Undertest actuation

 9.3-32.10B SIGNAL CIRCUITS

 The controller unit shall provide a minimum of 30 load switch control circuits, at NEMA logic level.

 Signal circuits shown on a blank diagram shall be connected by each controller including flash transfer relay, conflict resolver, blank diagram, open loop, blank diagram, output control of blank diagram, control panel, and blank diagram. The controller shall consist of one cycle and return to the designated phase by line switch. This equipment shall be suitable for school crossing locations.

 9.3-32.12D CONSTRUCTION STANDARDS - WIRING

 Inputs and outputs of the controller and accessories shall be brought through the wall harness and connectors and terminated on terminal strips in the cabinet.

 9.3-32.13E CONTROLLER PEDESTRIAN SEQUENCE

 The basic operation of the controller shall be to stay in the "GREEN/DON'T WALK" position so that the pedestrian has an immediate right of way. When the phase changes from the next phase immediately after the vehicle clearance intervals (yellow/or red).

 The controller shall also have the ability to stay in the "GREEN/DARK WALK" position when the driver has the "DON'T WALK" position at the time the pedestrian (or) when the phase changes from the next phase immediately after the vehicle clearance intervals (yellow/or red).

 When yield is provided by a coordination, the variable yield shall determine when the control may return to the walk position even if no calls are present on the opposing phases.

 9.3-32.14A GENERAL

 Both pretested and retested controllers shall be equipped with associated equipment as specified in Section 9.32.14A.

 9.3-32.14B TERMINAL STRIP/WIRING IDENTIFICATION

 Only terminal strips with screw-type terminals shall be used to secure signal and service wires to the terminal strips.

 Each conductor termination and each terminal strip shall be permanently tagged with an identifying circuit number as indicated on the Drawings. Wire markers shall be stuck over-type printed with the circuit numbers for each circuit available. Wire markers shall be applied within 6 inches of the termination. Wire marker requirements apply only to field wiring.

 All field wire terminal strips shall be located a minimum distance of 6 inches and a maximum distance of 8 inches above the bottom of the cabinet.

 9.3-32.14C POLICE PANEL

 The police panel shall have two toggle switches, each with two positions. Switch No. 1 shall be on the left side and its upper position shall be labeled "EMERGENCY OFF." In this position, the controller shall run. The lower position shall be labeled "ON" and in this position, the controller shall be normal. Switch No. 2 shall be on the right side and its upper position shall be labeled "EMERGENCY ON." In this position, the controller shall switch the pedestrian signals dark, and the controller shall run. The lower position shall be labeled "AUTO" and in this position, the signals and controller shall operate normally. Switch No. 1 shall override Switch No. 2. The controller will go up to the green light when being returned from flashing operation through Switch No. 2.

 9.3-32.14D AUXILIARY PANEL

 The terminal panel shall be mounted in the cabinet door and shall include the following items, as specified in Exhibit C (included in the Appendix of the Project Manual). Switches and lights shall be oriented and labeled. The door switch shall cause all display lights to be turned on when the door is open and off when the door is closed. Switches shall be toggle type except for "OFFSET CONTROL" switch.

 A "NORMAL FLASH" switch shall cause the signals to flash and shall be adjustable. A "MANUAL CONTROL" switch shall cause the controller to stop in each non-interrupted interval manually advanced by actuation of the manual push.
TRAFFIC SIGNALS SYSTEM

9-32

The term "Time Base Coordinator" describes a unit that is capable of providing timing functions for any standard traffic signal controller on a "Stand Alone" basis without the need for a computer or computer interface. The unit is capable of maintaining all timing functions such as time of day, cycle, offset and synchronization through a power failure of up to 40 hours and resuming operation with all outputs including synchronization identical to any other unit in a system which has not had a power interruption. The unit shall be programmable on a weekly basis with the capability of programming on a yearly basis events such as daylight saving time changes, holidays and special events. The unit shall be micro-computer based, modular in design using circuits consistent with the latest solid state digital technology.

All programming shall be done on a front panel keyboard or by downloading.

The unit shall have an illuminated display on the front panel which will show all output functions currently in effect and also programming that is presently in memory.

Time Base Coordinators shall be housed in one of the following ways:

(a) A single fully enclosed metal housing with easy accessibility for front panel keyboard.
(b) A separate module of the controller front panel.

The unit shall provide negative true outputs (nominal 0 volt) for each programmed function. Each output shall be an NPN open collector capable of sinking 100 MA and shall be capable of interacting directly with solid-state control equipment using true logic inputs per NEMA standards 75-1097-78-1/A70C. The unit shall provide 120 VAC output via sensitive mechanical relays (mini relay) for all functions for operating electro-mechanical controls, interconnection cables, systems or signs.

For traffic actuated controls, the unit shall provide a hold-off output for program 4 for phases of an actuated control with the following minimum functions:

(a) Phase 1 hold
(b) Programmed free operation
(c) 300isecond interval
(d) 4 cycle lengths
(e) 450 seconds

For pre-timed controls, the unit shall provide a dial reset program with the following minimum functions:

(a) 24 cycle length
(b) 60 seconds
(c) 300 electrodes per cycle

The zero point for each cycle shall be set by a push button on the front of the case or shall be on an automatic reset of all cycles which occurs at midnight every 24 hours.

The unit shall execute up to 99 programs over a 7-day period or one minute resolution between programs. Additional programming shall be available to provide daylight saving time resetting and to provide timing of normal programming for 10 holidays on a yearly basis.

Each unit shall have a standby battery that will retain in memory all timing functions and all zero points at least 40 consecutive hours with an accuracy of 0.01 percent over that period. During normal operation the battery shall be maintained by a trickle charge. The battery shall be a sealed lead acid type.
3-9.2.15G MAP DISPLAY BOARD

The map display board shall include a memorandum contact signaling system which shall use an annunciator button for each phase.

The detector call buttons and colored light indicators shall be of weatherproof construction, with all wiring be terminated in the appropriate positions on the interface board of the control panel of the map display board.

The map display board shall be graphically represent the intersection and shall be no smaller than 14 inches square and shall be mounted on the cabinet door.

White indicator lights shall show pedestrian and vehicular detector activations and any special functions (e.g., pretact, etc.) for each phase. Indicators shall be visible in bright sunlight.

3-9.2.15H CONTROLLER ASSEMBLY CABINET

The controller shall be housed in a cabinet as shown in the Controller Assembly Table. If the cabinet size specified does not, in the estimation of the Contractor, provide adequate space, a larger size cabinet may be substituted, but only by the approval of the Engineer. The Engineer shall be given written justification and a proposed cabinet layout with the manufacturer request to see larger cabinets. Each cabinet and the arrangement of components therein shall be to accommodate the largest load switch allowed according to NEMA handbook, TM-Part 4. Cabinet sizes shall be weatherproof meeting NEMA 3R specifications and constructed of aluminum. The maximum overall height of the complete assembly shall be 66 inches.

There shall be a police door in the main cabinet door. A large door shall be stainless steel. Doors shall be weather: Glass. The main door shall be fitted with a door stop having at least two positions with an extreme position of not less than 180 degrees and an intermediate position of 90 degrees.

The door shall be provided with an opening mechanism which will accept a 3/8-inch Allen wrench for operating instead of a permanent door handle. A sliding keyhole cover shall be provided to cover the area above the key.

The main cabinet door shall have a first lock and equal with a construction key and the automatic door shall have a standard police lock. The City will exercise the construction core and a second key for the police lock shall be provided with each unit. A sliding keyhole cover shall be provided to prevent ice and snow build up in the keyway.

Control cabinets shall be painted with 2 coats minimum or exceeding Federal Specification PCL-12A Oil Resist Coating. Moisture Curing Type 1, Class 26. Exterior color shall be selected by the Engineer.

(2) Bottom of Type 1 black.

Cabinets shall be clearly labeled on the inside of the door with a minimum of 3/8 inch lettering, indicating the intersection location and the names of the major minor cross streets.

The cabinet shall be of the following dimensions:

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<thead>
<tr>
<th>Dimension</th>
<th>Type I</th>
<th>Type II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>18 to 24&quot;</td>
<td>28 to 34&quot;</td>
</tr>
<tr>
<td>Height</td>
<td>20 to 28&quot;</td>
<td>28 to 36&quot;</td>
</tr>
</tbody>
</table>

Type III cabinets shall be painted black and shall be mounted on Type I and Type II cabinets. They shall be base mounted. The bottom of Type I black.

The equipment shall be designed for operation under temperature and humidity conditions encountered in the Pacific Northwest region and shall be certified by the manufacturer. Standards for the above-named components shall be set forth in the appropriate sections of the American National Standards Institute (ANSI) standard.
9-32.6 DETECTOR LOOPS

Detector loops shall be used for actual traffic-actuated control of the signal stations. A complete detector loop installation shall consist of loop wire and lead cable from the loop amplifier to the controller cabinet.

Loops wire shall be No. 14 AWG Class B (104 X 34) stranded copper-type, high-density polyethylene insulated with a 0.015 millimeter thickness.

The lead from the detector junction box to the controller cabinet or remote detector amplifier cabinet shall be single pair, copper-type insulated, PVC-jacketed, twisted-pair cable with copper foil and aluminum-foil shield,

The lead from the detector junction box to the controller cabinet or remote detector amplifier cabinet shall be single pair, copper-type insulated, PVC-jacketed, twisted-pair cable with copper foil and aluminum-foil shield, and a No. 18 AWG stranded tinned-copper drain wire between the traffic signal controller cabinet and the foundation signal protector. The conductors shall be twisted together approximately 3 turns per foot.

9-32.10 AERIAL TERMINAL COMPARTMENT

The compartment shall be capable of withstanding the thrust of "K" type and "T" type non-ferrous metallic electrical cable and shall accommodate "Branch Type" splices of interconnect cables.

Compartment openings shall accommodate various cable sizes indicated on the drawings.

上游

Compartment shall be watertight.

Compartment shall be watertight.

9-32.11 SIGNAL WIRING

9-32.11.1 PEDESTRIAN BUTTON CABLE

Color Code: 1 (Base/Tracer)

Black #14 #14 #14 #14 #14
White #14 #14 #14 #14 #14
Red #14 #14 #14 #14 #14
Green #14 #14 #14 #14 #14
Orange #14 #14 #14 #14 #14
Blue #14 #14 #14 #14 #14
Yellow #14 #14 #14 #14 #14
Red/Black #14 #14 #14 #14 #14
Green/White #14 #14 #14 #14 #14
Orange/Blue #14 #14 #14 #14 #14
Green/Black #14 #14 #14 #14 #14
Red/White #14 #14 #14 #14 #14
Black/White #14 #14 #14 #14 #14
Red/Red #14 #14 #14 #14 #14

ALL EXTERNAL HARDWARE SHALL BE STAINLESS STEEL.
TRAFFIC SIGNALS SYSTEMS

Ground roads shall be 5/8 inch diameter by 10 feet long and spaced not more than 100 feet apart. A ground road shall be driven in each new hardwood.

0-32.10(6) GROUND BOLTS, CLAMPS, AND BONING

Before galvanizing, all visible welds on the pole shall be ground, and luminaires shall be ground flush to base metal, and all sharp edges shall be removed on the interior to prevent damage to the wires in the pole. Structural material shall be zinc-coated by hot-dip process in accordance with ASTM A 123 and the final coating shall measure 6.00 inches or more thickness as determined by a magnetic thickness gauge. Hardness and appearance shall be coated in accordance with ASTM A 130. Threads shall be re-cut after galvanizing without exposing base metal. Galvanizing certification of compliance with the applicable ASTM Standards signed by an independent testing laboratory shall be submitted to the Engineer before shipment.

The finished pole shall be straight and free from injurious defects. Poles distorted by the galvanizing process shall be strengthened without damage to the galvanizing coating. The finishing coating shall be smooth and free of dress. After galvanizing, the interior of the pole and armoir shall be free from sharp edges to prevent damage to wiring.

0-32.14 GROUND LUGS

Metal poles shall have 5/8 inch tapped holes in the bottom edge of the holed inside the pole. A 5/8 inch stainless steel bolt with stainless steel lock washer suitable for grounding shall be provided.

0-32.15 NUT COVERS

On metal poles the Contractor shall furnish and install separate nut covers to cover anchor bolts and nuts only (not the base flange). Nut covers shall be smooth, finished off snuggly to the bolt. Nut covers shall be made of the same materials as the pole and shall be provided by the pole manufacturer.

0-33.15(1) STEEL POLY, ARMST, AND LUMINARE EXTENSIONS

Unless otherwise noted on the Drawings, poles, mast arms, and luminare extensions shall be without plus or minus 1/16 inch per foot of approximately 0.14 inches per foot of diameter.

0-33.2 STEEL POLES, ARMST, AND LUMINARE EXTENSIONS

0-33.2(1) GENERAL

The term "steel pole" as used herein refers to any steel pole, Except for the pole lengths 30 feet and under, and for the pole lengths of approximately 0.15 inches per foot of diameter.

0-33.2(2) BOLT CIRCLE

The term "steel pole" as used herein refers to any steel pole 1/2 inch diameter by 6 inches long or more. Steel poles shall be galvanized in accordance with ASTM A 135, unless otherwise specified.

0-33.2(3) HANDHOLES, FEEDSTONS AND WIRE INLETS

Steel poles shall have one oval 4 inch x 6 1/2 inch handhole, and a 3 inch x 5 inch handhole on the top, provided with a cover to prevent loss of soil or loss of shaft strength. The handhole shall have matching cover attached with stainless blind bolts. The cover shall be made and provided with wire protection. The cover shall be made and provided with wire protection. The cable outlet shall be installed, drilled and shaped around for better protection.

0-33.2(6) MAST ARM COUPLINGS

Couplings for steel pipes shall be 3 inch Schedule 40 steel pipe extending perpendicularly from the pole. Both ends of the pipes shall be reinforced with pipe not less than 1 inch in diameter by 12 inches long. The coupling shall be installed, drilled and shaped around for better protection.

0-33.2(7) ANCHOR BASE PLATES

A one-piece steel anchor base plate shall be secured to the lower end of the shaft by two continuous cast iron anchors. The base plate shall be fabricated with a hole sized such that the shaft will slip approximately halfway through the plate.
POLIES, PEDESTALS AND FOUNDATIONS

leaving a fillet between the end of the shaft and the inside of the hole, which shall be welded around the full circumference. A second weld shall be made around the fillet perimeter where the weld bevels shall not be accurate. Adjacent maximum acceptable cheeks closer than 3/4 inch are not permitted. Welded connections shall be cold tested.

Poles shall be full length pressure treated in accordance with AWPA C1 and AWPA C4a. Net retention of preservative in poles after treatment shall be not less than 0.4 pounds of pentachlorophenol per cubic foot of wood (equivalent to 8 points of 0.01 percent solution).

The depth of wood preservative penetration shall be not less than 3/4 inch as determined by boring. Preservative shall be pentachlorophenol conforming to the requirements of Department of Lighting Materials Standards as follows:

**Component**

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<td>Anchors for guy poles shall consist of one of the following types:</td>
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- (a) 4-way or 8-way steel expanding anchor, having a minimum of 300 square inches, made of pressed steel, coated with asphalt or similar preservative and fitted with 0.34 inch minimum gage eye-anchor rod 6 feet long;

- (b) Plate anchor meeting the requirements of Material Standard 5021.7 fitted with 0.34 inch minimum eye eye-anchor rod 6 feet long;

- (c) An approved steel screw, such as a power installed steel bolt anchor with expansion rod, expansion rod coupling, and strand eye nut. The single strand eye nut shall be in accordance with Material Standard No. 5021.1.

The steel screw will be sized based upon load and soil conditions by the Engineer.

The pipe brace shall be galvanized extra strong steel pipe.

**SECTION 9-34 ELECTRICAL AND SIGNAL CONDUITS**

9-34.1 GENERAL

Conduit shall be PVC coated galvanized rigid metal, galvanized rigid metal conduit, or Schedule 80 PVC conforming to Articles 390, 391 and 392 respectively of the NEC as indicated on the Drawings. Conduit and junction boxes shall be UL listed.

Conduit installed within the metering and disconnect enclosure shall be rigid metal and may be without the PVC coating.

**9-34.2 COUPLINGS AND FITTINGS**

Couplings and fittings for rigid steel type conduits shall be hot-dip galvanized, with the same quantities of zinc coated above. Couplings shall withstand 4 days in the PRECE test as specified above.

9-34.3 PVC COATING

All Schedule 80 PVC conduit coated with chromic acid to provide an anchor for the plastic coating. The entire coating shall be acrylized with an epoxy primer and cure to exceed 0.0005 inches thick prior to the application of the PVC coating.

A PVC coating shall be bonded to the outside of the pipe (including the threads) with a thickness between 0.005 inch and 0.006 inch. PVC coated conduit shall be analyzed ultrasonically. A coupling with the same PVC coating shall be polished and cross section will be identified by the manufacturer of uncoted pipe of the same nominal size. The wall thickness of
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- Film thickness
- Primed surfaces
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- Removal of improper paint
- Repainting existing steel structures
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- Steel
- Timber
- Filing
- Claims and adjustments
- Filing
- Claims and adjustments
- Steel
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- Claims and adjustments

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- Scope of work
- Withholding
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